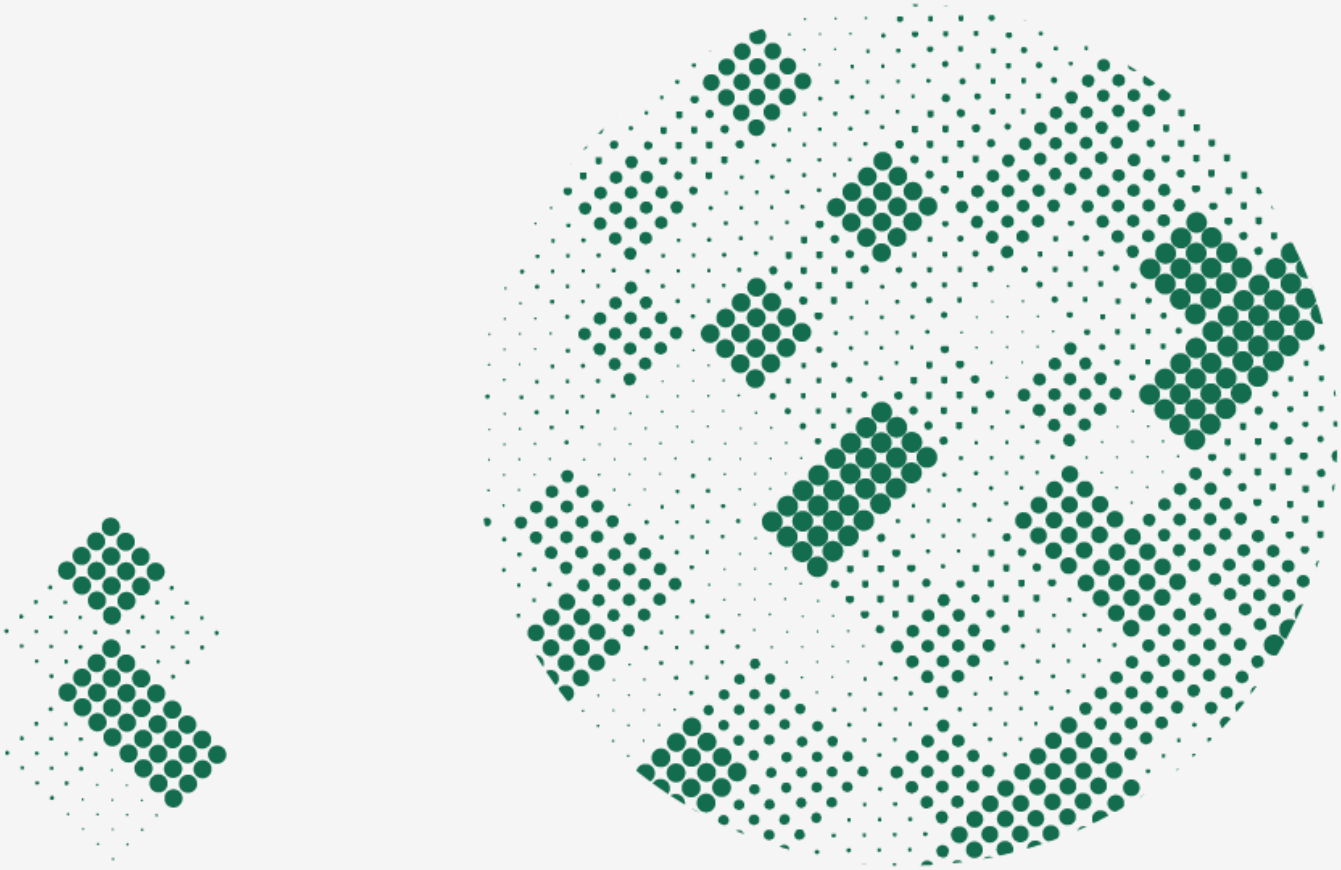
RESPONSIBLE RESEARCH AND INNOVATION IN TERRITORIES

RRI LEADERS

Deliverable 2.3

RRI Audit Reports – compendium of the individual reports of the involved territories



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RRI LEADERS
RESPONSIBLE RESEARCH AND INNOVATION IN TERRITORIES

www.rri-leaders.eu

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Deliverable 2.3

RRI AUDIT REPORTS – COMPENDIUM OF THE INDIVIDUAL REPORTS OF THE INVOLVED TERRITORIES

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P4	THE CATALAN FOUNDATION FOR RESEARCH AND INNOVATION	FUNDACIO CATALANA PER A LA RECERCA I LA INNOVACIO	FCRi
P5	ZURICH UNIVERSITY OF APPLIED SCIENCES	ZURCHER HOCHSCHULE FUR ANGEWANDTE WISSENSCHAFTEN	ZHAW
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P8	MUNICIPALITY OF THALWIL	GEMEINDE THALWIL	THA
P9	ECONOMIC DEVELOPMENT AGENCY OF SABADELL CITY COUNCIL	PROMOCIO ECONOMICA DE SABADELL	PES SL

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List of acronyms / abbreviations used in this document

AIRR – Anticipation, Inclusiveness, Reflexivity, Responsiveness
ANKO - Organisation for Local Development Western Macedonia
CERTH - Centre for Research and Technology Hellas
DIADYMA - Waste Management Company of Western Macedonia
DTSS – Digital Transformation Strategy for Sofia
ERP - Enterprise Resource Planning
ETS - Emissions Trading System
EU - European Union
FDI – Foreign direct investment
GIS – Geographical Information System
IIS - Integrated Information System
ISSS – Innovation Strategy for Smart Specialisation of Sofia
JDTP - Just Development Transition Plan
KPI – Key performance indicator
MFF – European Union's Multiannual Financial Framework
NGEU – Next Generation Europe Recovery Plan
NGO- Non-Governmental Organisation
NSRF - National Strategic Reference Framework
PECT-Vallès - Territorial Smart Specialisation in the Vallès area
PO – Protected Origin
PPC - Public Power Corporation
PSEC - Regional Council for Research and Innovation
PV - Photovoltaics
R&I – Research & Innovation
RDF - Regional Development Fund
RELOS3 - From Regional to Local: Successful deployment of the Smart Specialisation Strategies
RES – Renewable Energy Resources
RIS3CAT – Research and Innovation Strategy for Smart Specialisation in Catalonia
RRI – Responsible Research and Innovation
SDGs – United Nations Sustainable Development Goals
SME - Small and medium-sized enterprises
STEM - Science, Technology, Engineering and Mathematics
SWOT - Strengths, Weaknesses, Opportunities, Threats
SYS – Sofia Youth Strategy 2017-2027
TOWS – Threats, Opportunities, Weaknesses, Strengths

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About the Project

The project "Leveraging Leadership for Responsible Research and Innovation in Territories" (RRI-LEADERS) explores the relevance of responsible research and innovation (RRI) to territorial governance in four European territories, representing different cultural and socio-economic backgrounds, different scope of territorial oversight, different institutional and decision-making infrastructures, different R&I landscapes, and different dynamics among territorial actors.

The objectives of RRI-LEADERS are:

- to facilitate the adoption of RRI principles within territorial governance;
- to promote innovative, inclusive, and responsive multi-actor approach to the development of policies on issues related to science and innovation; and
- to provide an evolutionary perspective on the future of RRI in territorial policy and governance.

The central goal of RRI-LEADERS is to elaborate future-oriented strategy and action plans, or territorial outlooks, for the future potential of RRI as a guiding framework in territorial R&I governance. Outlooks will be developed through a multi-stage co-creation process, which will mobilise quadruple-helix stakeholders, i.e., academia, policymakers, industry, and civil society, from the participating territories.

RRI-LEADERS involves four different territories: Sofia (Bulgaria), Thalwil (Switzerland), Western Macedonia (Greece) and Sabadell (Spain), representing a diverse range of opportunities and implications for responsible research and innovation (RRI), which will enable to carry out a thorough assessment of the RRI relevance to territorial governance. The involved territories will thus act as demonstrators for the potential of RRI on sub-national level. The accumulated knowledge will be used to chart a detailed outlook for the future potential of RRI as a guiding framework in territorial governance of R&I and will aim to provide an evolutionary perspective on RRI for the Horizon Europe programme.

The project adopts the dominant understanding of RRI, as defined by von Schomberg: "A transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products."[1] It diverges only slightly from this definition in that it does not promote the separation of innovators from the rest of the societal actors, and instead seeks to include societal actors as co-creators in the innovation processes, and enable leadership in the development of policies with a future outlook. In doing so, RRI-LEADERS interpretation of RRI draws heavily on the extension of the RRI framework proposed by Stilgoe, Owen and Macnaghten, who emphasise the prospective notion of responsibility by introducing four dimensions of RRI – *anticipation, inclusiveness, responsiveness* and *reflexivity*, largely known as the AIRR dimensions.[2] RRI-LEADERS integrates these four dimensions into its methodological design and operational implementation.

[1] von Schomberg, R. (2011). "Prospects for technology assessment in a framework of responsible research and innovation". In: Dusseldorp, M., Beecroft, R. (Eds.), *Technikfolgen Abschätzen Lehren: Bildungspotenziale Transdisziplinärer*. Vs Verlag, Methoden, Wiesbaden.

[2] Stilgoe, J.; Owen, R. & Macnaghten, Ph. (2013). "Developing a framework for responsible innovation". In *Research Policy*, vol.42(9), pp.1568-1580.

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The overall implementation of RRI-LEADERS builds on the following methodology:

- *RRI Audits in the involved territories and partners*, which starts off the first stage of the co-creation approach in RRI-LEADERS. The partners will establish a clear baseline of existing practices and policy developments in the four territories that have already integrated or have the potential to integrate the RRI keys and the AIRR dimensions (anticipation, inclusiveness, reflection, and responsiveness), thus providing the grounds for mainstreaming the RRI-AIRR approach in relevant policy goals, implementation routines, and territorial (municipal/regional) strategies.
- *Delphi exploration of consensus about future orientations for RRI in the participating territories* defines another stage of the RRI-LEADERS' co-creation process. The Delphi method will be used to assess dissensus and barriers, and to develop consensus about possible and feasible future pathways for a better RRI-AIRR integration for each territory.
- The RRI-LEADERS co-creation process is not strictly linear. The next step in the process is the *Development of RRI-AIRR transformative outlooks in the participating territories.* For each participating territory a transformative outlook will be conceived, conceptualised, subjected to public scrutiny and validation through the involvement of non-organised and non-institutionalised citizens and community groups.
- A horizontal action of *Policy learning and evaluation* runs throughout the project and will integrate insights from the previous activities and will promote a shared and future-oriented vision for RRI as a territorial leadership framework.
- To communicate effectively with its target groups, and to support the diffusion and exploitation of RRI-LEADERS policy outcomes, the partners dedicate efforts to streamline all strategic *communication and dissemination activities*. RRI-LEADERS partners will develop the tools to ensure that RRI-LEADERS' results reach out to the broadest range of interested audiences both within the participating territories and to a broader policy audience across the countries involved and to the EU.

Website of RRI-LEADERS: www.rri-leaders.eu

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Executive Summary

This report represents **Deliverable 2.3 RRI Audit Reports – compendium of the individual reports of the involved territories** of the RRI-LEADERS Project, and presents the individual RRI[3] audit reports of four European territories:

- Region of Western Macedonia, Greece
- Sofia Municipality, Bulgaria
- Municipality of Thalwil, Switzerland
- City of Sabadell, Catalonia, Spain

The **overall objectives** of the territorial RRI audits are to:

- establish the *relevance* of RRI-AIRR[4] approach to the chosen policy focus of the four participating territories;
- establish a baseline of *existing* practices and policy developments (in the policy areas chosen by the participating territories) that have already integrated or have the potential to integrate the RRI keys and AIRR dimensions;
- provide *input* to a Delphi survey focused on future orientations for RRI in the four participating territories.

Each territorial RRI audit report provides (i) a synthesis of findings from the mapping of the territorial R&I eco-systems and stakeholders, as well as of the RRI discourses, (ii) presents the findings of SWOT[5] and TOWS[6] analyses and a summary of discussions in focus groups. Territorial reports conclude with policy recommendations and conclusions.

Focus of the RRI audit report of the Region of Western Macedonia, Greece

The Region of Western Macedonia has chosen 3 interlinked policy areas focused on the post-coal transition of the region:

- Development of a stakeholder engagement strategy within the course of the post-coal transition road map.
- Strengthening policymaking systems involving different modes of territorial governance of the post-coal transition strategy.
- Development of a methodology aiming to a smooth and innovative transition from the coal value chain towards an alternative development 'paradigm'.

The chapter outlines several main **challenges** in regards to the application of the RRI-AIRR approach. Stakeholder and public engagement approaches have been widely applied during the design of the energy-transition framework, but what should be improved in the future is the involvement of the local community through diverse participatory methods. There is a clear need for a new approach to design local policy (in the above mentioned policy areas), with a particular focus on efficiency, decentralisation, transparency, and a clear evaluation process. An efficient application of the RRI-AIRR approach (especially the dimensions of anticipation, inclusiveness and responsiveness) can help tackle the unemployment, which will result from the energy transition in the Region of Western Macedonia (need to plan the measures for re-skilling and up-skilling

[3] RRI – Responsible Research and Innovation policy framework includes five thematic keys: public engagement, gender equality, open access, science education and ethics.

[4] AIRR dimensions include anticipation, inclusiveness, reflexivity and responsiveness. RRI keys and the AIRR dimensions jointly form the RRI-AIRR approach.

[5] SWOT – strength, weaknesses, opportunities and threats.

[6] TOWS – inversed SWOT matrix: threats, opportunities, weaknesses and strengths.

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of the regional workforce) and can assist the local companies to modernize and adapt to new market demands and trends. Science education will have a strong role to play to allow Research, Technology Development and Innovation (RTDI) sector to accomplish this new mandate.

Focus of the RRI audit report of the Sofia Municipality

The report of Sofia Municipality analyses the municipal institutional and policy framework in four selected policy areas (*support for innovation, digital transition and new skills, sustainable urban development, youth employment and entrepreneurship*) with regard to the integration and implementation of RRI-AIRR keys and principles. The report further presents the state-of-the-art regarding the application of the RRI-AIRR framework in the abovementioned policy areas by the local government, and proposes strategies for improving territorial governance through a streamlined integration of the RRI-AIRR in the policymaking process. The analysis has shown that there are well-developed and comprehensive strategy documents in the chosen policy areas, most of which cover a seven or ten-year period of forward planning. Main conclusion is that RRI-AIRR keys are relatively well embedded in municipal policy documents and plans although the policy rhetoric rarely uses the exact terminology and vocabulary of the RRI-AIRR framework. **Challenges** yet to be addressed are the uptake of scientific research results in policy-making and the continuing lack of adequate communication on strategic priorities with the general public. The latter is perceived as an impediment to active citizen engagement in policy making/implementation.

Focus of the RRI audit report of the Municipality of Thalwil, Switzerland

The report of the Municipality of Thalwil makes an overview of the establishment of the RRI-AIRR approach in the municipal energy transition process. The RRI keys are understood by local stakeholders as levers for implementing innovations. The underlying assumption is that the energy transition can be driven forward on the basis of technological and social innovations. However, broad support from diverse actors is needed to embed new technologies in the energy transition in a sustainable and long-term way. In particular, the RRI approach provides an opportunity to consider innovations against the interests of different stakeholders along the quadruple helix who are new to implementing the energy transition in the municipality. The results of the analysis show that certain AIRR dimensions, such as anticipation in the form of forward-looking leadership, are already firmly embedded in local policymaking, but there are still **challenges** concerning other AIRR dimensions, such as inclusion (i.e. collaboration between representatives from business, government, civil society, and R&D) and reflexivity (i.e. evaluation of achieved goals).

Focus of the RRI audit report of the City of Sabadell, Catalonia, Spain

The report of Sabadell and Catalonia is focused on three thematic areas of the Smart Specialisation - Circular Economy, Active Ageing and Intelligent Design in Industry. The report provides the basis for understanding how the actors in those policy areas might benefit from the adoption of an RRI-AIRR approach. The main conclusion is that many of the RRI keys and AIRR dimensions are *de facto* implemented in the stakeholder organisations, whose representatives participated in project's activities (interviews, focus groups and participatory workshop). This is especially valid for gender equality, compulsory by law, and anticipation, essential in any innovation process and as well for establishing strategic plans. However, the RRI policy framework as such is not known or explicitly mentioned in policy plans and there is wide room for improvement of its application. This is the case of public engagement and inclusiveness, emphasised in the territorial policies about Smart Specialisation because of their huge potential for integrating diverse – and

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sometimes divergent – perspectives in research and innovation (R&I). Likewise, it should be noted that no significant differences in RRI implementation and potential have been found among the abovementioned three policy foci, RRI being a transversal concept whose practical application is very influenced by cultural and political idiosyncrasy regardless the economic sector.

The **concluding** part of the deliverable *2.3 RRI Audit Reports – compendium of the individual reports of the involved territories* summarizes the main findings from the territorial audit reports, highlighting a number of interesting and sometimes surprising commonalities and differences in the state-of-play concerning the embeddedness, relevance and potential of RRI keys and AIRR dimensions in the policy processes of the four participating territories. It is interesting to note that differences in practices and perceptions regarding the RRI-AIRR implementation are more pronounced between different quadruple helix stakeholder groups than between territories.

One overarching common feature is that the RRI-AIRR terminology and vocabulary are largely unknown. The only stakeholders well-versed in this field are researchers (and in rare cases policymakers) with experience of working on EU-funded research projects focused on RRI. Not surprisingly, RRI keys and AIRR dimensions are rarely formally included in policy documents, codes and procedures. This however does not mean that RRI related practices are non-existent. Quite the contrary – examples of principles comparable to RRI keys and AIRR dimensions are easy to find not just in policy documents and plans, but also in the way territorial stakeholders operate.

For the Region of Western Macedonia, public engagement, inclusiveness, open access and anticipatory governance appear to be the most important elements of the RRI-AIRR approach. Keys such as public engagement, open access and gender equality, and dimensions such as inclusiveness, anticipation and responsiveness are widely and adequately applied in Sofia Municipality. The most prominent aspects in Thalwil are anticipation, inclusiveness and open access. Sabadell is the only territory, which highlights its strict adherence to the norms of gender equality and ethics, and gives priority attention to the measures ensuring quality science education.

There are also some RRI keys and AIRR dimensions, which could be utilized in a more effective way to support the transformative change in the territories. In Sofia municipality, science education, ethics and reflexivity remain somewhat below the radar and are not practiced on a satisfactory level in none of the four selected policy areas. In Thalwil, there is room for improvement concerning science education, public engagement and reflexivity. Science education and reflexivity also need to be given more attention in the region of Western Macedonia, while in the city of Sabadell, the benefits of public engagement and inclusiveness have not yet been fully exploited. The unsatisfactory application of reflexive governance can be noted as a common feature of all four territories.

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Introduction

RRI-LEADERS: Leveraging Leadership for Responsible Research and Innovation in Territories, involves four different territories: Sofia (Bulgaria), Thalwil (Switzerland), Western Macedonia (Greece) and Sabadell (Spain), representing a diverse range of opportunities and implications for responsible research and innovation (RRI), which will enable to carry out a thorough assessment of the RRI relevance to territorial governance. The involved territories will act as demonstrators for the potential of RRI on sub-national level. The accumulated knowledge will be used to chart a detailed outlook for the future potential of RRI as a guiding framework in territorial governance of R&I and will aim to provide an evolutionary perspective on RRI for the Horizon Europe programme.

RRI-LEADERS attempts to leverage leadership through three complementary tiers of planned intervention around RRI. For each of these tiers the RRI-LEADERS exemplifies leadership as a proactive, shared and responsible taking of action towards setting ambitions for change and societal transformations, driving collaboration and agreement across societal actors, and striving for excellence and lasting impact in the pursuit of these ambitions. The three tiers of leadership intervention are interlinked into an operational progression, whereby each tier supports and enables the others as the project progresses:

- Tier 1 - Leveraging leadership in understanding of RRI proliferation and opportunities in the four territories.
- Tier 2 - Leveraging leadership in examining RRI construct relevance to territorial applications and its transformative potential.
- Tier 3 - Leveraging leadership in the reaffirming of the RRI concept with a view of providing tighter integration of territorial aspects into a renewed RRI construct.

This document represents *Project Deliverable 2.3 RRI audit reports – compendium of individual reports of the involved territories* and is developed within the framework of WP2 *RRI Audits in the involved territories and partners*. WP2 establishes a clear baseline of existing practices and policy developments that have already integrated or hold the potential to integrate the RRI keys and the AIRR dimensions. WP2 belongs to the first tier of territorial leadership, as presented above.

The report features the following chapters:

- The introductory chapter makes a short introduction to RRI-LEADERS project and explains the place of the current report in the project's development. It includes as well a short explanation of the RRI framework and the AIRR dimensions.
- Chapter 1 explains the methodology of the territorial RRI audits. The RRI audits of the participating territories encompass the activities accomplished in Task 2.1 Mapping of territorial R&I eco-systems and stakeholders, Task 2.2 Mapping of the RRI systems discourse and Task 2.3 RRI audit reports, and complete the first stage of the co-creation process in the RRI-LEADERS project.
- Chapters 2 to 5 represent the individual RRI audit reports of the four participating territories, which start with a synthesis of findings from the mapping of the territorial R&I eco-systems and stakeholders and of the RRI discourses, including systemic categorisation of stakeholders. The territorial reports further justify the chosen policy areas. The reports continue with a SWOT and TOWS analysis and a summary of discussions in focus groups. Territorial reports conclude with policy recommendations and conclusions.
- The final chapter 6 brings forth a synthesis of the territorial audit reports, making a review of the state-of-play in regard to RRI keys and AIRR dimensions in the four territories.

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RRI and AIRR Definitions

RRI keys and the AIRR dimensions jointly form the RRI-AIRR approach.

The **RRI policy framework** of the European Commission includes **five thematic keys**: research ethics, public engagement, science education, gender equality, and open access.

- **Public Engagement** is about bringing together researchers, policymakers, industry and civil society organisations and NGOs, as well as citizens, to deliberate on matters of science and technology.
- **Gender Equality** is about fostering gender balance in research teams, ensuring gender balance in decision-making in research, and integrating gender dimension in research and innovation content.
- **Open Access** is about making research findings available free of charge for readers.
- **Science Education** is about making science more attractive to young people (STEM – science, technology, engineering and mathematics) as well as teaching and learning of science to non-scientists, such as school children, college students, or adults within the general public.
- **Ethics** is about conducting research in such a way that allows others to have confidence and trust in the methods and findings of research.

AIRR Dimensions

- **Anticipatory Governance** is focused on harnessing the collective intelligence and wisdom of collaborating organisations and citizens from a given territory (city, region or state) to address strategic risks while at the same time capitalises on emerging opportunities so as to meet the set policy goals of the said territory.[7] Anticipation approaches include foresight, technology assessment, horizon scanning, scenarios, vision assessment, etc.
- **Inclusiveness** deals with the integration of perspectives from a wide range of societal actors (including non-organised and non-institutionalised citizens and community groups) and their involvement in multi-stage co-creation processes in a wide range of policy areas.
- **Reflexive Governance** implies encouraging reflection about societal circumstances in order to reassess practices and adjust initiatives.[8]
- **Responsive and Accountable Governance** places societal needs in the focus of plans and actions of public leadership and governance, and as well engages society in the processes of policy design and decision-making, as well as policy implementation, monitoring and evaluation. It further develops institutions, structures, systems and practices that promote the involvement and participation of the people and ensure equal access to services by all.[9]

[7] Jose Ramos (Action Foresight), Ida Uusikyla and Nguyen Tuan Luong (UNDP Viet Nam) (2020). *Anticipatory Governance — A Primer*. Posted on February 18, 2020 at https://www.vn.undp.org/content/vietnam/en/home/blog/AnticipatoryGovernance.html.

[8] Peter H. Feindt & Sabine Weiland (2018). 'Reflexive governance: exploring the concept and assessing its critical potential for sustainable development.' Introduction to the special issue, *Journal of Environmental Policy & Planning*, 20:6, 661-674, DOI: 10.1080/1523908X.2018.1532562.

[9] Department of Economic and Social Affairs – United Nations (2015). *Responsive and Accountable Public Governance. 2015 World Public Sector Report*. Publication ST/ESA/PAD/SER.E/187, accessible at https://publicadministration.un.org/publications/content/PDFs/World%20Public%20Sector%20Report2015.pdf.

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Chapter 1: Methodology

The current report is elaborated under *WP2 RRI Audits in the involved territories and partners*, Task 2.3 *RRI audit reports of the involved territories*. WP2 aims to establish a clear baseline of existing practices and policy developments (in the policy areas chosen by the participating territories) that have the potential to integrate the RRI keys and AIRR dimensions (RRI-AIRR approach). WP2 provides a launching point for mainstreaming RRI-AIRR approach in relevant policy goals, implementation routines, municipal/regional strategies. It lays the foundation for understanding how territorial actors might benefit from the adoption of the RRI-AIRR approach in the chosen policy areas.

The policy focus of the participating territories is as follows:

- **Region of Western Macedonia, Greece**: Develop a stakeholder engagement strategy within the course of the post-coal transition road map; Strengthen policy-making systems involving different modes of territorial governance of the post-coal transition strategy; Develop a methodology aiming to a smooth and innovative transition from the coal value chain towards an alternative development 'paradigm'.
- **Sofia Municipality, Bulgaria**: Support to innovation; Digital transition and new skills; Youth employment and entrepreneurship; and Sustainable urban development.
- **Municipality of Thalwil, Switzerland**: Energy transition, focused on reducing the use of fossil fuels and hence the greenhouse gas emissions, and reducing the total energy consumption in the territory of the municipality.
- **City of Sabadell, Catalonia, Spain**: Make the territorial innovation ecosystem more inclusive and better aligned with societal challenges, while respecting and promoting sustainability.

The **RRI audits of the participating territories** encompass the activities accomplished in Task 2.1 Mapping of territorial R&I eco-systems and stakeholders, Task 2.2 Mapping of the RRI systems discourse and Task 2.3 RRI audit reports, and complete the first stage of the co-creation process in the RRI-LEADERS project.

Task 2.1: Mapping of territorial ecosystems and stakeholders in the four participating territories. The mapping was accomplished through two data-collection methods; (i) semi-structured interviews and (ii) focus groups. A total of 90 stakeholder organisations (following the quadruple helix approach) were mapped in the four territories, as follows:

- Region of Western Macedonia, Greece: 28
- Sofia Municipality, Bulgaria: 26
- Municipality of Thalwil, Switzerland: 19
- City of Sabadell, Catalonia, Spain: 17

Three questionnaires for in-depth semi-structured interviews were designed in order to best address the specifics of each stakeholder group, as follows: (i) questionnaire for research and academia stakeholders, (ii) questionnaire for companies and organisations of businesses, and (iii) questionnaire for policymakers and civil society organisations. During the interviews the project partners also aimed to identify good practices based on or related to RRI keys and AIRR dimensions. Each territory organised one focus group to further explore some of the findings from the analysis of the in-depth semi-structured interviews.

The mapping process resulted in two immediate outputs: stakeholder profiles (presenting the organisations, whose representatives were interviewed or participated in the focus groups) and good RRI practices from each of the participating territories.

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Task 2.2: Mapping of the RRI systems discourse in the involved territories, which was accomplished through: (i) a documentary review and an analysis of relevant national and regional/municipal documents, which resulted in identification of gaps in existing policies as well as in outlining opportunities for future integration of RRI-AIRR approach in the policymaking of the four participating territories; (ii) a participatory workshop with experts from all stakeholder groups organised in each participating territory. Workshop discussions were summarised in a report, which included recommendations to local policy and decision-makers on how to identify opportunities/policy areas for integration of the RRI-AIRR approach in future municipal/regional policymaking and strategy development.

Task 2.3: RRI audits of the involved territories, which are focused on RRI-relevant policy goals, target groups, governance innovation opportunities, applications, as well as networks, so as to contribute to the conceptualisation of the territorial outlooks in WP4 Development of RRI-AIRR transformative outlooks in the participating territories.

Table 1: Number of interviews, workshop and focus groups participants per territory

	Region of Western Macedonia, Greece	Sofia Municipality, Bulgaria	Municipality of Thalwil, Switzerland	City of Sabadell, Catalonia, Spain
Task 2.1 interviews	**28**	**26**	**19**	**17**
Task 2.1 focus groups participants	**10**	**12**	**15**	**12**
Task 2.2 workshop participants	**13**	**23**	**15**	**13**
Task 2.3 focus groups participants	**31**	**42**	**26**	**24**

The **overall objectives** of the RRI audits are to:

- establish the *relevance* of RRI-AIRR approach to the chosen policy focus of the four participating territories;
- establish a baseline of *existing* practices and policy developments (in the policy areas chosen by the participating territories) that have already integrated or have the potential to integrate the RRI keys and AIRR dimensions;
- provide *input* to WP3 Delphi exploration of consensus about future orientations for RRI in the participating territories.

This deliverable - *D2.3 RRI audit reports – compendium of the individual report of the involved territories*, completes the work on the RRI audits in the four participating territories.

The methodology of Task 2.3 encompasses the following:

- **Synthesis of the findings from the mapping of territorial R&I eco-systems and stakeholders and of RRI systems discourse.** This work builds on the following reports delivered in 2021: *D2.1 Map on stakeholder relationships and interdependencies and report on stakeholder needs, interest, power and influence* and *D2.2 Report on the RRI policy discourse in the involved territories*. The objective was to make a critical re-assessment of the previous activities and reports under Task 2.1 and Task 2.2, with the aim to underline how RRI keys and AIRR dimensions are (or are not) reflected in the territorial policies (documents, strategies and action plans) and practices, and how RRI-AIRR approach is understood and practiced (or not) by the relevant territorial stakeholders (as per quadruple helix). Thus, each territorial RRI audit report had to underline the positive developments, but was also expected to highlight the areas where improvements are possible and propose a possible course of action.

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- **Systemic categorisation of territorial stakeholders** as follows: (i) stakeholders with high levels of interest in relation to RRI in practice; (ii) stakeholders with high levels of experience in RRI, (iii) stakeholders with high levels of power, and (iv) stakeholders with high levels of influence on RRI in practice. The work capitalised on the findings and analysis from the mapping of R&I ecosystems in the four participating territories.
- **Justification of the chosen policy areas:** policy, vision and strategic priorities, identified challenges, business performance, role of research and innovation, as well as civil society. At this stage additional review of territorial and national policy documents and reports was performed (desk research) to deliver an updated review of the chosen policy areas and their challenges.
- **SWOT/TOWS analysis** and stemming development strategies. SWOT analysis was performed for each territory and for each chosen policy area from the perspective of the RRI-AIRR approach. SWOT aimed to identify possibilities for integrating RRI-AIRR approach in the corresponding territorial policy area(s), including the potential benefits and negative aspects of such integration. SWOT analysis was complemented by TOWS (inversed SWOT matrix) analysis, which is action oriented. TOWS provides a good basis to outline possible development strategies as it points out dependencies and relationships between the internal and external factors influencing the chosen policies, i.e. it identifies the areas where action is needed.
- **Consulting the draft RRI territorial audit reports with stakeholders.** The consultations were organised though focus groups, and each participating territory organised four focus groups based on the quadruple helix approach (participants from science, participants from public bodies, business and industry representatives, and civil society actors and citizens).

  The **overall objectives** of the focus-group discussions were to:
  - outline a vision for the development of the chosen policy area(s) by 2030/2050;
  - establish the relevance of RRI keys and AIRR dimensions to the long-term development in the chosen policy area(s) in the participating territories;
  - identify strategic priorities for integrating the RRI keys and AIRR dimensions in the chosen policy area(s).

  Focus-group discussions addressed the following questions:
  - ✓ What is your vision for the development of your territory in the chosen policy area(s) by 2030 (2050)?
  - ✓ What is the transformative change that your territory should go through to achieve this vision? Which are the strategic policy priorities stemming from the vision?
  - ✓ How the responsible research and innovation framework (RRI framework), or individual RRI keys (public engagement, open access, gender equality, science education, ethics) could support the process of transformative change?
  - ✓ How the AIRR dimensions (anticipation, inclusiveness, reflexivity, responsiveness) could support the process of transformative change?
  - ✓ How do you perceive the role of *science/business/policy makers/civil society and citizens* in the process of this transformative change for achieving the identified policy priorities?
  - ✓ How do you / could you cooperate with the other stakeholder groups in the process of transformative change?
  - ✓ Recommendations for integrating the RRI keys and AIRR dimensions in the identified strategic policy priorities.

What follows are the four territorial reports (Chapters 2 to 5) which present the synthesis of findings from the mapping of the territorial R&I eco-systems and stakeholders and of the RRI discourses, including systemic categorisation of stakeholders. The territorial reports further justify the chosen policy areas. The reports continue with a SWOT and TOWS analysis and a summary of the discussions in the focus groups. Territorial reports conclude with policy recommendations and conclusions.

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Chapter 2: RRI Audit Report of the Region of Western Macedonia

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Summary

This audit report seeks to deepen the study regarding the integration of the RRI-AIRR approach in the territorial policies of the Region of Western Macedonia. To do so, a survey was drawn up based on the findings from interviews and a focus group, as well as on a documentary analysis and the workshop, and brought to the fore the final conclusions regarding the integration of the RRI-AIRR approach into the territorial policies. The target audience of this report are all the relevant stakeholders from the quadruple helix, namely policymakers, academia, business, and civil society that seek insights on the integration status of the RRI-AIRR approach into the territorial policy areas of the region of Western Macedonia which in short are:

- Development of a stakeholder engagement strategy as an integral part of the post-coal energy transition road map.
- Strengthening policy-making systems involving different modes of territorial governance of the post-coal transition strategy.
- Development of a methodology aiming to a smooth and innovative transition from the coal value chain towards an alternative development 'paradigm'.

In addition, a detailed table maps all the participants who have participated in the research so far, capturing them in four different types in relation to Responsible Research and Innovation, namely interest, experience, influence, and power. In total, 46 stakeholders from the region of Western Macedonia have been mapped.

A SWOT/TOWS analysis follows, which reflects the level of integration of the RRI-AIRR approach in the selected policies of the region, giving an opportunity to identify specific strategic policy priorities. More specifically, regarding the three policy foci of the region, eleven strategic priorities were identified in total describing the RRI keys and AIRR dimensions already being embedded.

Finally, four focus groups with participants covering the quadruple helix stakeholders were conducted, outlining recommendations for RRI-AIRR approach integration towards the strategic priorities of the region. The problems and questions of interest identified are:

- Research and innovation should be integrated into all available solutions for the energy transition.
- There must be equal development of various sectors of the region which will allow businesses to adopt the necessary transition strategies by 2030.
- A drastic change of the production model towards an environmentally neutral, socially sustainable, and economically competitive region.
- The need to transform the current production model to an alternative one that is primarily based on RES.

Recommendations for RRI-AIRR approach integration towards the strategic priorities of the region of Western Macedonia revolve around the following:

- University research centres need to play an active role, delivering science education focused on research designed around the local-economy needs.

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- Active collaboration of the academia members with the local business and policy-making actors and collaborations with relevant companies.
- Strong incentives to be given to attract investments in the region that are innovative and create jobs.
- Co-creation collaborations among business clusters in the region are to be encouraged in order to develop value-added products.
- In order to develop robust production chains in the region a regional model of cooperation should be developed which integrates valuable contributions from diverse businesses in the region.
- A public engagement that is structural in nature and will lead to a policy framework in the long term that implements solid cooperation at national and local level, in a multi-level transition governance approach.
- A clear anticipatory framework by the central policy makers is needed, considering all identifiable positive/negative effects of energy transition.

2.1 Introduction

The current audit report brings forth final conclusions regarding the perception and embeddedness of the RRI-AIRR approach in the territorial policies and practices of the Western Macedonia region.

The policy focus of the Region of Western Macedonia revolves around the following areas:

- Develop a stakeholder engagement strategy within the course of the post-coal transition roadmap.
- Strengthen policymaking systems involving different modes of territorial governance of the post-coal transition strategy.
- Develop a methodology aiming to a smooth and innovative transition from the coal value chain towards an alternative development 'paradigm'.

The initial steps taken were the mapping of the territorial R&I ecosystem and stakeholders, a documentary analysis identifying opportunities/areas for integration of the RRI-AIRR approach in the three selected territorial policy areas and a participatory workshop exploring participants' perception towards responsibility, and reporting on the RRI policy in the region.

The report is articulated upon:

- Identification of a vision and challenges in relation to the aforementioned policy focus areas.
- Critical analysis and synthesis of the experience related to RRI-AIRR in Western Macedonia.
- Stakeholder mapping in relation to the level of relevance (interest, experience, power, influence) with the RRI-AIRR approach.
- SWOT and TOWS reflection for the three chosen policy areas through a critical perspective.
- Identification of strategic policy priorities and policy pillars based on the SWOT/TOWS analysis.
- Findings from four focus-group discussions organised with quadruple helix actors.

The report ends with policy recommendations for the embeddedness of RRI-AIRR approach in the region, which will provide input to the upcoming Delphi study that will assess dissensus and barriers to reach consensus about possible and feasible future pathways for a better RRI integration in the territorial policymaking of the Region of Western Macedonia. The report will also provide input for the last stage in the RRI-LEADERS co-creation process where each territorial partner will develop a transformative outlook as an action plan for the integration of RRI-AIRR into territorial policymaking and will demonstrate how RRI-AIRR can be taken up as a policy framework in different territorial contexts and be applied to issues where science, technology and innovation require multi-actor approaches combined with a shared awareness of the future.

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2.2 Policy areas

The Region of Western Macedonia chose three policy areas:

- Develop a stakeholder engagement strategy within the course of the post-coal transition road map.
- Strengthen policymaking systems involving different modes of territorial governance of the post-coal transition strategy.
- Develop a methodology aiming to a smooth and innovative transition from the coal value chain towards an alternative development 'paradigm'.

Western Macedonia is dedicated to following the path of the post-coal transition roadmap, which includes improving policy-making mechanisms incorporating various types of territorial government. Western Macedonia's fair transition policies to the post-lignite age are important to build a new productive-consumer paradigm. The goal is to encourage regional networks and clusters to apply new ideas and policies to promote innovation, regional growth, and the improvement of public services for residents. To this aim, national policies and strategies must be impacted at all levels of governance in the direction of a more evolutionary approach to territorial policy.

The main policy vision for the future of Greek coal areas, and especially for the region of Western Macedonia, is to make them a better, more resilient, energy-efficient, and sustainable place. A fair transition plan will rely on the full support and participation of local communities to maximise the advantages for them while also promoting social cohesion by not leaving anybody behind. Policies will provide a new production model and a paradigm shift to the regional growth model.

The Just Development Transition Plan (JDTP) for Greece tackles all concerns emerging from the Greek government's strategic decision to retire all lignite power facilities by 2028, including extensive engagement with local stakeholders. The strategic priorities of the Region of Western Macedonia for the energy transition are summarised in five principles:

1. Create new employment opportunities in the local community.
2. Utilise the comparative advantages of the region, including high technical skill base of workforce, large potential for clean energy investment (solar PV, biomass, green hydrogen), prospects for sustainable tourism and smart agriculture, proximity to large urban centres, availability of district heating infrastructure, etc.
3. Ensure a fast transition with a focus on realistic and workable solutions.
4. Aim at sustainable development to promote social and environmental sustainability.
5. Promote research and innovation and integrate modern technology.

Western Macedonia is called upon not only to adjust its production model to the new requirements but also to proceed immediately to a comprehensive productive restructuring towards a full phase-out of lignite activities.

The main challenges that have been identified for the region with regards to the application of the RRI-AIRR approach are the following:

- Although public engagement and inclusion were applied to a large extent in the design of the energy transition framework of the region, the voice of the local community could be further strengthened by actively engaging it through diverse participatory approaches.
- All policy decisions relevant to the policy foci of the area were based on wider consultations with participation by the affected parties, but what was identified as a key shortcoming was a lack of a clear and effective evaluation process of all these policies.

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- Taking into consideration that the currently applied model of policy design is the top-down model, there is a need for a new policy-design process which combines efficiency, decentralisation, transparency, and evaluation.
- To ensure efficient clean energy, a strategic change of the production model of the region is needed, and a pathway for new investments must be created.
- To tackle the unemployment that will arise in the post-lignite era, the workforce has to be retrained and integrated into new production activities, while entrepreneurship needs to be strengthened and promoted. Science education has an important role to play through the organisation of seminars, educational activities, and the promotion of innovation to tackle the challenges of the energy transition.
- Research and development need to relate to the modernisation of companies. To keep up with the changing globalised market model, research results and outcomes must be used and should follow the responsiveness of local markets, and vice versa, local firms must adapt to new trends and new market demands.

The policy area analysis concludes with some key considerations for the transformative outlooks / the political and societal transformation process in the chosen policy areas. The transformative outlooks will be linked to prior strategies adopted within the territorial level, and will seek to update, expand, and enrich relevant territorial policies for sustainable development, or outgoing smart specialisation strategies, or thematic segments thereof along with enhancing the linkages with AIRR dimensions, especially anticipation, reflexion and responsiveness. These key considerations are:

- Finding strategies to ensure inclusiveness, outreach, and active participation of particular vulnerable groups, such as teenagers, women, and other underrepresented groups. The value of existing consultative fora and approaches in the consultation strategy has been assessed by an external evaluator and the results of the evaluation were given to the region to proceed with further actions.
- The participatory governance strategy for the promotion of the policy focus of economic transition towards a low-carbon economy for the post-coal lignite period, which includes bringing together all stakeholders from the quadruple helix, has worked quite well so far but it needs more concrete linkages between the stakeholders of the policy focus to construct an inclusive transformation path.
- The value of RRI-AIRR in the energy transition of the Region of Western Macedonia can be appraised based on a significant number of stakeholders who collaborate and participate in this area, including research institutes, companies and the regional authority.
- Every component of the transition plan, from spatial planning to investor attraction and governance, needs particular policies. The plan's execution needs to be speedier, more cost-effective, and socially equitable.
- Strengthening and promoting entrepreneurship as well as re-skilling of human resources to combat the unemployment that will arise in the post-lignite era. The application of scientific education, more particularly STEM, can play an important role at this point, through the development of seminars, educational activities, and the promotion of innovation.
- The active participation of citizens in the energy markets, through the energy communities (in the clean energy package, energy communities are legal entities that organise collective and citizen-driven energy actions that will help pave the way for a clean energy transition, while moving citizens to the fore and engaging them to the processes of the energy transition). For this active participation the added value of inclusiveness plays a significant role by integrating perspectives from a wide range of social actors (including non-organised citizens and non-institutionalised social groups) and involving them in co-creation processes.
- There is a need to promote local activities that can create jobs to replace those lost in the lignite industry while also promoting state of the art innovations that can contribute to a more efficient and effective regional economic development (e.g., smart agriculture, sustainable tourism, clean energy development).

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- The promotion of knowledge-intensive activities is also proposed (e.g., hydrogen production, new manufacturing activities), hence investing in Research and Innovation and building synergies between the local community and the University of Western Macedonia is a critical success factor.
- The rehabilitation of depleted lignite mines, spatial planning, licensing simplification, the creation of local energy communities and the launch of big infrastructure projects are highlighted as important prerequisites by the stakeholders.

2.3 Synthesis of experiences related to RRI-AIRR

1. Most prominent RRI keys and AIRR dimensions reflected and practiced in the region: Open access, public engagement, inclusiveness, anticipatory governance

Open access

Open access is the most prominent RRI key that is reflected in almost all territorial policies and is practiced by the relevant territorial stakeholders of the quadruple helix. Through the current policies on clean energy for the successful elaboration of the Region's Policy Focus such as the open process of submission of non-binding investment proposals by the public sector since 2020 and public consultations for stakeholder engagement for the energy transition, Open access has improved in terms of people' access to, usage of, and quality of information and communication technology, as well as publicly available data and information'.

The field of digital governance has been crucial for the development of all the 13 Regions of the Greek state and for the transition to the new digital and technology era. The policies and actions are designed and implemented to digitise the whole state governance and support the digital transformation of the country in general. More specifically, for the Region of Western Macedonia this area includes e-government actions related to open data, digital accessibility, digital economy. Through the Regional Development Fund of Western Macedonia with its digital governance there is an ongoing support in the developmental planning, by providing the necessary data for the relevant services, and support the beneficiaries in the process of prioritising the projects for their implementation, preparation, and integration into the respective operational programmes, as well as to support them during their execution until their completion. All those actions have largely improved the public open access to national, regional, and local data, policies and decisions.

Public engagement

Because the region's policy focus on engagement strategy, territorial governance and an alternative development paradigm towards a low-carbon economy has a direct impact on the society at large, another major and widely practiced feature is public engagement. Public consultation has been so far an important tool in the creation of policies towards the energy transition and intervention actions. Open public consultations on different areas of the policy focus such as clean energy development, industry manufacturing activities, actions for sustainable tourism, etc. were undertaken in connection with the open data, and all stakeholders were given the opportunity to share their thoughts.

Finding ways and means to assure outreach and active involvement of certain vulnerable groups, such as adolescents, women, and other groups not proportionally represented within current interest organisations, has received special attention. Existing consultative fora and techniques were mapped out and their value in the consultation strategy appraised.

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Inclusiveness

The participatory governance model for the advancement of the policy focus for the post-coal lignite era has been very well maintained so far by bringing together all stakeholders relevant to the advancement of the energy transition such as academia, businesses of the region, regional policymakers and civil society. There is a collaboration and participation of many stakeholders for the advancement of the three policy areas such as the RIS Structure of Western Macedonia, Regional Authority with the Regional Development Fund, the local university departments and the national centre for research and technological development. There is also a crucial interaction of the research institutes of the region with other agencies and many collaborations with businesses such as PPC and business clusters such as the cluster of bioeconomy and environment of Western Macedonia as well as ANKO Western Macedonia S.A. organisation for local development which is actively involved in the transition action policies, e.g., new district heating strategies.

The Transition Plan requires specific policies in every aspect, from spatial planning to investment attraction and the governance system. The concern is about the fact that the governance model, which outlines how people in authoritative positions hold themselves accountable to their stakeholders, and incorporates ethics, integrity, and a responsible code of conduct, largely ignores regional and local structure conditions, therefore a combined model of governance, with local and central actors is proposed in the Just Transition Development Programme for the plan to be faster, efficient, cost-effective, and socially fair.

Throughout the preparation of the master plan, regular and open dialogue with stakeholders was maintained, including the Municipal Councils, labour centres, chambers, trade unions, scientific bodies, the University of Western Macedonia, the Centre for Research and Technology Hellas (CERTH). The contribution of the academic community was mentioned as catalytic to co-shape the new upgraded role that the CERTH will have.

Since 2020 a Technical Committee was established, to evaluate the investment proposals and formulate a scientifically substantiated opinion. Non-public sector organisations have been invited to submit non-binding investment proposals and development plans in response to open invitations for the transition economy. Since July 2020, an open process of submission of non-binding investment proposals by the public sector has started. The Government Committee has approved a Special Transitional Fair Transition Programme which is designed specifically for the lignite areas and will be financed mainly by the NSRF 2014–2020, the Green Fund and the Recovery Fund. From September 2020, the Public Sector bodies that are active in the lignite areas were invited to submit proposals within the Special Transitional Fair Transition Programme (2020–2023), for the financing of projects and actions.

The Regional Operational Programme of Western Macedonia promotes the support for Higher Education Institutions and Collaborative Institutions for the development of entrepreneurship, innovation, and business maturity, with the aim of utilising research activity, inventions and new products and services developed in academia, strengthening the connection with the labour market and industry and the employability of graduates and researchers.

The Regional Operational Programme's activities provided an inclusive paradigm for business assistance actions for the application of innovations and/or research and technology outcomes. As a result, mechanisms that presently promote competitiveness, innovation, and business extroversion (incubator, regional framework for company growth) have been established, bringing together diverse stakeholders. Business support activities have resulted in the formation of collaborative schemes (clusters) and networks focusing on key areas, as well as extroversion-oriented business and cluster support actions focusing on local products and services.

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2. RRI keys and AIRR dimensions not reflected, understood, lacking, or not practiced: Science education, reflexive governance

Science education

The transition towards a low-carbon economy also shifts the territorial priorities in the STEM field (Science, Technology, Engineering and Mathematics), as seen by the emergence of several new internet-based firms and a growing focus on STEM and robotics education. The investments, which include infrastructure and skills to support STEM-related activities in the Region of Western Macedonia will not be completely realised until 2030. Existing research infrastructure has been upgraded, and new research infrastructure has been created. Western Macedonia has established a new campus (by 2020) to boost the region's research dimension, as well as upgrading secondary education facilities.

However, the gap between a smooth link between academia, business, and administration is still existent, with the biggest caveat being science education towards the general public. Moreover, science education is not fully supported through funds or concrete development action plans to boost innovation through STEM practices in the region.

Smart Specialisation Strategy is the development strategy of the Region of Western Macedonia, which focuses on exploiting the results of Research, Technological Development, and Innovation from the production sectors in which the region has or can acquire a competitive advantage. It is very important in the new programming period this strategy to focus smartly on those activities of industries, utilising the knowledge of the business and research world.

The Regional Council for Research and Innovation (PSEC) was established in the framework of the implementation of the Smart Specialisation Strategy in the Region, as an instrument to support research, technological development, and innovation development actions. Special emphasis from PSEC is given to the action of Fair Transition in Western Macedonia with the aim of the smooth transition of the region to the next post-coal era and the support of the local community. PSEC focused on the study of socio-economic impacts and challenges of fair transition. The goal of PSEC for the post-coal era is the creation of a dynamic and effective ecosystem of research, innovation, and entrepreneurship. Its role needs to be further strengthened.

The above can help the enhancement of the collaborative and networking actions between research institutions, educational institutions, and businesses in priority areas of the Region. Collaborative links from the aforementioned actors have been established but these established links need to maintain and provide a constant stream of new insights in order to help the region achieve its policy focus on energy transition in a low carbon economy. Science education is a major dimension to the success of the territory’s development and improving it has been highlighted as a critical component of the energy transition.

Reflexive governance

A variety of studies have been conducted on the economic activity, social conditions, and the region's energy profile. Support for de-lignified enterprises, as well as the reinforcement of existing and future investments, will be achieved through the provision of specific institutional incentives (financial, tax, insurance, and licensing), as well as the utilisation of all available resources. However, these provisions and incentives need further elaboration on how they will address each economic and developmental bottleneck of the Region’s economic force since societal circumstances rapidly change due to the nature of the energy transition and there is a need to reassess practices and adjust initiatives and have a more competent reflexive governance.

Assessing the overall RRI-AIRR approach, most of the dimensions are applied to various degrees. Open access, public engagement, inclusiveness and anticipatory governance are the most prominent RRI keys and AIRR dimensions reflected and practiced in the region of Western Macedonia. In terms of ethics formal institutions

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such as the university follows strict rules over the research processes, data management and other relevant issues concerned. Gender equality plans are established by law and are followed through the university's committee on gender equality. Science education and reflexive governance are the two dimensions that lag behind. The existing barriers and drivers to integrating all the RRI-AIRR approach in the chosen policy areas of the region, in comparison to other coal-intensive regions, are the lack of progress in energy transition which includes a significant lack of response in terms of effective policymaking. The important transition to renewable energy resources without a thorough strategic and spatial planning along with environmental impact assessments, demonstrate a lack of reflexivity and anticipatory governance by regional and national policymakers. Significant delays in key anticipated investments are caused by a bureaucratic and ineffective public administration, demonstrating a lack of reflexivity and responsiveness.

2.4 SWOT/TOWS analysis

SWOT analysis

The section describes the Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis for the three chosen policy areas in Western Macedonia. SWOT analysis has been used to identify possibilities for integrating RRI-AIRR approach in the low-carbon transformation in Western Macedonia, including the potential benefits and possible negative aspects of such integration.

Table 2: SWOT analysis of the region of Western Macedonia

Strengths	Weaknesses
Stakeholders: (1): Open access is reflected in almost all territorial policies and therefore represents the most prominent RRI key. Open access is mainly practiced by the Academia, Business and Civil Society. (2): Business and policy making organisations consider ethics as fully implemented. They are also applying practises close to RRI keys and AIRR dimensions such as public consultation indicating inclusiveness. (3): The University and CERTH are the public bodies which implement RRI keys and AIRR dimensions in the most effective way, followed by the Regional Authority and the municipalities. **Local policy areas:** Several policy documents relevant to the region's policy areas reflect some of the RRI keys and AIRR dimensions (open access, science education, inclusiveness) to a high degree, and some RRI keys (public engagement) and AIRR dimensions (responsiveness) to a sufficient degree. (4): RRI/AIRR keys/dimensions are well-reflected in the following documents:	**Stakeholders**: (1): Lack of effective cooperation between societal, research and business stakeholders does not favour the generation of RRI-AIRR outputs. **Local policy areas:** (2): **The centralised institutional** setting of the state gives little room to regional and local actors to apply the AIRR dimensions of reflexive and responsive governance. (3): Science education and anticipatory governance are partially applied since research results are not sufficiently embedded in energy transition policymaking systems. Thus, there is a need for more targeted scientific research that can directly incorporate societal local needs. (4): The short coal phase-out timespan is considered by many local actors as adequate, which is contradictory to the existing notion that the timespan given for the transition is very short – this is an indication of a lack of anticipatory governance.

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■ "Develop a stakeholder engagement strategy within the course of the post-coal transition road map": Road Map for a Managed Transition of Coal-Dependent Regions in Western Macedonia (2020). ■ "Strengthen policy-making systems involving different modes of territorial governance of the post-coal transition strategy": Regional Operational Programme for Western Macedonia (2014). ■ "Develop a methodology aiming to a smooth and innovative transition from the coal value chain towards an alternative development 'paradigm'": Stakeholder Engagement Plan (SEP) for Western Macedonia (adopted in 2020) and Just Development Transition Plan (2020).	
Opportunities	**Threats**
(1): The energy transition is associated with a special emphasis on digital transformation policies, which is expected to help local enterprises benefit through accessing valuable information and networking opportunities, achieving maximum levels of open access. (2): The already-implemented post-coal practises from other coal intensive countries in energy transition can help the region to improve the integration of RRI-AIRR approach in territorial governance. (3): Just Transition fund and the Green Deal Strategy provide many opportunities for applying RRI-AIRR approach promoting responsive governance, by drastically strengthening the digital / innovative competences of the local workforce through skilling, upskilling and reskilling practices. (4): Extensive environmental restoration and land repurposing of the region involves a holistic green strategy which takes into consideration the perspectives of societal actors, promoting inclusiveness and regional anticipatory and accountable government.	(1): The region shows a step back and lack of progress in energy transition compared to other coal intensive regions in EU. This concerns public engagement strategies which seem to be less reflexive, responsive and inclusive, failing to comprise local governance conducted by local actors. (2): The critical shift in the development of measures such as photovoltaic installations and wind turbines that is currently being implemented, may harm the environment without contributing to new jobs. This is an indication of lack of reflexive governance and may need to be readdressed. (3): Limited open access of local societal segments in the public consultation takes place regarding post-coal transition. While the transition mechanisms foresee and implement full publication of both policy decisions as well as consultations, the implementation and evaluation process are absent. This leads to the possible exclusion of crucial policy remarks by the local peripheral and national actors in the post-coal transition, indicating lack of inclusiveness. (4): A bureaucratic and dysfunctional public administration leads to significant delays in critical scheduled investments that may jeopardise the whole just transition plan, indicating a critical lack of responsive governance and reflexivity.

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TOWS analysis

This section presents the **TOWS** (inversed SWOT matrix) analysis. The objective of the TOWS analysis is to outline dependencies and linkages between the internal and external factors identified in the SWOT analysis. Thus TOWS analysis provides the basis to elaborate development strategies and propose concrete actions which aim to take advantage of opportunities, leverage existing strengths, focus on minimising/mitigating external threats and address internal weaknesses.

The main findings of the TOWS analysis are presented in the table below.

Table 3: TOWS analysis of the region of Western Macedonia

	External opportunities (O)	External threats (T)
	(1): The energy transition associated with digital transformation policies, sparks open access. (2): The experience gained from other coal intensive countries can improve the integration of RRI-AIRR approach. (3): Just Transition Fund and the Green Deal Strategy provide many opportunities for applying RRI-AIRR approach. (4): Environmental restoration and land repurposing involves a holistic green strategy promoting inclusiveness, anticipatory and accountable governance.	(1): The region shows a step back in public engagement, reflexivity and responsivity compared to other coal-intensive regions in EU. (2): The massive shift in photovoltaics and wind turbines without contributing to new jobs, indicates a lack of reflexive governance. (3): Limited access of local societal groups to public consultation during the implementation and evaluation processes. (4): Bureaucracy may jeopardise the just transition indicating a lack of responsive governance and reflexivity.
Internal strengths (S)	Strengths-Opportunities strategy (S-O) **(Maxi-Maxi strategy)**	Strengths-Threats strategy (S-T) **(Maxi-Mini strategy)**
(1): Open access is reflected particularly in Academia, Business and Civil Society. (2): Business and policy making organisations consider ethics in particular as fully implemented.	(1-S)-(1-O): Digital transformation may be formed into a multi-functional open-access database. (2-S)-(1-O): Ethics is incorporated as a primary RRI-AIRR prerequisite to all digital measures. (3-S)-(1-O): Research institutions are actively involved in the digital transformation and RRI-AIRR approach. (4-S)-(1-O): Energy transition programmes involve digital transformative initiatives and RRI-AIRR measures. (1-S)-(2-O): The incorporation of open access practices implemented in other coal areas contributes to the effective implementation of RRI-AIRR principles. (2-S)-(2-O): Ethics can improve an ex-transition practises framework, by incorporating ethical issues (equal access, environmental protection) in an already effective framework.	(1-S)-(1-T): Initiate a broader engagement strategy spectrum that allows a fast exploitation of stakeholders' perspectives. (2-S)-(1-T): Ethics is embedded in a holistic transition framework that will promote equal participation of local societal segments. (3-S)-(1-T): UoWM is actively involved in the implementation of energy transition. (4-S)-(1-T): Mature and well-developed transformational initiatives with significant magnitude of investments are implemented. (1-S)-(2-T): Open access to decision making allows an effective social consultation on massive shift in photovoltaics and wind turbines. (2-S)-(2-T): The assimilation of ethics in transition strategy, restricts the over-development of investments such as photovoltaics and wind turbines that do not create new jobs.

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(3): The University and CERTH are the ones that primarily implementing RRI keys and AIRR dimensions to the most effective way (4): RRI/AIRR keys/dimensions are well-reflected into the key policy documents referring to Western Macedonia	(3-S)-(2-O): The University of Western Macedonia and CERTH contribute to the transfer of experience gained in other countries. (4-S)-(2-O): Strategic action programmes are enriched by practises gained from coal-transition regions. (1-S)-(3-O): Open access foreseen in Just Transition Fund and the Green Deal Strategy, promote an innovative capacity building involving skilling, upskilling and reskilling practices (2-S)-(3-O): The Just Transition strategy incorporates ethics, taking into consideration business and all societal actors. (3-S)-(3-O): University/CERTH lead the development of a holistic educational framework for the post-coal future workforce. (4-S)-(3-O): Just transition programmes incorporate innovative competences for the local scientists and workforce. (1-S)-(4-O): Restoration and land repurposing foresee full open access as well as public consultation and engagement for local key-actors. (2-S)-(4-O): Land restoration focuses on impacts, affecting all societal segments. (3-S)-(4-O): UoWM/CERTH scientifically supports the environmental restoration. (4-S)-(4-O): Environmental restoration is incorporated in all energy-transition programmes.	(3-S)-(2-T): University/CERTH promote the scientific research on more valuable energy sources such as Hydrogen etc. (4-S)-(2-T): The Regional Operational Programme foreseen diversified green energy sources. (1-S)-(3-T): Open access in evaluation procedures is initiated, actively promoting the participation of societal actors. (2-S)-(3-T): Ethics is embedded in all phases of public consultation by clearly addressing open access to all strategic documents. (3-S)-(3-T): UoWM/CERTH develop open platforms for the evaluation of the transition strategy and actions. (4-S)-(3-T): Transition Programmes foresee a broader participation of all quadruple helix segments. (1-S)-(4-T): Open access platforms limit the negative effects of bureaucracy. (2-S)-(4-T): Ethics is incorporated in public administration in terms of accountable governance to societal needs. (3-S)-(4-T): University develops an innovative governance model for energy transition. (4-S)-(4-T): The transition funds accelerate the implementation of the proposed investments and transformations, overcoming bureaucracy.
Internal weaknesses (W)	Weaknesses-Opportunities (W-O) **(Mini-Maxi strategy)**	Weaknesses-Threats (W-T) **(Mini-Mini strategy)**
1): Lack of effective cooperation between societal, research and business stakeholders does not favour the generation of RRI-AIRR outputs.	(1-W)-(1-O): An effective digital transformation favours cooperation between the stakeholders. (1-W)-(2-O): Incorporation of already-implemented practises in other coal-regions, contributes to effective cooperation. (1-W)-(3-O): Just Transition Fund and the Green Deal Strategy encourage innovative approach of cooperation. (1-W)-(4-O): Environmental restoration strategy involves societal actors such as	(1-W)-(1-T): The lack of cooperation is minimised by setting a clear roadmap, distinct duties and effective governance model. (1-W)-(2-T): The development strategy of photovoltaics and wind turbines promote an effective cooperation among societal actors. (1-W)-(3-T): Open debates and referendums on transition strategy and key investments are applied.

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(2): The centralised institutional setting of the State gives little room to regional and local actors to apply reflexive and responsive governance. (3): Science education and anticipatory governance are partially applied without incorporating societal local needs. (4): The short coal phase out time span is not considered by most local actors as unrealistic indicating a lack of anticipatory governance	farmers and producers in the consultation and the decision making. (2-W)-(1-O): Decentralisation of the consultation and the decision making models is supported through digitalisation. (2-W)-(2-O): Practises from ex coal intensive regions include local decision making and place-based approaches. (2-W)-(3-O): The implementation rules of the Just Transition Fund encourages the decentralisation of the State in the particular area. (2-W)-(4-O): The implementation of a holistic green strategy advocates decentralisation policies. (3-W)-(1-O): Societal needs are incorporated into scientific research through extensive digitisation. (3-W)-(2-O): Scientific research and anticipatory governance are taking into account best practises from other coal regions. (3-W)-(3-O): Local societal needs are sufficiently embedded into Just Transition Fund and the Green Deal Strategy. (3-W)-(4-O): Scientific research is focused on environmental restoration taking into consideration societal local needs. (4-W)-(1-O): Digital transformation eases the negative consequences of a short time span of coal phase out. (4-W)-(2-O): The negative consequences of the short time span are mitigated by integrating the experience in other coal regions. (4-W)-(3-O): Just Transition Fund quickly transforms the local workforce to become capable to find alternative jobs in the short period. (4-W)-(4-O): Environmental restoration and land repurposing is implemented shortly, aligned with the time span.	(1-W)-(4-T): Emphasis on digitisation is decreased bureaucracy and increase the effectiveness of cooperation. (2-W)-(1-T): Decentralisation in decision making speeds up the implementation of energy transition. (2-W)-(2-T): Decentralisation brings investments more directed to local needs, apart from photovoltaic and wind turbines. (2-W)-(3-T): The evaluation of scientific results at a local level connects scientific research to local needs. (2-W)-(4-T): A clear distinction in administrative procedures and competences between the State and the local level, enhances the effectiveness of post-coal strategies. (3-W)-(1-T): Research is focused on transitional needs aiming to speed up the implementation of post-coal strategy. (3-W)-(2-T): Scientific studies of alternative energy solutions such as energy storage, hydrogen and biomass contributes to a more balanced energy mix. (3-W)-(3-T): Science results of the local university are evaluated on the basis of benefits to the local communities. (3-W)-(4-T): Science research that takes into consideration local needs and anticipatory governance practices decrease bureaucracy. (4-W)-(1-T): An extension to coal phase out road map brings the necessary time for a smooth transition. (4-W)-(2-T): A more balanced energy mix by including not only photovoltaic and wind turbine but also other energy solutions, contributes to a realistic phase out and smooth transition. (4-W)-(3-T): A large part of the evaluation of the transition plans is attributed by local bodies rather central entities. (4-W)-(4-T): Simplifying the investment requirements and invest on digitisation overcome bureaucracy and accelerate the transition plan.

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2.5 Identification of strategic policy priorities

The chosen policy areas are a part of a broader strategy of energy transition, which is focused in articulating the following strategic policy pillars which were taken into consideration for the implementation of the SWOT/TOWS analysis. The strategic policy pillars are:

- Energy transition – climate neutrality.
- Empowerment and promotion of entrepreneurship.
- Just transition and strengthening human capital.
- Agri-food and farming sector.
- Adjustment of land reuse – circular economy.

1st Policy focus: Develop a stakeholder engagement strategy within the course of the post-coal transition road map

The most effective policy priorities for the stakeholder engagement strategy within the course of energy transition can be exported from several distinct policy documents that have already been prepared by the policy makers for that specific cause. Taking into consideration the strategic policy pillars and the strengths/weaknesses/opportunities/threats/ accruing from the SWOT/TOWS analysis, a strategic policy priority is: "***Development of supportive digital infrastructures and services of smart communities".*** This policy priority would identify, promote, and implement the necessary digital infrastructures that are necessary for the characterisation of a community as "smart". These infrastructures concern the region's public infrastructures as well as business and home infrastructures of the communities. They can include high speed net based on digital/optical fibre networks, electric mobility installations, sophisticated web services, enterprise resource planning (ERP) systems for public and private organisations, GIS systems, sophisticated sensors' city networks, etc. All the above would critically strengthen the post-coal transition road map, allowing stakeholders from all quadruple helices to get engaged in favourable terms and cope with the harsh post-coal challenges, promoting inclusiveness at an effective way.

The next strategic policy priority is focused on offering the local communities and workforce a total framework of strengthening their own capabilities, to cope with the challenges occurred by the energy transition. This is: ***"Upgrading the skills and retraining (upskilling & reskilling) of the employees of the companies that need support for their transition to the economy of zero pollutants".*** This is initially focused on empowering local workforce with new and innovative skills to be able to either change their current occupation or stay within it with increased capabilities. Those competences will be included in a holistic educational framework that includes digital/internet competences, RES, and alternative energy sources (for current / ex-employees of the PPC S.A.), innovative entrepreneurship and start-up establishment (counselling/mentoring programmes). University and CERTH will play a primary role in establishing this priority, promoting reflexivity by the policy making sector in directing the framework on their exact needs.

Following the previous rationale of the highest possible inclusiveness of all engaged actors, anticipatory governance in setting clear policy targets and reflexivity directed to the exact needs of stakeholders and the region in total, the next policy priority is: ***"Development of a social safety framework".*** The main aim of this policy is to directly help local community with financial, insurance and employment motives to cope with immediate effects of post-coal transition. This policy is implemented through direct payments, subsidies, compensations for current and past coal workers, decommissioning work status or transfer to another public organisations, early-stage or voluntary retirement status and indirect compensations (tax reductions, loan

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provisions, etc.), fully implementing reflexivity/responsiveness in societal needs and inclusiveness regarding all actors.

The next policy priority deals with the environmental consequences of the past-implemented coal activity in the region and the future investment prospects. The policy is: ***"Restoration of degraded areas and facilities and change of their use".*** It can be implemented through the necessary soil restoration and land use adjustment regarding the ex-coal mines, air pollution and biodiversity monitoring, energy crops on degraded land, free provision of land to local entrepreneurs, RES investments promotion, geothermal energy, or hydropower applications in the degraded areas. This is a sample of Reflexive Governance, engaging science in researching scientific approaches for all the above and promoting a responsive approach to the environmental degradation.

2nd Policy focus: Strengthen policy-making systems involving different modes of territorial governance of the post-coal transition strategy

The following policy priority reflects the reforms/upgrades that must take place in the administrative/ legislative framework of the post-coal region indicating the effectiveness of the whole post-coal transition plan itself. The policy priority is: ***"Development of an effective just transition governance system with the involvement of regional structures in governance"***. The implementation of this policy priority can take place through the improvement of the current legislation framework to a more flexible one (lift of bureaucratic burdens), the initiation of a Just Transition Observatory that will record plan's progress, the development of a multilevel governance system that will involve all actors, and the shift of the decision-making system of the transition plan to a local basis.

The next policy priority deals with the energy consumption in the region and the promotion of investments/technologies that contribute into that direction. The policy priority is: ***"Strengthen innovative energy technologies".*** The policy includes energy consumption monitoring which will be implemented through the development of smart energy systems, an H2 Innovation Hub promoting Hydrogen technologies, the construction of heating / cooling units with heat pumps and RES for the energy needs of the region of Western Macedonia and the development of storage and energy supply networks. These technologies will occupy scientific institutions as a research field, local/national businesses as an investment field and local/national authorities as an administration field, benefiting local society through all three fields. Inclusiveness is secured through the involvement of all actors and reflective governance through the satisfaction of needs regarding clean energies.

The following policy priority is connecting research with production, promoting scientific research, start-up entrepreneurship, and the creation of research-business synergies. The name of the priority is: ***"Linking research with production, promoting start-up entrepreneurship, and creating spin-offs".*** The priority includes an Innovation Zone and an Academy Institutes creation, the establishment of an open access green datacentre containing all scientific and professional research regarding green technologies and the mass promotion of start-ups and university spin-offs.

The strategic policy priority of ***"Development of an effective social dialogue between the actors of the quadruple helix (***policymakers, academia, business and civil society)***"*** is predominantly concerned with the active involvement of all actors of the helix in the energy transition plan, from the evaluation to the implementation phase. The implementation activities behind this policy include the establishment of an open access database where all actors can consult, take decisions, and evaluate progress of the on-going scientific, legislative, and entrepreneurial activities regarding the transition plan. Inclusiveness is the primary AIRR dimension of this priority, with responsiveness by the side of central policy makers for the local needs to follow.

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3rd Policy focus: Develop a methodology aiming to a smooth and innovative transition from the coal value chain towards an alternative development 'paradigm'

The next policy is primarily focused on enhancing local businesses coping with the strict obligations for green activities. It consists of combination of measures regarding financial support on digital infrastructures (exclusively for businesses), investment incentives and supplementary organisations exclusively focused on zero-emission economy. The policy is: ***"Transforming and strengthening the competitiveness of existing companies that need support for their transition to a zero-emission economy by 2030".*** It is implemented through an effective Carbon dioxide ETS and an Integrated Information System (IIS) system evaluating organisation's carbon levels, and the creation of green clusters, promoting low-carbon economy. Anticipatory Governance is secured through the expected green outcomes of the implemented policies, the level of inclusiveness concerns Green private businesses, while responsiveness is expressed through the implementation of measures that can satisfy the strict low-carbon EU prerequisites.

The following policy provides a holistic development framework for the attraction of innovative companies lead to transformation of the existing production model. The policy is: ***"Establishment and attraction of new companies that create jobs and lead to economic diversification, modernisation and transformation of the existing production model".*** The policy consists of all necessary measures to diversify the existing production model of the region to a new, innovative one that can afford that harsh coal-transition in the long term. It is implemented through the promotion of IT, bio- & nanotechnology, and medicine facilities, the empowerment of current research institutes and innovation zones and active relocation of existing local businesses to innovation parks. This policy is articulated on the STEM-based RRI key of science education, to perform the necessary research and the inclusiveness of the highest possible number of companies to the aforementioned policies by the policy makers, reflecting the local entrepreneurial needs.

The final policy priority concerns the energy upgrade specifically in the public infrastructures of the region. It involves a total energy efficiency empowerment in the local public infrastructure including office buildings and production units from municipal and other local authorities and supporting energy communities on the public local level. The policy is: ***"Improving energy efficiency in public buildings and strengthen energy communities".*** The primary AIRR dimension implemented at this case is reflexivity to the green needs of the synchronous business environment as well as the national and EU legislations. Direct financial support of energy investments by the public policy makers will activate local stakeholders (from business and community) to follow and adopt green practises.

2.6 Summary of focus group discussions

In this section we briefly summarise the main points arising from the discussions of the four focus groups.

Focus group: Academia

The vision

The focus group of the stakeholders from academia was held as an online discussion among 14 participants. Concerning the vision for the territorial development in the policy area of energy transition and decarbonisation by 2030 in the region, there were two main views. On the one hand, the participants stated that there is a lack of concrete communication of the implementation steps for the transition plan of the region. This left the participants with a blurred understanding of what this energy transition strategy is and therefore they do not have a clear vision for the future. On the other hand, several participants shared that

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research and innovation should be integrated into whatever solution is going to be implemented for the energy transition. Changing the situation from threat to opportunity should go through innovation. In the complexity of the whole transition process there is a pressure that comes from above (the national level and also the EU level) for decarbonisation of coal intensive regions, but also a benefit that concerns the global level. Therefore, the region of Western Macedonia needs to absorb this pressure in a way that benefits the local community that sees this process as a threat.

Necessary changes and strategies arising from the region's vision

The focus group participants agreed that to achieve this transformation in the context of research and innovation, an evaluation framework should be included. This evaluation framework will have to be participatory and incorporate many dimensions to identify ineffectiveness, inefficient units, and inefficient groups. In addition, the changes the region must implement to achieve this vision have a common denominator according to the participants: public engagement is viewed as the foundational key to support the transformation process of the region. To achieve this, it is good to implement the **public consultations** in a strategic and thematic way i.e., to have a coordination within specific topics and to create the appropriate strategic planning or consultation groups on specific issues.

Transformation & collaboration

Regarding the perceived role of the academia in the process of this transformative change, participants stressed the importance of the university for disseminating knowledge and providing key research for pressing issues of the region. The university and all its academic personnel along with its research institutions are crucial for bridging the research and development weakness of the businesses in the region through strategic synergies and by enhancing scientific education through their work and collaboration with the region's stakeholders and the public. In academia, a new term has emerged – the so-called institutional viability. That is, for a project or process to be implemented properly it must have social, economic, environmental, and institutional viability.

Recommendations for RRI / AIRR approach integration

Finally, **recommendations for integrating the majority of RRI keys and AIRR dimensions** into defined strategic policy priorities were made by the focus group participants. Changes must be made in order to have effective **public engagement and science education**. The university research centre needs to play an active role. Essentially all the strategies of the programme at the level of the university research centre need to be successfully disseminated. Each institute needs to transfer to the university community all these strategies and to seek collaborations with specific companies that want to be involved in the transition. Businesses with the help of the university research centre will be able to take actions to implement the vision and strategy for the transition.

Focus group: Business

The vision

The focus group of the business stakeholders took place online with 8 participants. Regarding the vision for the territorial development in the policy area of energy transition and decarbonisation by 2030, all participants mixed optimistic with pessimistic views. Business stakeholders follow with great interest the region's effort for development planning and what they have called a fair development transition. Much of the region's wealth came from the lignite mining and the business vison is that the atrophic RIS sectors (agri-food, health-medicines, ICT, energy, environment and sustainable development, transport, materials – construction, tourism-culture-creative industries) for the region of Western Macedonia must be rejuvenated. At the

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moment, a desperate effort is made in the sense of time pressure because the region is in the process of changing its production model, going into the path of clean energy and trying to lead other sectors of the economy that will bring added value for the region. In order for businesses to adapt in such a short time, very robust measures and transformative design must be made and there must be equal development of various sectors of the region in order to have a transformative process.

Necessary changes and strategies arising from the region's vision

Regarding the strategic priorities to be followed, the focus group participants agreed that to achieve this transformation there is an urgent need to change the production model in a targeted way depending on the know-how and potential new added values that each business affected by the transition could bring. For example, some businesses in the agri-food sectors (especially in the field of medicinal herbs) had discussions with the region as representatives of the field to participate in processes of making the region's lavender sector protected agricultural origin. At the moment, the business sector of the region has a pool of specialised personnel only linked to PPC and with the energy transition this pool of personnel will be unskilled to be assimilated in new production models or specialties. The region must consider this well so that it does not become desolate, and the local workforce stays in the area. What is therefore needed is to retrain and reskill the staff and integrate them into the other branches of the economy that will be developed in the region.

Transformation and RRI keys

Most of the focus group participants stressed that for this transformation process, the commitment to participation and public engagement is crucial because this transition affects all stakeholders and citizens. Regarding the perceived role of the businesses in the process of this transformative change, panellists underlined their role in incorporating local workforce in the various provinces of the Region of Western Macedonia due to internal immigration caused by job losses from the energy sector and the search for new job opportunities in the area. Businesses are helping in assimilating new recruits and try to apply a form of reskilling to the extent allowed by their business resources. However, their role as business stakeholders must be seen as complementary and they need the help and guidance from the other stakeholder groups in the process of this transformative change. The panellists expressed their concerns that the links between business and academic institutions must be strengthened because businesses can collaborate with the research institutions to provide innovative outputs for the region and contribute better to the transformative model with the help of the academic know-how and research on a regional level. The role of the Regional Authority plays an important role in the transformative process because it can help local businesses with financial schemes to help in their production model change and give new incentives for in-house investments in the region from the currently existing local business sector. Administrative ameliorations and optimised procedures to lessen the bureaucratic bottlenecks for local investment procedures must be done by the Regional Authority.

Recommendations for RRI / AIRR approach integration

The focus group participants made recommendations for integrating RRI keys and AIRR dimensions into defined strategic policy priorities and how the process of transformative change can be organised. Strong incentives should be given to attract investments in the region that will generate wealth and attract workforce in the region. In addition, there should be a differentiation of the production base, considering all the other sectors along with the social impact, the environmental footprint they have in the area and considering the participatory processes combined with entrepreneurship beyond the production of wealth. Local entrepreneurship must be enhanced through incentives because it creates added value in final products or in services of the region. Another strong recommendation put on the table was the synergies. Every company should be interested in its development through synergies with research institutions, universities, etc. These

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participatory processes and public engagement must exist so that everyone contributes from their own sector of expertise and gives their contribution to the region's economy and move forward to a sustainable development beyond economic development. This can mostly be achieved through participatory processes, collaborations among business clusters of the region for the development of value-added products for the region and the adoption of all these research and development results. The primary sector needs support because for some businesses to shift in the agri-food sector, which is considered for the region an industry that needs support, they must be supported with incentives and regulatory frameworks. That is, there is a need to create an integrated model with various elements to have a production chain that can maintain a circular efficient feedback loop of the elements.

Focus group: Policymakers

The vision

The policymakers' focus group took place online with 8 participants. The political decisions for the rapid delignification of Greece until 2028 formed the vision for a just transition in Western Macedonia. The region has already entered a process of transformation, which is rapid and with significant economic, social, and environmental implications. This vision in practice focuses on a drastic change of the production model towards an environmentally neutral, socially sustainable, and economically competitive region. This vision however, even though it was reflected in important programmatic texts such as the Just Development Transition Plan of Western Macedonia, in practice it has not become "property" of the local actors and society yet, as it was largely imposed from above. As a result, it was not sufficiently understood that we are called upon to manage a problem of historical proportions.

Necessary changes and strategies arising from the region's vision

The necessary changes resulting from the above vision are the turn to green energy and transition to a zero-emission economy to attract critical size new investments, while linking companies with research organisations and promoting internationally competitive products and services. Changes also need to be done in active labour market support policies, such as the acquisition of new skills (skilling), the upgrading of existing ones (upskilling) and the retraining (reskilling). Finally, actions for soil restoration in the areas of former lignite mines and upgrading of the natural and cultural environment are needed.

The necessary strategies arising from the above vision:

- Entrepreneurship Strategy
- Research and Innovation Strategy
- Energy Strategy
- Environmental Regeneration Strategy
- Human Resources Strategy
- Digital Transition Strategy

Transformation and RRI keys

RRI keys should be the basis of transformation and change. Public engagement, however, has not been achieved at a satisfactory level in practice, as much of the consultation that has taken place, has been largely veiled to legitimise the planned policies. For the public engagement to work effectively, more place-based approaches and a more decentralised transition governance system are needed. In this way, the co-shaping of transition policy specialisation could be achieved, through the active and responsible involvement of critical local actors. The keys of open access and scientific education could also contribute to the change process if the relevant data, studies, and research results are uploaded on public platforms and repositories. At the same

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time, the calls of the relevant programmes could make as an obligatory condition the open access and uploading of the results in common repositories.

Transformation and AIRR dimensions

There is a need for flexible design which should be open to change of course if the need arises, incorporating the responsiveness dimension. To achieve this however, bottom-up models are necessary which should not be designed centrally. There is also considerable gap for further integration of the dimension of anticipation as well as reflexivity in policy design, analysis, and evaluation, in an environment that is rapidly changing environmentally and technologically.

Transformation and collaboration

It has been found that the partnerships have not developed to the extent that they should, active participation and effective collaboration in the direction of co-forming a common vision. This problem lies not only in the top-down approach of the transition governance, but also in the inability of key players at the local level to find a common ground, often due to a different or competing agenda. In this context, the convergence of goals and priorities between policy makers, researchers, businesses, and civil society requires confidence-building strategies, sound arguments, credible data, and technocratic support.

Recommendations for RRI / AIRR approach integration

The integration of the RRI / AIRR approach into the selected policy areas requires a policy engagement that is structural in nature and will lead to a policy framework in the long term. This requires a solid cooperation at national and local level, in a multi-level transition governance approach. To achieve this, a mobilisation of policy co-shaping dynamics at the regional and local level, towards the realisation of a long-term vision that has not been imposed from above. This outline could create favourable conditions for integrating a more effective RRI / AIRR approach in the transition process.

Focus group: NGOs

The focus group of the NGOs' stakeholders took place online and had only 1 participant.

Vision

The NGO panellist spoke about the need to transform the current production model of the region to an alternative one that is primarily based on RES. However, the way this will be implemented and the benefits to the local society and economy are not clear to the broader public. This leads to the conclusion that further clarification to the wider local public is needed.

Necessary changes and strategies arising from the region's vision

The most prominent changes that are accrued from the current vision for the development of the region of Western Macedonia are the need for a change of the local production model to a RES. In addition, the current legislation framework needs to be simplified to remove obstacles for investments. There must be a provision of clear incentives for investments in the region, such as direct subsidies and tax motives as well as a better communication towards an effective public consultation, based on quadruple helix approach.

Transformation and RRI keys

The participant expressed that even though there are only a few NGOs in the region, they can play an important role as they can operate on a local scale to promote social or political change. The NGOs are vital to the development of society, the improvement of communities, and the promotion of citizen engagement in the transformative processes of the region. The proper implementation of the RRI keys should be the primary

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mean of the transformation of the existing production model and energy transition. However crucial keys have not been applied at an adequate level. First, public engagement has not been adequately implemented since the largest part of the public consultation that has already been conducted did not include key quadruple helix segments. So, for the remaining part of the public consultations it is vital to address the aims and the objectives of all actors. Likewise, the key to open access has to be implemented properly, especially in the decision-making part where the local society has not agreed or accepted many of the proposed investments (e.g., very large photovoltaic projects that are not labour-intensive). Moreover, the key to science education in the region should be connected directly with real economy rather than remain in theoretical level.

Transformation and AIRR dimensions

The practice of the energy transition so far has indicated that there is a need to enhance the distinct AIRR dimensions that have not been implemented at a sufficient level. Anticipatory governance has to be strengthened in the direction of foreseeing the positive and negative effects that the current transition model may bring to all participating actors. Responsiveness must by enhanced at an even greater level. The reflexivity of the central policy makers should be expressed in addressing major local concerns such as the timeframe of the proposed energy transition plan, which for a large portion of the participating actors is considered very limited.

Recommendations for RRI / AIRR approach integration

A clear anticipatory framework by the central policy makers is needed, which would clearly foresee all possible positive and negative effects of the current transition plan. Moreover, this framework should be strengthened in the direction of reflexivity and responsiveness by adopting the major concerns and requests by the societal and research actors, such as the inclusion of all participating actors in the decision making, the more effective communication of the Just Transition Plan principles to the wider public and the initiation of financial motives to the local businesses to cope with the harsh in- and just-after transition business environment.

Analytical resume

This section summarises the discussion and findings from all focus groups that were conducted. First, all the stakeholders held similar opinions on the necessity of shifting the region's present production model to an alternative that will incorporate the new emerging needs of the energy transition. Opposing views were identified in the linkages that should exist between the stakeholders and what would be the most effective way to achieve a robust networking. Businesses can engage with research institutions to offer creative outputs for the region and contribute better to the transformational model with the support of academic know-how and research on a regional level. Businesses without their own research and development department need the help and access to academia through research institutions to make collaboration for business growth, research consultations and innovations. The regional authority's participation is critical in the transformation process because it may assist local firms with financing schemes to aid in the shift of their production model and provide new incentives for in-house investments in the region from the existing local business sector. Administrative improvements and processes must be implemented to reduce bureaucratic bottlenecks in local investment procedures, with the Regional Authority playing a vital role in this. This issue stems not just from the top-down approach to transition governance, but also from major individuals at the local level's failure to establish common ground, frequently owing to conflicting or opposing agendas. In this setting, confidence-building tactics, good arguments, trustworthy statistics, and technical assistance are required for policymakers, researchers, corporations, and civil society to align their aims and priorities.

Regarding the common ground that can be found for advancing the RRI-AIRR approach, the integration of the RRI / AIRR methodology into the relevant policy domains necessitates a structural policy engagement that will

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result in a long-term policy framework. Strategic, tactical, and operational actions are widely split, with each activity having its own players, objectives, and tactics that co-evolve, this necessitates strong collaboration at the national and local levels. To do this, policy co-shaping processes at the regional and local levels must be mobilised to realise a long-term vision that is not imposed from higher levels. This plan may make it easier to include a more effective RRI / AIRR strategy into the transition process. Public engagement is the foundation that needs to be enhanced in the region to achieve the desired transformation. Anticipatory governance must be reinforced to predict the good and bad consequences that the existing transition model may have on all stakeholders. Central policymakers' reflexivity should be demonstrated in resolving key local issues, such as the planned energy transition plan's timescale, which is deemed severely constrained by a big number of the involved actors. Finally, through targeted networking and partnerships with the region's stakeholders and the public, scientific education can be improved by creating strategic synergies with the stakeholders and include more active public interaction in the agenda.

The following conclusions can be made from the four focus groups:

- There is a necessity of shifting the region's present production model to an alternative that will incorporate the new emerging needs of the energy transition (anticipatory and reflexive governance).
- Collaboration between business and academia is considered crucial to the development of a transformational model (science education).
- Quadruple helix engagement is critical in the transformation process (inclusiveness).
- Integration of the RRI-AIRR methodology into the relevant policy domains necessitates a structural policy engagement that will result in a long-term policy framework.
- Multi-level transition governance model, with strong collaboration at the national and local levels.
- Reinforcement of anticipatory governance and responsiveness is considered as a necessity for the new governance model of the post-coal transition strategy.

2.7 Policy recommendations and conclusions

The RRI audit report for the region of Western Macedonia brings forth the following conclusions regarding the embeddedness of RRI-AIRR approach in the regional policy discourse:

The most prominent RRI keys and AIRR dimensions reflected and practiced in the region are open access, public engagement, inclusiveness and anticipation. Open access is the most prominent RRI key reflected in almost all territorial policies and practiced by the relevant territorial stakeholders of the quadruple helix. More precisely, open access has improved in terms of people's access to, usage of, and quality of information and communication technology, as well as publicly available data and information. Public engagement is also widely practiced in the region, with public consultation constituting an important tool in the creation of policies towards the energy transition. The participatory governance model for the advancement of the policy focus for the post-coal lignite era has been very well maintained so far by including all stakeholders relevant to the advancement of the energy transition such as academia, businesses of the region, regional policy makers and civil society. Moreover, mechanisms that presently promote competitiveness, innovation, and business extroversion (incubator, regional framework for company growth) have been established, bringing together diverse stakeholders.

On the other hand, science education and reflexive governance are not applied or practiced sufficiently. Although there are investments in the region which include infrastructure and skills to support STEM-related activities, there is still a big gap concerning a smooth link between academia, business, and administration. Moreover, science education is not fully supported through funds or concrete development action plans to

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boost innovation through STEM practices in the region. Regarding reflexive governance, the findings call for a need to reassess practices, to adjust initiatives and thus have a more competent reflexive governance.

The evidence of SWOT/TOWS analysis and four focus groups provide a clearer picture on the level of RRI-AIRR integration. The TOWS analysis identified a total of eleven strategic priorities among the policy areas of the region in which RRI-AIRR elements are already embedded and could be further strengthened. Those strategic priorities are listed below:

Table 4: Embeddedness of RRI-AIRR approach in the strategic policy priorities of the region of Western Macedonia

Policy Focus	Strategic policy priorities	RRI-AIRR approach embedded
1st Policy focus: Develop a stakeholder engagement strategy within the course of the post-coal transition road map	Development of supportive digital infrastructures and services of smart communities	Public engagement, inclusiveness
	Upgrading the skills and retraining (upskilling & reskilling) of the employees of the companies that need support for their transition to the economy of zero pollutants	Science education
	Development of a social safety framework	Anticipatory governance, reflexivity, responsiveness
	Restoration of degraded areas and facilities and change of their use	Reflexive governance, science education, responsive governance
2nd Policy focus: Strengthen policy-making systems involving different modes of territorial governance of the post-coal transition strategy	Development of an effective just transition governance system with the involvement of regional structures in governance	Inclusiveness, responsive governance
	Strengthen innovative energy technologies	Inclusiveness
	Linking research with production, promoting start-up entrepreneurship, and creating spin-offs	Open access
	Development of an effective social dialogue between the actors of the quadruple helix	Open access, inclusiveness, responsiveness
3rd Policy focus: Develop a methodology aiming to a smooth and innovative transition from the coal value chain towards an alternative development 'paradigm'	Transforming and strengthening the competitiveness of existing companies that need support for their transition to a zero-emission economy by 2030	Anticipatory governance, inclusiveness, responsiveness
	Establishment and attraction of new companies that create jobs and lead to economic diversification, modernisation and transformation of the existing production model	Science education, inclusiveness
	Improving energy efficiency in public buildings and strengthen energy communities	Reflexivity

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2.8 References

Hellenic Ministry of Environment and Energy. (2019). National Energy and Climate Plan. https://ec.europa.eu/energy/sites/ener/files/el_final_necp_main_en.pdf

Hellenic Ministry of Environment and Energy. (2020). Just Transition Development Plan of lignite areas. https://www.sdam.gr/sites/default/files/consultation/Master_Plan_Public_Consultation_ENG.pdf

IENE. (2020). Just Transition Development Plan Current Situation and Prospects for Areas in Energy Transition in Greece. https://www.sdam.gr/sites/default/files/consultation/Current_situation_and_prospects_for_areas_in_energy_transition_in_Greece_EN.pdf

WB. (2019). Stakeholder Engagement Plan (SEP) for Western Macedonia. https://www.sdam.gr/sites/default/files/consultation/Greece_-_Stakeholder_Engagement_Plan_(SEP)_ for_WM_June_2020_FInal.pdf

WWF. (2016). Roadmap for the Transition of the Western Macedonia Region to a Post-Lignite Era. https://regionsbeyondcoal.eu/wp-content/uploads/2019/02/Roadmap_PostLignite_EN_FINAL-1.pdf

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Chapter 3: RRI Audit Report of Sofia Municipality

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Summary

This report presents the findings of the RRI territorial audit for Sofia Municipality. The audit comprises analysis of the municipal institutional and policy framework in four selected policy areas (*support for innovation, digital transition and new skills, sustainable urban development, youth employment and entrepreneurship*) with regard to the integration and implementation of RRI-AIRR keys and principles. The report draws upon analytical work and information gathered through semi-structured interviews with representatives of quadruple-helix stakeholders in Sofia (academia and research institutes, business, NGOs, and policymakers), focus groups, and desk research. Activities were carried out in the period April – December, 2021 by the project partners ARC Fund and Sofia Development Association. The report assesses the state of the art regarding the application of the RRI-AIRR framework by the local government in the abovementioned policy areas and on that basis, proposes strategies for improving territorial governance through a streamlined integration of the RRI-AIRR in the policymaking process.

The report concludes that RRI-AIRR keys are relatively well embedded in policy documents and plans; while the policy rhetoric rarely uses the exact terminology and vocabulary of the RRI-AIRR framework, comparable principles are referred to in the municipal documents and also practiced by the administration. Desk research has shown that there are well-developed and comprehensive strategy documents in the chosen policy areas, most of which cover a seven or ten-year period of forward planning.

The audit reveals that some RRI keys (public engagement, open access, gender equality) are better known and more adequately reflected in the policy areas (e.g., sustainable urban development, support for innovations) in comparison to other keys (e.g., science education, research ethics). Overall, policymaking is assessed as anticipatory and responsive, relying on broad public engagement (mostly through citizen consultations) and input from academia, business, and civil society. Public bodies responsible for policy implementation (in particular in the areas of digital transition and sustainable urban development) pursue and rely on broad public engagement, inclusiveness, foresight scenarios, transparent and accountable programming. These principles are contained both in their internal codes of procedure as well as in the respective policy guidelines. Other municipal units and departments show a lower level of awareness of the RRI-AIRR approach and hence, the full potential of its application in organisational policies remains unused, despite the presence of practices that contain elements of RRI keys and AIRR dimensions.

As regards the experience of the quadruple helix stakeholders with the RRI-AIRR framework, the analysis shows diverse and uneven knowledge and practices across sectors. Representatives of the academia are better informed and therefore can provide better input to municipal policymaking, in comparison to the business or NGOs. Nevertheless, uptake of scientific research results in policy-making is still marked by slow and bureaucratic procedures. Lack of adequate communication on strategic priorities with the public also limits active citizen engagement in policy making/implementation. While Sofia is yet to establish a city science office or a similar unit to coordinate urban research and innovations, various forms of collaborations and trajectories involving local stakeholders bring added value to the city economy and contribute to the well-being of citizens.

Based on the analysis, the report formulates several strategic policy priorities to be pursued by local policymakers in order to ensure more coherent and consistent application of the RRI-AIRR principles and thus,

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a more citizen-centred, open, transparent and inclusive governance. These priorities are clustered in the following five groups:

1. **Institutional framework**: political leadership and municipal bodies responsible for strategy implementation.
2. **Strategic policy framework**: alignment of the municipal strategies with national and EU-level strategic and programming documents.
3. **Capacity building** for RRI and AIRR-based territorial governance and promotion of multi-actor and multi-stakeholders alliances supporting RRI-AIRR .
4. **Communication and engagement** with citizens and stakeholders
5. **International learning** and cooperation with stakeholders at local/national/EU level.

The current report and the recommendations made aim to inform the transformative outlook to be produced for the territory of Sofia Municipality by the end of the RRI-LEADERS project.

3.1 Introduction

The purpose of this report is to integrate the results from previous activities (stakeholder mapping of policy actors, best practices related to the use of RRI-AIRR in public policymaking) conducted in Sofia and to produce a summary assessment of the state-of-play in regard to RRI keys and AIRR dimensions. This exercise completes the process of co-creation and gathering of information from quadruple helix partners (interviews, focus groups, participatory workshop). The audit aims to assess the information and to propose conclusions and actionable recommendations to local government on how to improve the application of RRI keys in strategic programming. In this sense the report also seeks to generate ideas for territorial governance and the municipal policy framework which will be included in the transformative outlook for Sofia. The ideas and proposals received so far from the stakeholders as well as from the documentary analysis are a valuable opportunity for triggering institutional change and transformation by introducing and legitimising new policy approaches and organisational practices. The territorial audit report which also provides a systematic analysis of the level of engagement and responsibility of quadruple helix partners can act as a catalyst for institutional change by advancing new attitudes, principles and practices on how to address a policy problem in a responsible and accountable manner.

The report sums up the key findings, conclusions and recommendations concerning the implementation of the RRI-AIRR framework in policy and strategic planning at Sofia Municipality, with a focus on four policies: *support for innovation, digital transition and new skills, youth employment and entrepreneurship, and sustainable urban development*. The analysis steps on the inputs of deliverables *Mapping of stakeholder relationships and interdependencies* and *Territorial report of Sofia Municipality*. The two reports are based on input from quadruple helix partners with knowledge and experience in the four policy areas and RRI-AIRR practices, which was obtained through individual semi-structured interviews in the first phase of the project (April-May, 2021), followed by a focus group (held in May 2021) and a participatory workshop with representatives of academia, NGOs, policymakers, and the business (held in July 2021). Four additional focus groups were held in November and December 2021, with each of the quadruple helix partners (policy makers, NGOs, academia, and business). Focus groups provided a structured, in-depth analysis of how the RRI-AIRR framework can be integrated in the long-term vision of the city. The current report also draws upon desk research of current strategies and policies of Sofia Municipality in the four policy areas mentioned above. Documentary analysis of relevant national-level

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legislation, strategies and programmes related to RRI was conducted and the following documents have been reviewed:

National-level documents

- National Plan for Development of the Open Science Initiative in the Republic of Bulgaria
- National Strategy for Development of Scientific Research in the Republic of Bulgaria 2017-2030
- National Roadmap for Research Infrastructure 2017-2023
- Innovation Strategy for Smart Specialisation
- Strategy for Effective Implementation of Information and Communication Technologies in Education and Science in the Republic of Bulgaria (2014-2020)
- Act on Development of the Academic Staff in the Republic of Bulgaria
- Scientific Research Promotion Act
- Higher Education Act
- Law on Equality between Women and Men
- Law for Protection against Discrimination

Municipal documents

- Innovation Strategy for Smart Specialisation of Sofia
- Digital Transformation Strategy for Sofia
- Sofia Youth Strategy 2017-2027
- Vision for Sofia 2050
- Programme for Sofia 2021-2027.

For the completion of this report, additional documents and reports related to the development and implementation of municipal policies were consulted; informal discussions were held with representatives of the municipal administration in charge of implementing action plans linked to relevant policies (for example, digital transition, culture, youth activities). For the completion of the audit, a SWOT analysis of the current level of awareness of and application of the RRI-AIRR approach has been carried out. Drawing upon the SWOT, a complementary TOWS analysis has been made, which outlines key strategic priorities and measures for integration RRI keys and/or AIRR dimensions in the municipal policy-making procedures and governance.

The report concludes with recommendations to local policy- and decision-makers on how to identify opportunities/policy areas for integration of the RRI-AIRR approach in future municipal policy-making and strategy development.

3.2 Policy areas

The ambition of the local government is to build Sofia as an innovative city that employs digital technologies, policy and financial instruments to improve the efficiency of urban operations and public services, the economic, social, and cultural environment, citizen well-being and quality of life, while ensuring that the needs of present and future generations are met in an equitable manner. The four policy areas chosen by the municipality reflect this ambition and contribute to its implementation. While RRI-AIRR principles are not explicitly highlighted as guidelines in strategic planning and implementation, the municipal administration strives to translate the results of applicable research and innovation into its practices and governance models. The overall goal for the city authorities is to strengthen the role of research and innovation in policy making, and, through ongoing dialogue and exchange with local and national stakeholders, to pursue strategic planning which is anticipatory, responsive, and inclusive.

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Policy area SUPPORT FOR INNOVATION

The policy initiatives in this area aim to strengthen the innovation ecosystem in the municipality. Sofia is home to one of the most developed start-up ecosystems in Central and Eastern Europe and is the start-up hub of the Balkans. Sofia Municipality was the first in Bulgaria to draft its own strategy for smart specialisation – the *Innovation Strategy for Smart Specialisation of Sofia* (ISSS), which focuses on two of the four sectors from the national Smart Specialisation Strategy, i.e. Informatics and ICT and new technologies in the creative and recreational industries.

Strategic priorities in ISSS include securing financial capital and access to the market for innovative SMEs and start-ups, development of digital technologies. Science education is emphasised as key to cultivating highly-skilled human capital. Main stakeholders in the policy area include the municipal administration and municipal bodies (e.g. InvestSofia, Municipal Guarantee Fund, InnovativeSofia), local industry and business clusters, universities, start-up associations.

Main challenges relate to the need for better communication between the municipality, citizens, academia and the industry in the implementation of policies. With regard to academia, Sofia Municipality is expected to support innovation through commissioned studies and research (the results of which can feed into municipal policies). In terms of RRI-AIRR keys, current policy documents do not include questions of gender equality, ethics/research ethics. Although not specifically mentioned, AIRR dimensions linked to anticipatory, responsive, and reflexive governance are embedded. Nevertheless, the current implementation, monitoring and evaluation measures and the role of the Monitoring Committee could be revised to accommodate AIRR dimensions; some KPIs could be revised to reflect more fully those dimensions as well.

Key considerations for the transformative outlooks and the political and societal transformation process in the policy area:

- With respect to inclusive policy making and public engagement: the needs of vulnerable groups and of people with disabilities need to be addressed. In 2021 the municipality has set up a committee to consult and oversee the implementation of a range of measures (regulatory, technological, communication) aimed at people with hearing disabilities.
- Increasing the competitiveness of the municipality and developing the knowledge economy, establishment of new mechanisms for incubation and financing.
- Whereas various initiatives are implemented to support technological innovations and start-ups, less attention is paid to innovations in the public administration sector. Steps are being taken in this direction as well (for example, the participation of Sofia in the project *PolicyCloud*, a Horizon2020 initiative, which will create a cloud-based tool for effective policy modelling, testing and management through data analysis and visualisation; Sofia is one of the pilot cities.)

Policy area SUSTAINABLE URBAN DEVELOPMENT

Policies in this area are described in the Integrated Municipal Development Plan (a new plan is being developed for the period 2021-2027, due to be voted by the Municipal Council by the end of 2021). The Plan sets medium- to long-term goals for sustainable city development (infrastructure, economy, human capital, culture and education); forecasts for socio-economic and spatial development; guidelines for the management of city functional systems. The vision for the city stated in the Plan is: "*Sofia Municipality is a more adaptable, sustainable, inclusive and diverse municipality, focused on the knowledge economy and offering a higher quality of life in a cleaner environment.*"

The strategic priorities set forth also focus on improving its connectivity and digital infrastructure through environmentally friendly, smart and cost-effective solutions. Municipality-wide measures are planned to build

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ecosystems for smart, green, climate-neutral, sustainable growth, reducing the consumption of raw materials and supporting innovations in production processes. Long-term goals are set to help implement the EU political objectives, e.g. through local Green Deals and lead tech uptake for better life. Further strategic goals focus on building a more competitive local economy based on innovation and a sustainable increase in the share of employment in sectors with high added value and export potential.

The main challenges that have been identified relate to the lack of efficient communication between the municipal departments in charge of implementing the policy; silo-thinking; lack of reliable networked data. In terms of human resources, improving the soft skills of the administration to cooperate more effectively with academia, the industry and civil society is also identified as a need. Research results are not readily taken up by policy makers; this is due on the one hand to lack of funding for applied research and policy-related studies. On the other hand, it is a part of the overall atmosphere of distrust in public institutions and scepticism about their capacity to apply efficiently new knowledge and ideas.

Main stakeholders for policy implementation include the municipal enterprise SofiaPlan, which is in charge of developing the Plan; the municipal council, which has to approve the policy. Academia, civil society and the business have a high interest in the policy as beneficiaries but also as sources of knowledge, expertise and good practices. On the other hand, they do not have a strong-enough standing and have no decision-making powers (despite their involvement in consultative and advisory bodies at the municipality).

Key considerations linked to the desired transformations in the chosen policy areas relate to improving the structure and organisation of the municipal administration; it is recommended to optimise and reorganise the administrative processes in the municipality, in order to improve strategic planning, development and social inclusion. Key factor for achieving the policy objectives is strengthening the administration's collaboration with universities and research institutes, and in general seeking external expertise from private and public bodies with a capacity to influence the uptake of relevant research results.

Policy area YOUTH EMPLOYMENT AND ENTREPRENEURSHIP

The main document is the *Sofia Youth Strategy 2017-2027* (SYS).[10] According to the document, Sofia needs to grow into a city of the young, the active and the innovative. The strategy aims to provide young people in with skills for lifelong learning, competences for development, prosperity and autonomy, and active social participation in the public decision-making process. Given Sofia is home to almost half of the universities in the country (23 out of 52) and many young people come to the city to study, the strategy supports youth organisations, youth services and youth workers, by connecting them with educators and employers, and by creating various programmes that meet the interests, needs and experiences of young people.

Strategic priorities include the creation of favourable conditions for education, affordable and accessible to all; professional, social and personal realisation of young people, their participation in socio-economic life, and involvement in public governance. A further priority includes promoting active and healthy lifestyles of young people. Among the other strategic objectives are continuing education and youth entrepreneurship, youth career development and support for youth innovations and start-ups.

Challenges identified in the implementation of the strategy related to cooperation among stakeholders (municipality, youth, universities, civil society). More funding instruments are needed to support innovative projects and start-ups, despite the existing municipal small grant schemes (among them *Financing Innovative Start-ups Programme*, *Social Innovations Program*, *Program Culture* and *Program Europe*). The municipality has established a youth council, which advises on and takes part in the implementation of the strategy. Despite

[10] https://www.sofia.bg/documents/20182/448750/Strategy_young_people-SO-2017-2027.pdf/8186ee54-8135-42e0-bfa2-17dd2b281742 (in Bulgarian)

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that, a general apathy and lack of interest in young people to engage in public life is noted (which may be due also to the numerous volunteer and civic engagement opportunities in the city). Therefore, novel ways of engaging with youth through digital technologies could become a priority in the coming years.

Main stakeholders include schools, universities; youth councils in schools and universities, informal associations of young people, non-governmental organisations established by or working with young people; business clusters and associations. Those with high interest in policy implementation include youth councils and NGOs established/run by young people. In terms of their capacity to influence policies, NGOs and youth organisations with wide representation are more likely to play a key role.

Key considerations regarding the youth policy include, first of all, introducing gender equality measures in the strategy. This is so far missing from the document, as is the case with other strategic programmes. Secondly, new priorities in line with the national and EU-level strategies for 2027 have to be formulated (e.g., EU Green Deal, EU Youth Strategy 2019-27, Digital Education Action Plan 2021-27) to support young entrepreneurs. Students could be given tasks such as developing business plans or designing urban development projects, which would earn them credits in their studies.

Policy area DIGITAL TRANSITION AND NEW SKILLS

According to the Digital Transformation Strategy for Sofia (DTSS, adopted in 2020), the long-term vision for the city is: "Sofia systematically achieves sustainable economic growth and develops a high value-added economy through the introduction and use of high technology in all areas of public and economic life. Sofia develops as an innovative, intelligent, modern, progressive and high-tech city, an attractive centre and a preferred place for living, business and R&D."

This policy responds to the rapid development of digital technologies and aims to make the city future-proof, ready to cope with the challenges of tomorrow. At present, Sofia offers one of the highest Internet speeds in Europe and has a vibrant start-up and entrepreneurial ecosystem. The DTSS includes measures to establish Sofia as a European technology leader, open to citizens and the industry; an innovative hub for the R&D potential of the technology sector; an expanding market for locally developed products and solutions; and a recognisable location for testing smart urban solutions. The InnovativeSofia unit in the municipality is taking steps to make the city's efforts more visible and to set an example by becoming early adopters of tech innovations.

The following barriers to the policy implementation have been identified:

- Financial constraints - choosing the right investment that will create a long term impact.
- Lack of experience with developing foresight scenarios: the city administration needs to develop future scenarios considering the impact of transformative technologies, and overall, to improve its capacity for anticipatory governance. With regard to public engagement and citizen participation an integrated digital platform for citizen participation and communication is needed. At the time of writing this report, such a platform is being developed as part of the city's participation in the project *PolicyCloud* (https://innovativesofia.bg/en/project/policycloud-2/).

Main stakeholders and key actors include Sofia Municipality (the InnovativeSofia department), representatives of the local ICT ecosystem, other municipal units, e.g. SofiaPlan; stakeholders from the local smart city ecosystem, research/academia, businesses.

Key considerations for the transformative outlook and the political and societal transformation process in the chosen policy area:

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1. Include gender dimensions/gender equality linked to digital transition, transformative technologies, digitalisation; DTSS currently does not mention gender and has no specific measures for promoting gender equality.
2. In terms of leadership and management, the InnovativeSofia unit has so far proven successful and it has the potential to grow into a smart city research and technology coordinating point. Implementation of (digital) participatory models of governance, digital collaborative ecosystems are important objectives for digitalisation of the city, next to public e-services. Under the PolicyCloud project, a new digital tool enabling the integration of data collection, modelling and simulation technologies will be developed. This is an incentive for the city to harness the potential of big data analytics and cloud technologies to improve the modelling, testing and realisation of policies.

3.3 Synthesis of experiences related to RRI-AIRR

Conclusions from the documentary analysis, interviews and focus groups largely confirm the view that RRI keys and AIRR dimensions are (implicitly) known and followed in policy-making and implementation; they are not formally included in internal documents or codes of procedure. RRI keys, for example, public engagement, open access, gender equality, are more easily recognised and followed; science education and research ethics are thought as pertaining mostly to academia and only in specific cases relatable to policy development. The levels of awareness of the RRI keys among academia, municipal staff, business, NGOs differ widely; the framework is better known by those who have participated in EU funded projects (e.g. Horizon2020) or have undergone professional training in the subject. For **public bodies** most important is public engagement, followed by open access/open data, science education/research ethics. **Public engagement** is key to policy development, implementation, and impact assessment (for all target groups); it is broadly understood as a type of "social contract" between institutions and citizens in terms of responsibility.

Creating communication spaces and participatory mechanisms in order to maintain a high degree of participation in RRI and AIRR is considered by all stakeholder groups as a necessary driver of change. By their nature, RRI and AIRR are a multi-actor (i.e., they involve many stakeholders) and multi-level processes (i.e., they concern all the hierarchical levels of the organisation). Therefore, they can be "institutionalised" only by creating appropriate permanent administrative and communication spaces and procedures inside the organisation.

With regard to the **AIRR dimensions** (anticipatory governance, inclusiveness, responsiveness and reflexivity), the majority of the respondents see them reflected in the administrative practices, although they are rarely described using this specific terminology. Overall, public bodies are seen as responsive and adapting to the needs of citizens. On the other hand, while there seems to be sound expertise to conduct analyses as part of the policymaking process, there is lack of sufficient capacity in defining strategic goals and creating long-term visions (**anticipatory process**).

As a whole, the current strategic priorities and objectives set by the municipal administration in the four policy areas only partially reflect the RRI-AIRR framework. According to the participants in the focus groups and workshop, some of the reasons relate to **external**, others to **internal factors**. For example, the systematic discourse of RRI has only recently become mainstream, mainly in academia and research organisations, but not in public administration. Other reasons have to do with the fact that there is no research unit within the municipality that could be tasked with providing background studies, impact assessment, etc. in strategy development. A further reason deals with the (lack of) political commitment to set integrated objectives for smart transformation in Sofia. There is "diffusion of powers/mandates/capacity" between the central and

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district municipalities; levels of capacity vary across district administrations which impacts on the overall quality of performance.

Finally, while communication and cooperation with **stakeholders** (public engagement, inclusiveness) is regarded by all as critical for success, little is done to raise their capacity; as stated by a respondent, "it is important to provide continuing support, to build the skills and capacity of stakeholders to lead the process of change." Last but not least, the level of engagement of civil society largely depends on funding (which is lacking, in most cases) and the proactive approach of the municipality of reaching out to citizens and civil society organisations. Thus, the role of Sofia Municipality is seen as supporting the process (either financially or through other means) and integrating the efforts of all those involved.

In what follows, the report looks at each policy area and discusses the extent to which the RRI keys and AIRR dimensions are embedded in the respective policies and practices; a brief overview of the main barriers and drivers to integrating the RRI-AIRR approach is provided.

Policy area SUPPORT FOR INNOVATION

The current municipal strategy for smart specialisation promotes a quintuple helix model of implementation; document analysis has shown that principles close to the RRI keys have been observed in drafting the strategy, namely, integrated approach (i.e. drawing from connected policy fields); partnership and teamwork, publicity, transparency and citizen participation (engagement). "Integrity" and "protection of public interest" are put forward as leading principles for implementation. Since the ISSS does not explicitly refer to the questions or use the language of **gender equality, ethics/research ethics, responsibility**, these will need to be incorporated in the next revision cycle.

In terms of AIRR principles, the strategy steps on analysis and foresight scenarios with regard to the smart specialisation fields for the city. Although not specifically mentioned, it can be claimed that AIRR principles linked to **anticipatory, responsive, reflexive and accountable governance** are embedded in the document.

Barriers and drivers for change. Input from the documentary analysis and the focus groups shows that Sofia Municipality is regarded as the leader of the process of change. The municipal administration is expected to respect the needs of all citizens (by being inclusive and responsive) but should also aim to balance between diverging interest claims. Barriers relate to the "lack of trust" in the municipal institutions to adequately respond to citizens' needs (resonating with a widespread distrust in public authorities as a whole) and to implement policies in a transparent and accountable way. A further obstacle concerns the absence of clear division of responsibilities between national public bodies (ministry of economy, ministry of education, ministry of health) and local governments for the implementation and support of innovations.

In terms of **public engagement/inclusiveness**, the following issues have been identified:

- The **engagement** of groups with special needs (disabilities) has to be improved, either through technological means (to allow people with disabilities to participate) or proactive support to organisations representing these groups.
- There are high levels of disinformation, also at the expert level, concerning scientific research and results, which prevents the successful uptake of innovations; media have no training and knowledge on how to cover science subjects and consciously or not, become accomplices in the process.
- In terms of **anticipatory and reflexive governance**, the process of *ex ante* technology assessment in Bulgaria is weak; not many organisations have this expertise and could aid decision-making. In addition, most software and tech innovations are available in major European languages, however, very few are also in Slavic languages. This is a technical issue which stands in the way of utilising digital technologies in an inclusive and open way (in all policy areas).

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- A major obstacle which concerns the innovation ecosystem as a whole is that "legislation lags behind innovations," which prevents academia and businesses to proactively offer innovative products and know-how to the local government.
- The current public procurement system is ineffective and does not support the uptake of innovations.

Drivers of change: open data policies, data sharing, information sharing between municipality (as data owner) and stakeholders (end users of data – businesses, academia, NGOs).

- Securing funding for the small grants programmes of Sofia Municipality is a factor for success, by engaging in a responsive, inclusive way a variety of local civil society organisations. These programmes include *Programme Europe, Programme Culture, Programme Social Innovations, Programme The Crisis as an Opportunity.* Special strands of the programmes are aimed at vulnerable groups, people with disabilities, migrants.

Policy area SUSTAINABLE URBAN DEVELOPMENT

The main documents that inform activities in this area are the *Vision for Sofia 2050* and the *Programme for Sofia* 2030 (which is the new masterplan for integrated city development). The strategic documents **cover all five of the RRI keys and most of the AIRR principles.**

The *Programme 2030* relies on **broad public engagement, inclusiveness, foresight scenarios, transparent and accountable governance.** Nevertheless, barriers to the full realisation of RRI-AIRR identified by project participants include, for example, lack of measures and incentives to support the internationalisation of innovations for urban development; this diminishes the capacity to attract international investors and research expertise. Further barriers and drivers:

- Regarding **open access and inclusiveness**, one problem is the insufficient capacity of the administration to analyse available data to design public services. **Inclusiveness** and **public engagement** are understood (by stakeholders from academia, business) as a means of receiving feedback from the citizens/clients/end users of services.
- In terms of **reflexive governance**, potential barriers are administrative system elements which are not responsive and do not cooperate.
- Systems of KPIs need to be introduced at each level/unit of government; having standards for outputs and results will guarantee quality and objective evaluation of the work done. Achievement (or failure to achieve) of KPIs will also inform future interventions and changes (which could influence **anticipatory governance** practices).
- **Gender equality** is still narrowly understood in terms of close-to-equal numbers of men and women taking part in activities or having positions in office; it is important to adopt gender equality plans which encompass a wide range of considerations regarding gender dimensions of policies.
- Regarding **responsive and inclusive governance**: the administration has to be anticipative in order to mediate and reconcile private and public interests.

Policy area YOUTH EMPLOYMENT AND ENTREPRENEURSHIP

As evidenced by the analysis of the *Sofia Youth Strategy* (SYS), the document reflects most of the principles of the RRI-AIRR framework – in the strategy development, implementation, monitoring and evaluation. These include **civic participation** through a broad consultation process; the objectives set in the Strategy support **access to open data, inclusiveness and engagement,** and **(science) educatio**n. As concerns the AIRR dimensions, the Strategy mentions inclusion of young people in policy- and decision-making. The annual

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assessment and monitoring are examples of **reflexive and accountable** governance; an annual report is submitted to the respective directorate in the municipality.

With respect to **barriers and drivers for change**, the following main conclusions have been drawn from the interviews, focus groups, and participatory workshop.

- When it comes to **public engagement and inclusion**, there is need for more dialogue between public bodies, the private sector and youth organisations; more efforts are needed to give voice to all citizens, in particular to underrepresented groups and young people with special needs.
- **With respect to self-reflection/self-assessment in policy implementation,** the element of the *build-measure-change* cycle or of design thinking (*creating, testing, piloting*) is yet to become a leading aspect in the administration's work. This is a process of ongoing adjustment of organisational structures and practices, not yet adopted by the city.
- With respect to **responsiveness and inclusiveness**, an existing barrier is the lack of effective long-term collaboration with organisations from the business sector, so that initiatives for youth entrepreneurship can be pursued.
- A potential **driver for change** could be collaboration (engagement with) all stakeholders – schools, businesses, universities, to define a framework of future skills needed for the local economy. In this process, the leading role should lie within the municipality. Given the experience with the Youth Advisory Council, working with the municipality for the implementation of the Youth Strategy, this could be a strategic objective set for the next 3-5 year period (until 2027).

Opportunities to include RRI and AIRR in the policy area: The SYS does not focus on **gender equality, ethics, or science education**. These issues need to be reflected in a revised version of the SYS, also in light of new EU initiatives, such as the Next Generation EU.

Policy area DIGITAL TRANSITION AND NEW SKILLS

The main policy document is the *Digital Transition Strategy for Sofia* (DTSS). Documentary analysis has shown that **public engagement** is essential part of its implementation; information exchange and communication; participation, collaboration, (co)-production; participatory decision-making; and open governance are all described in the document as methods of **public engagement** and **inclusiveness**. The DTSS itself is the result of a broad consultation process with over 100 stakeholder organisations city-wide. **Open data, access to data**, open source software are listed as prerequisites for the implementation of the DTSS. In terms of **science education**, specific Strategy objectives aim to encourage university education in STEM, informatics, as well as entrepreneurship in these fields. No considerations of **ethics**, including research ethics and ethical issues linked to digital transition are mentioned; ethical issues (also linked to use of AI, public e-services, etc.) are critical for a just digital transition and should provide an overarching framework for broad stakeholder engagement.

Barriers and drivers of change:

- In terms of **open access to data**, an existing barrier is the lack of compatibility and verification mechanisms for standardising data collected. In principle, the current hierarchical model of governance and decision-making is an **obstacle** to a more effective communication and cooperation between the municipality and stakeholders.
- Regarding the process of **responsive, reflexive governance**, centralised communication and decision-making prevent the promotion of bottom-up initiatives and ideas for change.

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- **Ethical principles** need to be observed in conducting policy impact analyses (*ex ante*). Systematic analysis of social impacts is mainly done by researchers, but anticipation approaches like foresight studies or horizon scanning are not routine practice.
- **Public procurement** procedures need to be reorganised to allow for better alignment with the RRI-AIRR approach.

Drivers of change: There are internal administrative procedures for **self-assessment/reflexive governance**, but they vary across municipal departments. These procedures are often updated to include new KPIs for quality and effectiveness, and for process monitoring. Digitalisation can improve this process and will introduce standardised protocols for monitoring and evaluation. Utilising digital tools for citizens consultations is another opportunity to be exploited.

A Digital Board comprising local quadruple helix stakeholders and tech companies supports the implementation of the Digital Strategy. Membership is open (by invitation from the deputy-mayor for digitalisation).

3.4 SWOT/TOWS analysis

Table 5: SWOT analysis of Sofia municipality

Strengths	*Weaknesses*
Stakeholders: Some of the RRI keys are well embedded in and practiced by the research and academic community – open access, research ethics, science education. Civil society organisations and policy makers have a good track record in applying practices that are very close to AIRR dimensions – especially inclusiveness, anticipation and reflective governance. Local stakeholders (youth, NGOs, academia, business) are engaged in consultative bodies working with the municipal administration. **Local policy areas:** **S1** There are well-developed and comprehensive strategy documents in all chosen policy areas **S2** Policy documents relevant for the chosen policy areas reflect well some RRI keys and AIRR dimensions (open access, public engagement, science education, inclusiveness), while others are present in some documents (ethics, responsiveness, anticipation, reflexivity). **S3** Leading EU experience is used to develop digital tools for data collection, policy modelling, testing, and management, which will positively	**Stakeholders**: Low level of awareness of RRI-AIRR approach and hence, the full potential of its application in organisational policies remains unused, despite the presence of practices that contain elements of RRI keys and AIRR dimensions. Obtaining scientific and technological expertise from local stakeholders is often stalled due to perceived risks of corruption/nepotism/clientelism. There is a need for more public discussions and dialogue between public bodies, the private sector and civil society in support of transparent policy-making. Strategic political commitment to achieving policy objectives is extremely important but difficult to reach. **Local policy areas:** **W1** RRI keys and AIRR dimensions are not formally set in internal documents or procedural codes. **W2** The current hierarchical model of governance and decision-making is an obstacle to a more effective communication and cooperation between the Sofia Municipality and local stakeholders. **W3** Lack of capacity of the municipal administration to define broad-spectrum, long-term visions for

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influence practices for anticipatory, reflexive, and responsive governance. **S4** A Digital Board comprising local quadruple helix stakeholders supports the implementation of the Digital Strategy. **S5** Municipal grant making programs developed to support local initiatives by Q4 partners	city/territorial development; limited digital skills of the administrative staff. **W4** Strategic documents in the policy areas are not coupled with realistic action plans and sufficient funding. **W5** Lack of synergy of systems (investment, sectoral policies, technology, etc.) **W6.** Lack of capacity to manage cooperation with external stakeholders (misunderstood as corruption risk) **W7** Low level of awareness of RRI-AIRR approach and hence, the full potential of its application in organisational policies remains unused, despite the presence of practices that contain elements of RRI keys and AIRR dimensions. **W8** Foresight /anticipatory governance measures in the city administration are limited mostly to a 5-year span.
Opportunities	***Threats***
O1 Good practices from other countries, specifically aimed to improve the integration of RRI-AIRR approach in territorial governance, are a source of knowledge and experience, which can be used and adapted to the local context (e.g. twinning projects and mutual assistance projects between public bodies in Bulgaria and the EU). **O2** The EU and national programmes of the current seven-year programming period (2021-2027) provide numerous and diverse opportunities for applying RRI-AIRR approach in policy design and policy implementation. **O3** The municipal administration and leadership have the potential to become early adopters of bottom-up initiatives and ideas based on the research/innovation results, in order to achieve a transparent, responsive and accountable governance. **O4** Municipality investing in improved and expanded (digital) communication and engagement with citizens and stakeholders. **O5** Quadruple-Helix stakeholders have a high interest in the RRI-AIRR approach, as they perceive it as very relevant.	**T1** Partisan politics preventing the adoption of priority policy measures/funding instruments for territorial development and governance. **T2** Certain segments of society remain isolated from the decision-making processes, especially the vulnerable/underrepresented groups and people with special needs. **T3** Sustained application of the RRI-AIRR approach in the policy-making cycle is blocked/delayed due to shortcomings in the overall administrative set-up of the municipal departments (inefficient communication, cumbersome decision-making procedures). **T4** Insufficient administrative culture/administrative capacity to utilise public private partnerships (PPPs) in support of innovation/cooperation with local stakeholders due to risks of corruption. **T5** Level of competitiveness of local stakeholders in EU programmes is lower compared to stakeholders in other EU countries.* **T6** Local/national dynamics of in/outmigration, demographics, and ageing population pose further obstacles to strategic planning and resource allocation (human, financial, material).

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TOWS analysis

This section presents the **TOWS** (inversed SWOT matrix) analysis. The objective of the TOWS analysis is to outline dependencies and linkages between the internal and external factors identified in the SWOT analysis. Thus TOWS analysis provides the basis to elaborate development strategies and propose concrete actions which aim to take advantage of opportunities, leverage existing strengths, focus on minimising/mitigating external threats and address internal weaknesses.

The main findings of the TOWS analysis are presented in the table below.

Table 6: TOWS analysis of Sofia municipality

Internal strengths Maximise Strengths to maximise Opportunities (Maxi-Maxi strategy)	**Opportunity 1** Good practices from other countries, specifically aimed to improve the integration of RRI-AIRR approach in territorial governance, are a good source of knowledge and experience	**Opportunity 2** The EU and national programmes of the current seven-year programming period (2021-2027) provide funding opportunities for applying RRI-AIRR approach in policy design and policy implementation.	**Opportunity 3** The municipal administration has the potential to become early adopter of bottom-up initiatives based on research/innovation, in order to achieve a transparent, responsive and accountable governance.	**Opportunity 4** Municipality investing to improve digital communication and engagement with citizens and stakeholders.	**Opportunity 5** Quadruple-Helix stakeholders have a high interest in the RRI-AIRR approach, as they perceive it as very relevant.
S1 There are well-developed and comprehensive strategy documents in all chosen policy areas.		Adopt EU approach of taxonomy analysis of sustainable sector/policy development measures	- Plan pre-commercial procurement for early uptake of innovations and research results - Utilise PPPs for uptake of scientific input to policy making	- Provide funding and introduce digital tools and platforms for communication within the municipality and with stakeholders - Promote business models (and PPPs) that can sustain the digital transition of the city in public services	Invite Q4 stakeholders to regular consultations (through advisory councils) for input to policies
S2 Partial inclusion of RRI-AIRR in policy and practice	Support networking and international cooperation efforts/projects by local stakeholders which have a high interest in the RRI-AIRR	Initiate own/support external projects in fields linked to the policy areas to take advantage of available EU funding	Revise public procurement to allow for better alignment with the principles of RRI-AIRR approach	Expand the mandate of InnovativeSofia unit to build digital communications	Streamline strategic goal setting in policy areas to achieve synergy in development/reporting / monitoring/evaluation of

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	approach in strategic planning			infrastructure in the municipality	policies with stakeholders participation
S3 Leading EU experience is used to develop digital tools for data collection, policy modelling, testing, and management	Capitalise on existing good practices through EU-level networks in which Sofia participates	Conduct regular reviews of policy and action plans to ensure alignment with EU priorities and funding opportunities	Strengthen collaborations with partner municipalities from EU to improve the integration of RRI-AIRR in the policy process	Utilise participation in EU projects to adopt new digital instruments for policy making and implementation	Promote networking of local Q4 stakeholders with EU partners
S4 Well-functioning units for urban development and digital transition in Sofia Municipality which could serve as examples for policymaking	Promote the positive practices across the municipal administration		Support projects/initiatives for digitalisation of municipal operations and communications	Continue the process of digital transition to secure data compatibility across the municipal departments (data sets from the municipality and companies follow compatible formats so that data could be easily integrated, analysed, shared).	More active inclusion of stakeholders in policymaking
S5 Municipal grantmaking programs developed to support local initiatives by Q4 partners	Utilise funding to build capacity for local stakeholders to apply RRI-AIRR		Utilise funding to support pre-commercial procurement and uptake of innovations		Utilise funding programs to encourage learning and capacity building for stakeholders to apply RRI-AIRR

Internal strengths Maximise Strengths to minimise Threats (Maxi-Mini)	**Threat 1** Partisan politics preventing the adoption of priority policy measures	**Threat 2** Certain segments of society remain isolated from the decision-making processes, especially the vulnerable/underrepresented groups and people with special needs.	**Threat 3** Sustained application of the RRI-AIRR approach in the policy-making cycle is blocked/delayed due to shortcomings in the overall administrative set-up of the municipal departments (inefficient communication,	**Threat 4** Insufficient administrative culture/administrative capacity to utilise public private partnerships (PPPs) in support of innovation/cooperation with local stakeholders due to risks of corruption.	**Threat 5** Level of competitiveness of local stakeholders in EU programmes is lower compared to stakeholders in other EU countries.	**T6** Local/national dynamics of in/outmigration, demographics, and ageing population pose further obstacles to strategic planning and resource allocation (human, financial, material).

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			cumbersome decision-making procedures).			
S1 Strategic documents with relevant objectives in the chosen policy areas	Strategic planning to be for a 10-year period, with clear KPIs and funding sources per policy objective	Regularly review and revise all policy documents to include measures for inclusion and engagement of vulnerable groups	Ensure that strategic objectives are well communicated to all stakeholders engaged in policy implementation	Build capacity of the administration through regular training	Prioritise local business/technology sectors for funding (through Municipal Guarantee Fund, SofiaInvest, etc.) to achieve policy objectives	More active engagement of the thematic advisory councils working with the Mayor to set up strategic priorities
S2 Partial inclusion of RRI-AIRR in policy and practice	Inform municipal administration /council of the benefits or RRI-AIRR to encourage adoption and improve policymaking	Introduce new/improve existing mechanisms for consultations with the target groups		Build capacity of the administration through training programs	Introduce incentives/requirements for inclusion of RRI-AIRR principles in strategy/policy development	
S3 Cooperation with other EU partners/mutual learning	Promote international cooperation to ensure alignment of policy objectives with EU priorities	Engage in mutual learning programs with EU partners and adopt good practices	Engage in mutual learning programs with EU partners and adopt good practices to improve administrative operations	Initiate own/support projects with EU partners to build internal capacity	Develop in-house training programs for municipal staff	
S4 Well-functioning units which could serve as examples in policymaking (SofiaPlan, InnovativeSofia)			Policy sandboxing for societal impact: test policies, with broad public engagement, before official approval			
S5 Municipal grant making programs support local initiatives by Q4 partners		Use funding to support the involvement of the target groups through pilot projects			Support capacity-building projects for the local stakeholders	Support pilot projects to tackle specific challenges and areas in need of improvement

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Internal weaknesses Minimising Weaknesses to maximise Opportunities	**Opportunity 1** Good practices from other countries, specifically aimed to improve the integration of RRI-AIRR approach in territorial governance, are a good source of knowledge and experience	**Opportunity 2** The EU and national programmes of the current seven-year programming period (2021-2027) provide numerous and diverse opportunities for applying RRI-AIRR approach in policy design and policy implementation.	**Opportunity** 3 The municipal administration and leadership have the potential to become early adopters of bottom-up initiatives and ideas based on the research/innovation results, in order to achieve a transparent, responsive and accountable governance.	**Opportunity 4** Improved and expanded (digital) communication and engagement with citizens and stakeholders.	**Opportunity 5** Quadruple-Helix stakeholders have a high interest in the RRI-AIRR approach, as they perceive it as very relevant.
W1 RRI keys and AIRR dimensions are not formally set in internal documents	Develop internal guidelines using good practices from other countries				Collaborate with Q4 stakeholders to develop internal documents on RRI-AIRR adoption
W2. Hierarchical model of governance and decision-making is an obstacle to a more effective communication and cooperation with stakeholders	Take steps to improve model of governance based on good international practices		Undertake internal reorganisations to strengthen horizontal communications and bottom-up initiatives within municipality	Introduce digital communication to facilitate internal and external communication	
W3. Insufficient administrative culture /administrative capacity		Utilise EU funding to improve administrative capacity through pilot projects		Build internal capacity for big data analysis; train and retain local talent (within the administration)	
W4 No realistic action plans and sufficient funding for policy implementation		Build internal capacity for project development and implementation of EU funded programs			
W5 Lack of synergy between systems (investment, sectoral policies, technology, etc)			Introduce digital communication to facilitate synergy of internal and external communication and data sharing	Introduce digital communication to facilitate synergy of internal and external communication and data sharing	

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W6. Lack of capacity to manage cooperation with external stakeholders (misunderstood as corruption risk)			Introduce new procurement procedures that include RRI-AIRR principles and anticorruption measures		Introduce transparent rules for communication with local stakeholders, publish regular reports of the activities
W7 Low level of awareness of RRI-AIRR approach and hence, the full potential of its application in organisational policies remains unused, despite the presence of practices that contain elements of RRI keys and AIRR dimensions.	Participate in EU-wide actions aimed to promote the application of RRI-AIRR	Utilise partnerships to adopt and share good practices on applying RRI-AIRR in the municipal administration and in the cooperation with stakeholders		Utilise digital technologies to increase awareness of RRI-AIRR among the administration and local stakeholders	Strengthen communication and collaboration with stakeholders as a way to improve the awareness of RRI-AIRR

Internal weaknesses Minimising Weaknesses to avoid Threats	**Threat 1** Partisan politics preventing the adoption of priority policy measures	**Threat 2** Certain segments of society remain isolated from the decision-making processes, especially the vulnerable/underrepresented groups and people with special needs.	**Threat 3** Sustained application of the RRI-AIRR approach in the policy-making cycle is blocked/delayed due to shortcomings in the overall administrative set-up of the municipal departments (inefficient communication, cumbersome decision-making procedures).	**Threat 4** Insufficient administrative culture/administrative capacity to utilise public private partnerships (PPPs) in support of innovation/cooperation with local stakeholders due to risks of corruption.	**Threat 5** Level of competitiveness of local stakeholders in EU programmes is lower compared to stakeholders in other EU countries.
W1 RRI keys and AIRR dimensions are not formally set in internal documents	Revise current internal protocols and policy making guidelines to include RRI-AIRR principles	Revise current policies to include measures for inclusion of the target groups in public advisory and consultation bodies			
W2. Hierarchical model of governance and decision-making is an obstacle to a more effective communication and cooperation with stakeholders	Involve more actively in policy making the advisory and consultative bodies at the municipality; set up new ones if needed	Introduce digital tools for communication between municipality and citizens/stakeholders	Plan measures to reduce top-down decision-making and promote bottom-up communication and initiatives		

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W3. Insufficient administrative culture /administrative capacity			Build internal capacity of the municipal staff through training programs		
W4 No realistic action plans and sufficient funding for policy implementation		Revise policies to include realistic and achievable KPIs and feasible sources of funding	Seek cooperation with national authorities to identify funding programs in support of policy implementation		
W5 Lack of synergy between systems (investment, sectoral policies, technology, etc)			Improve the coherence of administrative systems through regular periodic review of their work and achievement of KPIs		
W6. Lack of capacity to manage cooperation with external stakeholders (misunderstood as corruption risk)		Set up new and support the functioning of the existing stakeholder advisory ad consultative bodies working with the Mayor of Sofia			

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3.5 Identification of strategic policy priorities

Based on the SWOT/TOWS analysis and focus groups, the following strategic policy priorities, in which the RRI-AIRR approach would best fit, are identified.

Strategic policy priorities can be clustered in the following five groups:

1. **Institutional framework**: municipal bodies responsible for strategy implementation.
2. **Strategic policy framework**: alignment of the municipal strategies (*Digital Transformation Strategy for Sofia, Youth Strategy 2017-2027, Innovation Strategy for Smart Specialisation of Sofia, Vision for Sofia 2050, Education Strategy 2016-23*), with national and EU-level strategic and programming documents.
3. **Capacity building** for RRI and AIRR-based territorial governance model and promotion of multi-actor and multi-stakeholders alliances supporting RRI-AIRR.
4. **Communication and engagement** with citizens and stakeholders.
5. **International learning** and cooperation with stakeholders at local/national/EU level.

Furthermore, several cross-cutting priorities/sectors for intervention have been outlined, as follows:

A. Internal (municipal administration, municipal procedures, etc.)

1. Improving the policy development, assessment, reporting, and evaluation process through stakeholder participation.
2. Building the capacity and skills of the administrative staff for better understanding RRI-AIRR .
3. Developing internal guidelines /protocols for applying RRI-AIRR in strategic planning and programming; it is essential to define an operational protocol for the effective engagement of the different categories of stakeholders and to foster their collaboration.
4. Developing a data policy to manage in a coordinated way the collection, access to, analysis, sharing, storage of data (required for policy making, public services, etc.)

B. External (related to stakeholders and citizens)

1. Communication with stakeholders: optimise communication by using a variety of channels, further develop and promote digital tools (accessible and adapted to the needs of various groups of society). Regularly provide information to key stakeholders to build their capacity in the field of RRI-AIRR and the relevant policy areas.
2. Introduce new or expand existing funding programmes to implement activities in support of RRI-AIRR principles.
3. The sustainable use of resources/circular economy principles has to be made a horizontal priority in each strategic policy area. Citizens and stakeholder need to be engaged in activities and campaigns for adopting green and sustainable living, for reducing air pollution, mitigating climate change, enhancing resource efficiency.
4. Close cooperation with the media to provide visibility and publicity to the achievements of science and local innovators, in order to garner public support for innovation policies.

Below are presented the key strategic priorities relevant to each policy area. As several of the survey documents (youth strategy, innovation strategy) are up for update and revision, results and know-how from the RRI-LEADERS project will be used to incorporate RRI-AIRR principles in the new documents.

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Policy area SUPPORT FOR INNOVATION

1. Citizen participation in policy making is streamlined, efficient and easily evaluated through the use of digital technologies.
2. Building expertise for developing and implementing innovations in the public administration sector.
3. Focus long-term planning and programming on green technologies and developing human capital for industry 5.0 (including health and biotech industry).
4. Encourage innovations for city governance through open data policies and involvement of the industry in developing innovations (b2g, g2b, data-as-a-service, etc.).
5. Open up the innovation ecosystem of Sofia to neighbouring cities and to the region.

The proposals can be implemented through specific measures included in the annual Action plans for the implementation of the Innovation Strategy for Smart Specialisation of Sofia. Public engagement measures/inclusiveness/anticipatory governance principles can be supported through the municipal funding programme for social innovations (calls for proposals are published annually).

Policy area SUSTAINABLE URBAN DEVELOPMENT

1. Integrate sustainable development principles into all sectoral policies, in order to improve the quality of life in the city and municipality.
2. Climate change adaptation, clean air and smart transport are critical for the future of the city.
3. Increasing the competitiveness of the municipality and developing the knowledge economy, setting up new mechanisms for incubation and financing.
4. Integrating the RRI-AIRR principles as horizontal priorities in all of the municipal funding programs.
5. Support open experimentation and living lab initiatives, transforming the city into a test bed for innovative green & digital solutions to emerging societal challenges.

The priorities can be implemented through measures included in the Action plans for the *Programme for Sofia 2030*.

Policy area YOUTH EMPLOYMENT AND ENTREPRENEURSHIP

1. Introduce new opportunities for education and entrepreneurship in the municipality through better networking among stakeholders.
2. Involve young people in advisory and consultative bodies at the municipality in order to facilitate regular input and feedback on youth-related policies and measures.
3. Further support the innovation ecosystem, through programs for start-ups, tech and social innovation; open programs to people with migrant background.
4. Develop education and employment programs attractive to young people, in order to stop the brain drain and retain young talent in the city.

These proposals can be implemented as part of the annual plans, developed and carried out in cooperation with the Youth Advisory Council of the municipality. In addition, specific priorities can be included in the annual calls for proposals to be funded by the municipal funding programs.

Policy area DIGITAL TRANSITION AND NEW SKILLS

1. Adopt a centralised approach for digital transition, consolidating infrastructure and resources across the entire administrative ecosystem based on open (data) access, ethical use of data management, inclusive and reflexive governance.
2. Ensure public (e)-services are adapted to and meet the needs of people with disabilities in line with EU directives.

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3. Strengthen the role of Sofia Municipality as end user/client of local ICT, R&I companies, to foster product experimentation and development of digital products and solutions for the public sector.
4. Initiate public debate and adopt strategic guidance on the ethical use of AI in technology, research, and public services.
5. Develop smart data platforms / digital twins of integrated public service systems to facilitate large-scale socio-technical transitions, e.g. green transition, just energy transition, low-carbon economy transition, etc.

These proposals are partially or fully in line with the DTSS and can be implemented by the InnovativeSofia unit (in charge of the DTSS). In addition, the municipality (through InnovativeSofia) is part of several ongoing international projects (*PolicyCloud* under Horizon2020, UIRC – International Urban & Regional Cooperation, funded by the EC, Bloomberg Philantropies), which aim to accelerate the digitalisation of the municipal administration and public services through big data analytics.

3.6 Summary of focus group discussions

In November and December, 2021, four focus groups were held: one with representatives of policymakers, one with NGOs, one with the business, and one with academia.

Main conclusions from the discussions (all groups)

All stakeholders pointed to a commonly felt need and desire to push for institutional change towards **more responsiveness, communication, more and better involvement of stakeholders** and much more emphasis on **continuous experimentation** and **capacity building across institutions** and organisations in order to improve policymaking and implementation.

There is an agreement among the **policymakers, NGOs, and academia**, that the RRI-AIRR approach would **improve the inclusiveness** and relevance of policies, that is, to be more responsible vis-à-vis what society regards as desirable outcomes and results of municipal governance. Focus is placed on increasing the societal relevance of funding and investments, open access instruments/open data, digitalisation of services and administrative procedures, innovation for sustainable urban development, cohesion, etc.

The need for **guidance for policymakers on how to do RRI** was identified by all groups. There is need for a clear and common understanding of what is meant by RRI and how to communicate it. **Policymakers** specifically mentioned that RRI-AIRR principles need to be set in municipal protocols/guidelines, but have to be tied to the achievement of specific objectives per policy area. **Industry and business** specifically mentioned the need to make RRI clear and concrete in their terms – in particular about the commercial gains to be made from this approach. By focusing on attracting new minds and new stakeholders into the R&I process as well as becoming more responsive to changing societal needs, RRI unleashes currently untapped potential in society.

All stakeholder groups ranked the **potential for developing better networks and cross-stakeholder collaboration** as a key opportunity stemming from RRI. NGOs, policymakers and researchers see value in RRI facilitating collaborations among them, emphasising how these may generate better innovations, better science, and better opportunities for youth entrepreneurship. **Researchers** noted that collaborating with end-users may lead to the discovery of new research areas and questions, and subsequently improve the impact of science, whereas **NGOs** noted that collaboration may help scientists become more aware of the bigger picture in society; some NGOs have policy-specific expertise or expertise linked to one or more of the RRI keys, which neither academia nor policymakers have fully utilised.

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Business and Policymakers specified that RRI might foster **greater competitiveness and creativity** within the R&I ecosystem. Even though many companies are not familiar with RRI, **business** representatives view it as a way to create new commercial opportunities by improving business understanding of consumer demand (based on **open data**), putting end-users (including the municipality) at the heart of the innovation process, and stimulating RRI processes in collaboration with research. Companies have already undertaken activities in line with RRI, albeit using different terms (e.g., sustainable innovation, participatory design, open innovation, stakeholder dialogues, scenario development, circular economy, risk assessment). Policymakers emphasised the potential for RRI to improve policy decisions around R&I, as well as **highlighted the value of dialogue and communication in increasing trust in society.**

The **political and institutional commitment of leaders** and managers is structurally one of the **key factors in the institutional change processes** which could transform the governance models in Sofia Municipality and stimulate uptake of RRI-AIRR . Participating groups agreed that the nature of RRI-AIRR as a conceptual approach aimed at actors' reciprocal responsibility, defines a space for innovative forms of governance centred on the adoption and the practical implementation of (self-) regulatory instruments such as codes of conduct, guidelines, technical standards, and audits.

Institutional framework: Both capability and capacity building are needed for the local administration to integrate RRI-AIRR in territorial governance. This requires **leadership, top-level vision and strategy**, and the rewarding of institutional improvement in order to facilitate change towards mainstreaming RRI-AIRR .

RRI-AIRR approach rewards long-term thinking in innovation by enabling society to reflect, rethink and reshape the system over time. This was viewed by **policymakers** as particularly important in light of contemporary challenges and health crises such as the COVID-19 pandemic. Both **policymakers and NGOs** commented on the opportunity, from RRI, to focus more attention on inclusive programming and financial sustainability, fostering environmental awareness in society and particularly amongst young people and business investors, as well as to develop new ways of valuing the social impacts of research and innovation (esp. with regard to vulnerable groups).

Coordination and network building were seen as important for learning under RRI-AIRR , and some participants identified particular structural opportunities to enable networking and partnerships, including the importance of role models (for youth entrepreneurship), developing a platform that brings policymakers, science, and industry together. Further, **researchers** noted the importance of taking advantage of **scientific networks to foster cross-country learning** and utilise ongoing and future programmes at EU level (i.e. Horizon Europe) which aim to promote innovation and support for emerging technologies.

All participants agreed that **transparency, inclusiveness and visibility** are part of the philosophy of RRI and AIRR and, at the same time, they are preconditions for developing effective measures aiming to integrate RRI-AIRR in the operations and management of the organisations.

Focus group with representatives of universities and research organisations (10 participants)

Participants in the group included university professors and researchers, with experience in all four policy areas.

Concerning the policy area **support for innovations**, most participants agreed that **priorities** should include **green innovations** and those linked to **digital transformation of public systems**. This process should be led by research institutions and academia, as well as the business, while the role of civil society is to identify the issues and generate demand for solutions which meet current societal needs and challenges. Equally important is the inclusion of all stakeholder groups, following a **quintuple helix** model; in this respect urban **living labs, policy sandboxing** and other forms of experimentation need to be encouraged.

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Among the identified **barriers** are market conditions supporting the innovation process, well-trained personnel, esp. in SMEs, as well as a robust regulatory framework (both at national and local level) and new procurement procedures; for example, pre-commercial procurement could facilitate the process of early uptake of innovation products. According to the group, there is potential for boosting innovations through collaboration between 4-helix stakeholders. **Media** is identified as a key actor since media disseminate information to society; well-informed citizens can participate in the process of problem identification and support scientific research and innovations. So-called **hidden innovations** also need attention and publicity, as they can drive the R&I process forward.

Push factors for RRI-AIRR adoption: The COVID-19 pandemic has become a main driver for innovation and digitalisation; public institutions, research, the industry should use the momentum and push for new measures in this respect. Transformative technologies, data gathering, sharing and data governance have gained even more importance, and state and local governments play a key role for support of **innovations, the use of artificial intelligence, and development of personalised data services (data-as-a-service). Access to data and open data** are essential for the process of innovation and digital transition, but while public bodies are required to provide open access to data, they are not – yet - good in developing public services.

With regard to strategic priorities for **digital transition,** data are needed also for making possible socio-technical transitions, for example, creating **smart data platforms**, which integrate multiple public service systems (transport, energy, utilities, etc.). Such platforms can mobilise/incentivise both industry and citizens to take part in the design and implementation of such systems. On the other hand, there is a clear dependence between digital skills competencies of the staff and capacity for innovation of the business; digital tech companies are more prone to pursue and introduce innovations.

Participants also noted that a **generational shift** is taking place, with more young people taking high positions in office; this process could accelerate innovation, research, and digitalisation. At the same time, huge disparities still exist in digital skills competencies across different social groups, esp. marginalised ethnic groups, which could slow down digitalisation and leave people out.

With regard to policy area **youth employment and entrepreneurship,** participants noted that less attention is given to opportunities for **informal/non-formal education** through which young people gain important digital skills. Sofia has a huge potential to develop as a centre of the gaming industry, and the capacity of people engaged in the industry, incl. gamers, has to be better utilised. There is also potential to engage young people in open innovation and experimentation linked to societal challenges. For example, the city itself could become a testbed for various (digital) solutions in key public systems (transport, health, etc.) The support of civic entrepreneurs requires the creation of dedicated places and processes whereby different players can collaborate to let emerge, define and experiment ideas (e.g., spaces like SofiaLab, which is a member of the ENoLL network of living labs).

Sustainable development: Transforming the city into an open living lab for experimentation and digital/green entrepreneurship could be a long-term vision for Sofia, with relevance to all four policy areas. **Youth employment and entrepreneurship objectives** should cater to the needs of young people which are mobile, motivated, adaptable, adjusting also policies for informal, non-formal learning and recognition of skills. While many initiatives are available for entrepreneurship training most are geared towards the early stage of entrepreneurship, whereas the focus should be on how to sustain the business and remain competitive.

Role of RRI-AIRR dimensions:

- **Public engagement and science education** were noted as very important for innovations; the role of media is not less important as it makes possible the communication of science and research to the public and to

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policymakers. It is important to **raise the profile of researchers and academia**, to improve their public image, in order to build trust in science (through events such as Night of Researchers, Science Festival).

- **Gender equality**: it was stated again (as in previous focus groups) that this is not an issue for academia; women are well represented but the salaries of researchers and professors in universities are still very low compared to other professions. Considerations of work-life balance need to be taken in all policy areas.

Role of academia in the process of integrating RRI-AIRR in territorial governance: Universities and research organisations provide long-term insight into the future through their research. They can help with defining the long-term agenda of society in various fields of science and technology development. In this respect the focus group participants generally support the idea of having a special unit in the municipality responsible for research and science but this unit should work together with other (permanent or *ad hoc*) science and research panels which can advise on specific issues.

Focus group with policy makers and representatives of public institutions (8 participants)

The focus group brought together representatives of public institutions from local government, national agencies, as well as representatives of the EU Committee of the Regions. Key words in the discussion were **leadership, innovation, leading-by-example, e-government, responsive and anticipative governance,** capable to foresee risks and manage crises swiftly and efficiently**.** The vision for Sofia in the next 20-30 years is for a city which experiments, tests, innovates, in which citizens are active partners of the administration. The innovation ecosystem is built to ensure a sustainable green and digital transition into the future. In order for this vision to become reality, a change in mentality and dedicated political leadership is needed. Capitalising on its competitive advantages, Sofia can become a model for other cities in the country as well as in the region.

Policy area support for innovation

Similar to the other focus groups, participants proposed priorities that dealt with a) seeking **alignment between local, national, European priorities** for innovation while focusing on the city's needs; b) better communication and **collaboration mechanisms between the helix partners**; c) consistent efforts to make the impact/**effects of innovation visible to the public**. These priorities can be achieved by further improving and **building up the administrative capacity** of the municipality. A special fund for social experimentation/innovations could be established to support innovative solutions. Being the capital city with the highest concentration of universities, IT sector businesses, highest share of FDIs, etc., the city should strive to lead the innovation process also by sharing experience with and opening its innovation ecosystem to other cities in the country.

Policy area digital transition and new skills

Participants unanimously agreed that **digitalisation of administrative procedures, e-government and public e-services** should be on top of the local government's agenda. The city should build upon the momentum created by the COVID-19 pandemic which forced public institutions, private companies, as well as citizens to turn to digital tools for communication and work. The infrastructure for **e-government** exists at national and local level, and these facilities need to be integrated to **ensure adequate, secure, and accessible public services to the citizens.** In this regard, group participants proposed solutions (most of which are already being implemented within the digital transition strategy of Sofia), such as building a **platform for data exchange / open data** accessible to public and private companies.

A high priority is **improving the digital skills of the administration** and the citizens through re-skilling and upskilling programmes for all ages. Launching a **public debate on what transformative technologies hold for the future**, including the use of AI in different applications is also needed. It was pointed out that digital technologies clearly impact on the administration's ability to **respond and adapt** to changing societal needs**.**

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Policy area sustainable urban development

For the policymakers, the main focus in the foreseeable future should be **on air pollution, smart transport and alternative mobility solutions, and curbing urban sprawl**. Citizens should be mobilised to adopt responsible consumption and circular economy principles. This could be achieved by funding **small pilot projects** (initiated by citizens, NGOs) to tackle concrete problems in the city. Investment policies should be geared towards **sustainable economic solutions and adaptation to climate change.** In addition, demographic developments such as in- and out-migration, an ageing population, the EU regulatory and financial climate (through the Multi-Annual Financial Framework) will have a major impact on various systems in the city (e.g., education, labour market, housing, healthcare, etc.).

Policy area youth employment and entrepreneurship

Participants pointed out several long-term priorities for the city in this policy area, which largely coincide with those proposed by the other focus groups. These include a) ensuring citizen participation in strategy development; b) introducing dedicated funding instruments for initiatives of young people; c) design flexible employment policies built on forecasts of labour market needs; d) include young people in policymaking through consultative and advisory bodies; e) widely communicate policy objectives to young people, so they know how to engage. Science communication is important, in order to make research and academia more attractive to young people and to retain talent in the country.

With respect to the role of the **5 RRI keys**, participants noted that **science education is becoming a critical factor for building sustainable, resilient city systems.** As the COVID-19 crisis has shown**,** cities must have reliable infrastructure – including institutional, human, and financial resources – so they can quickly **adapt** and **respond** to crises. In the future, cities will have to be prepared to function in circumstances with a high degree of urgency, uncertainty and unpredictability; this requires multi-disciplinarily collaboration and depends on responsibility-sharing among stakeholders. Sofia should seek to build flexible, multi-functional teams capable of solving emerging problems, instead of maintaining a heavily bureaucratic administration, with rigid hierarchical decision-making systems.

Participants discussed the feasibility of establishing a **city science office** and appointing a chief scientific officer (based on the UK model) in an effort to create an institutional ecosystem steering the relationship between science actors, local communities, socio-economic actors and city government. There was general support for the idea which can be a good delivery mechanism to experiment, prototype, and scale-up innovative and entrepreneurial initiatives. Other participants commented that such an office/position will need support from other administrative units in order to coordinate vertical and horizontal urban policies, research and innovation.

All participants agreed that **public engagement** is a crucial factor for gaining support to policy measures, in all stages of the policymaking process, from needs assessment to evaluation. The methods of engagement should reflect the specifics of the policy topic and the socioeconomic characteristics, including gender, of the concerned target groups. Concerning **gender equality**, the group thought that it should be understood more broadly as ensuring **diversity in representation** and **inclusion of all** groups in society. A more acute problem for Sofia and the country is the **worsening demographics,** the **ageing** population and continuing **brain drain**. Policies, esp. youth policies, should therefore prioritise measures to stop the brain drain, retaining young talent, and offering competitive opportunities for living, studying, and working in the capital city.

Regarding **open access to data** policymakers agreed that it is important for shaping research and innovation; it is also needed for transparent decision-making, but at the same time, IPR needs to be observed. Open access must be granted for any data that has been produced using public money. Many times private and public interests do not align in terms of how data are harvested, processed, shared, etc., as data is becoming a very valuable currency and local governments need to strike a balance among conflicting interest groups. E-

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government relies on data being gathered and shared in a coordinated way among different institutions and levels of government, which requires a strong leadership and consistent efforts. Participants proposed that a dedicated unit in the municipality is established tasked with the realisation of e-government. The recommendation was also for following a centralised **open data policy**, making sure that the interests of public institutions are protected against big companies which use data for commercial gain.

Focus group with representatives of civil society and NGOs (15 participants)

Discussions began with the question whether NGOs should be expected to have a vision for the municipality and the policies to be developed. NGOs can propose various initiatives to aid the policymaking and test potential solutions, but it should be within the remit of the administration to propose a comprehensive vision for the city's future. On the other hand, strategic documents are still written in an administrative jargon which averts citizens or NGOs from active participation. NGOs are the link, translating the policy language to citizens, enabling communication and cooperation among stakeholders.

For this group, strategic priorities in the area **support for innovation** cluster in three groups: a) building **infrastructure for innovation** support, such as hubs, incubators, accelerators, and offering financial support for the implementation of projects; b) **citizen participation** in defining a strategic vision for the city, including through citizens budgets; c) building capacity for developing and implementing **innovations in city governance.** Sofia Municipality could utilise more efficiently the expertise and experience of the civic sector by commissioning studies conducted by experts from the NGOs.

With regard to **sustainable urban development**, the strategic priorities concern: a) facilitating more effective access and communication between citizens and the administration, through special contact points in each district administration; b) infrastructure that is accessible to all citizens; c) curbing urban sprawl and regeneration of abandoned areas, esp. in the city periphery; d) improving public transport and air quality; e) using digital tools to discuss plans for public infrastructure and reconstruction of public spaces.

In the area of **youth employment and entrepreneurship**, discussions focused on the following priorities: a) establishing new or improving existing programs for entrepreneurship, through mentoring and expert support from the business; b) regular reviews and forecasts about labour market needs in light of the green, digital, energy transitions; c) creating opportunities for people with migrant background to study, work and start their own business in the city; d) integrate new measures in municipal youth policies that account for gender dimensions of employment and skills in a digital environment.

Priorities in the area of **digital transition and new skills** include: a) introducing e-government and public e-services; b) improve digital skills of the municipal staff; c) continue to follow an open data policy. The role of NGO can be to offer training for digital skills, in particular to elderly citizens, marginalised groups, to ensure that they are not left behind in the digital transition. Participants in the focus groups reiterated an opinion already shared by NGO in previous surveys, namely, that civil society must be included in the monitoring, impact assessment and control of policy implementation.

As concerns RRI-AIRR principles, according to the group **public engagement** has a consultative role and provides expertise for defining long-term priorities. Secondly, public engagement is important for monitoring, evaluation, and control of policy implementation, and thus improving accountability and transparency. Thirdly, public engagement creates a sense of shared responsibility, solidarity and trust in public institutions. **Open data policies** are considered prerequisite for a quality research process and for facilitating cooperation among stakeholders in an accountable, transparent way. **Access** to data increases the quality of idea generation, innovation and development of digital technologies. **Ethics and integrity** are important to overcome the low levels of trust in public institutions. In policymaking, ethics implies also responsibility to future generations. With

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regard to **gender equality**, some participants expressed the opinion that both genders are treated equally in Bulgaria. A renewed understanding of gender equality is needed to provide a more encompassing perspective to policies in terms of inclusiveness, promoting diversity, and ensuring a place for all social and ethnic groups in policy implementation.

With regard to **AIRR dimensions,** participants agreed that practically all four principles are applied even though they are not formally described in the AIRR terminology. **Self-assessment and reflexivity** depend on a regular review of the available data, therefore, it is crucial for the administration to ensure that data used for analysis and policy initiatives are correct. In this respect, NGOs and the administration could join forces in conducting **foresight studies** which could be integrated in the programming process.

Focus group with business representatives (9 participants)

The focus group with representatives of the business followed the same structure as the rest of the groups. Their opinions largely coincide with those of the other three groups. In terms of priorities, in the policy area **support for innovation**, they placed the focus on closer collaboration with the business in defining a long-term vision for a smart and innovative city, within a 10-15-year timeframe. According to the business, important priorities in technology development fields for the city should also include biotechnology and medical sciences. Reducing the administrative burden on SMEs and full digitalisation of the SMEs was also listed as important. Priorities in **sustainable urban development** need to focus on limiting construction and improving the living environment, building new green spaces and parks. Energy efficiency of buildings and using green technologies for construction is also seen as important. Constructing modern industrial zones should be planned as low-carbon zones. Overall, participants agreed that long-term urban planning should involve the business, taking into account also future transformations in the industry and the respective impact on the education system and the labour market.

With respect to **digital transition,** the participants highlighted the following priorities: a) e-government, e-services for citizens and businesses; fully functional e-administration; b) training and skills building programmes for new digital future, which can be implemented jointly by the business and academia. Cybersecurity and building a resilient digital infrastructure was mentioned as an important priority as well. Concerning **youth employment and entrepreneurship,** the participants proposed to focus on developing digital/hybrid learning models, which can be taught outside the school. Encouraging university education in STEM, internship programmes for young people in the municipality/municipal enterprises/joint projects with municipal schools for entrepreneurship were also mentioned. According to the business, the pandemic has stressed the need to support young doctors/medical specialists, esp. those willing to work in municipal hospitals (e.g., through tax deductions, housing allowances, etc.). Holding annual meetings business-academia to define priorities in the labour market on the territory of the city are also recommended.

According to the focus group, in order for the priorities to be achieved, **several transformations are needed: a)** the management and implementation of policies has to change, by including more actively the business and other stakeholders through consultative/advisory bodies; **b)** more private-public partnerships and regular meetings between the local business and local government could facilitate uptake of innovations in all spheres of public life; **c**) increased funding for business-led initiatives in support of policy objectives was ranked third in importance.

Regarding the RRI-AIRR dimensions, the opinions of the focus group were as follows**.**

- **Public engagement** is important to utilise the expertise of the business (and other stakeholders) on various topics; it is a way to address better the needs of citizens and to motivate them to participate in public projects. Citizens need to know how public money is spent; lack of transparency increases the perception of

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corruption which impacts negatively the process of transformation. Therefore, informing and engaging the public increases citizens' trust in the administration. There were also negative opinions, arguing that the administration "does not care" what the public thinks.

- With respect to **gender equality** the respondents' opinion coincides with that of the other groups: it does not seem to be an issue in Bulgaria and it is not a barrier to strategic transformation. That said, it is necessary to respect diversity and differences between genders and generations.
- **Science education** is considered very important, esp. for research and innovation in high tech fields. According to participants, there is direct correlation between science education and the levels of innovation, the number of young people starting careers in science/academia. Science education and better awareness of scientific breakthroughs implies capacity to adequately assess future needs and priorities, and making informed decisions and quality input to policymaking. The focus group participants also emphasised the need for scientists and researchers to communicate more effectively their work to the public; businesses need to have R&I units, and so does the administration.
- Concerning **ethics** most respondents understand it as prevention of corruption and basis for responsible, accountable, transparent governance. Ethics means professional responsibility; it is foundational for a fair businesses environment and well-functioning public administration.
- **Open access:** for the participants, open access and open data are drivers of collaboration, sharing of knowledge, transfer of ideas and good practices among actors of the research and innovation ecosystem. Open access enables experimentation and drives forth scientific progress; at the same time, innovative commercial products have to be protected by IPR. The municipality could negotiate with the business which data are open access and can be used for designing new public services.

With regard to **AIRR** dimensions, according to the participants **anticipatory** governance is most important for successful policy making; **responsiveness** was ranked second; followed by inclusiveness and reflexivity. In their opinion, the municipal administration has the least capacity for anticipatory governance; inclusiveness is also a weak aspect of the administration's work; responsiveness and reflexivity were assessed as relatively well integrated in policymaking. In this respect, local government can learn a lot from the business: for example, by adopting idea generation models, flexible management practices, being more focused on the client's needs, adapting more quickly to new circumstances, better management of financial capital and public expenditures.

Participants also discussed the **roles of the quadruple helix partners** (science and research, business, NGOs, policymakers) for the integration of RRI-AIRR in territorial governance.

- **Science/academia** are primarily responsible for providing knowledge-based input relevant to policymaking in key urban systems (health care, social services, digital transition). The scientific community however needs to open up more and collaborate with the other stakeholders. Science leads the way into the future, creates the vision for the city to follow.
- **The business**, on the other hand, produces know-how, knowledge, services, and products, and much of the revenue in the municipal budget – therefore it has the right to monitor how money is spent. In the process of transformation, businesses can sponsor the implementation of certain policy priorities, in collaboration with academia and NGOs. The business can also drive forward experimentation, by being early adopters and innovators. Many joint projects can be carried out through private-public partnerships.
- When it comes to the role of the **civic sector**, NGOs are mostly seen as an intermediary between citizens and the administration; they can facilitate public engagement and ensure inclusiveness, esp. of vulnerable groups or groups with special needs. Secondly, NGOs play a key role for **monitoring, control of implementation, and assessment** of policymaking and implementation.
- As concerns **public bodies and local government**, they were unanimously identified as the leaders of transformation: from launching public debates on which digital technologies and innovations are most needed to society, to creating a favourable environment for research and innovation through an enabling regulatory, financial, and communication framework. Responsible leadership is the key to building a vision for the city and achieving it.

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The recommendations of the group on **how to integrate RRI-AIRR in the four policy areas** largely repeat those made by the other focus groups. Emphasis was placed on regularly consulting with citizens and stakeholders on defining policy priorities and their implementation; carrying out joint projects and collaborative actions; using digital platforms for collaboration and communication, etc. Specific recommendations dealt with providing tax reliefs or other incentives to innovative businesses on the territory of the city; incentives for businesses investing in young people and programs for retaining local talent; creating and nurturing a well-networked ecosystem of innovators; promoting local services and products which improve the well-being of people and the living environment in the city.

3.7 Conclusions and policy recommendations

This report presents the findings of the RRI territorial audit for Sofia Municipality. Based on document analysis, semi-structured interviews and focus groups with more than 80 representatives of the quadruple-helix partners in Sofia, review of the institutional and policy framework in the four policy areas (*support for innovation, digital transition and new skills, sustainable urban development, youth employment and entrepreneurship*), the report gives an overall positive assessment of the extent to which an RRI-AIRR framework is integrated in policymaking and implementation. The audit has clearly shown that embedding RRI principles into territorial development policies and urban planning tools is not a one-way and linear process, but requires careful orchestration of the trajectories of multiple actors and governance levels. Specific recommendations, derived from the analytical studies and the focus groups are formulated to aid local authorities in the process.

While the municipal administration is yet to take full advantage of RRI-AIRR in order to address the complexity of the interplay between science and society, especially as it affects territorial development, many of the local stakeholders involved have strong experience and are willing to share it with the city. As evidenced by the focus group discussions, purposefully or not, some municipal units have already adopted planning instruments that incorporate RRI, generating effects on the urban level. Cases linked to the implementation of the smart specialisation strategy of Sofia, the digital transition strategy, and individual city-level projects, reveal a number of elements that are sustainable, open, inclusive, anticipative and responsive in the city strategic planning (such as public engagement, open access/open data, gender aspects). In those cases administrative codes of practice, internal guidelines, organisational and functional structures are also in place. Open access has been promoted as a core mission by all stakeholders, and it is recognised as the main driver – but also a prerequisite – of open science and open innovation practices. The audit indicates that ethics, RRI governance and science education are dimensions that can be included in the policy instruments.

Results of the focus groups and document analysis provide the municipal authorities with a baseline to improve the integration of the RRI-AIRR approach in their commitments to develop self-sustaining research and innovation ecosystems, which can successfully address societal challenges for a common benefit. For most of the experts and stakeholders involved, RRI emerges as a potentially effective solution to ensure smart, sustainable and inclusive growth in a post-COVID society, a chance to restore the public confidence in science and innovation, and a novel way for policy-makers to argue the case for responsible, anticipatory, transparent governance.

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The following recommendations are formulated based on the document analysis, interviews and focus groups. The **first group** of recommendations concern the institutional framework and collaboration among stakeholders; the **second group** includes recommendations for each policy area.

Group 1 Recommendations on institutional framework and stakeholder collaboration

1. Including RRI and science-based policymaking in the organisational standards and practices following a whole-administration approach. If this does not happen, RRI and AIRR reduce their transformative capacity, becoming, so to say, only a tick-in-a-box procedure. Hence the importance to adopt a mainstreaming approach, i.e., an approach which considers RRI and AIRR as a framework influencing all the aspects of governance and functioning of the municipal administration (procedures, structures, norms, culture, motivations) as well as all its functions (e.g., strategic planning, investment, etc.)
2. Organising innovation**.** The municipality has to pay a structural attention to innovation, so that the results of research can be integrated into existing administrative units and policies. This can be done by setting up a municipal-wide R&I team or a team that is distributed across different management boards.
3. Strengthening city research capacity: Developing urban regional research ecologies that interact, reflect and act together is necessary for handling the emerging accelerating and accumulating crises. Ensure good structural and administrative support for stakeholder collaborations so they can survive partisan politics shifts.
4. Including evaluative measures into the governance framework: specific metrics and indicators adaptable to the specific conditions in which the RRI-AIRR framework is used should be integrated. Evaluation criteria should be set in line with the aims and objectives of the specific policy.
5. Rethink and redefine principles of gender equality, taking into account various gender dimensions of policy impact, generational differences, minority groups, intersectional discrimination, etc.

Group 2 Policy-specific recommendations

Policy area SUPPORT FOR INNOVATION

1. Recognising the potential of civil society to co-create innovative solutions to urban challenges and contribute to the construction of public policies in all levels of territorial government.
2. Developing new knowledge and tech transfer processes (municipal incubator, pre-commercial procurement) that enable civic players, young people, citizens, local start-up and SMEs to become promoters of new solutions to societal goals.
3. Financial instruments should allow more space for research that is relevant to local challenges. Also, having a single point of contact for research cooperation in local government can contribute to more effective collaboration between academia and public bodies.
4. Developing new public procurement procedures (incl. such for pre-commercial procurement) which include RRI keys and AIRR dimensions and facilitate uptake of innovation results in urban systems.

Policy area YOUTH EMPLOYMENT AND ENTREPRENEURSHIP

1. Students as representatives of future generations not only change city life, they also have a deep impact on research and innovation. To make sure that new generations can enter into this ecology and contribute with their specific engagement and expertise, the city needs to offer new programs for employment and internship. The participation of students and young people in the urban research ecology is fundamental for preparing the city and the next generation for the changes they will face.
2. Transforming the city into an open learning environment and encourage student-led experimentation through living labs and co-creation formats.
3. Developing flexible programs with academia & business to recognise skills and competencies acquired from informal/non-formal learning, in order to retain local talent.

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Policy area SUSTAINABLE URBAN DEVELOPMENT

1. The city administration should put more emphasis on innovation and experimentation, including by building an adequate administrative system for organising and governing the innovation process.
2. Enable (through facilities and funding) collaborations between research, industry and NGOs and build living labs as a space for co-creation, incubation, acceleration of local economy solutions, offering neighbourhood-based community-owned services and infrastructure.
3. Transform the city itself into an experimentation "playground", promoting the interaction among citizens, policymakers, researchers and experts in-field to explore and tackle together key societal challenges. Citizens can become the vehicle for design, approval and validation of solutions and good practices that are transformed into concrete policies.
4. Initiate own/support external projects in fields linked to the policy areas to take advantage of available EU funding for urban development.

Policy area DIGITAL SKILLS

1. Continue the implementation of the municipal Digital Transition Strategy for Sofia.
2. Initiate and coordinate digital transformation policies, to reduce the administrative burden, to develop and implement e-services for the citizens and businesses in Sofia, open data platforms and smart city projects.
3. Include young people, NGOs and start-ups in the process of training/reskilling/upskilling of people from various ages.
4. Promote business models (and public-private partnerships) that can sustain the digital transition of the city in public services.
5. Prioritise local business/technology sectors for funding (through Municipal Guarantee Fund, SofiaInvest, etc.) to achieve policy objectives.

3.8 References

Innovative Sofia (2020). *Digital Transformation Strategy for Sofia*. https://innovativesofia.bg/wp-content/uploads/2020/06/Digital-Transformation-Strategy-for-Sofia-Final-accepted-ENG.pdf

Sofia Municipal Council (2016). *Innovation Strategy for Smart Specialisation of Sofia*. https://www.sofia.bg/documents/20182/448750/ISIS_Sofia.pdf/f51fcd5a-2973-4679-89fe-62b3dccb6662

Sofia Municipal Council (2016). *Sofia Youth Strategy 2017-2027.* https://www.sofia.bg/documents/20182/448750/Strategy_young_people-SO-2017-2027.pdf/8186ee54-8135-42e0-bfa2-17dd2b281742 (in Bulgarian)

SofiaPlan (2017). *Vision for Sofia 2050.* https://vizia.sofia.bg/vision-sofia-2050/

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Chapter 4: RRI Audit Report of Thalwil

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Summary

The energy turnaround and the achievement of net-zero CO_2 consumption is an important goal for the municipality of Thalwil. To achieve this goal at the municipal level, several issues need to be addressed, such as supplying the building stock with renewable energy sources, the conversion of the vehicle fleet to climate-neutral, the development of new funding sources and resources for this energy transition, the reduction of the personal carbon footprint of residents to nearly 0t CO_2 eq. per capita (net-zero) by 2050, and the improvement of the analysis and monitoring of energy balances. Several prerequisites must be fulfilled to meet these challenges, including a continuous exchange between the various community members and a broad public securing and communication of the goals and necessary implementation measures.

The Responsible Research and Innovation (RRI) approach is used to analyse the integration of sustainable development into innovation processes and identify both weaknesses and strengths. The RRI approach combines so-called RRI keys (ethics, public engagement, gender equality, open access, and science education) with AIRR dimensions (anticipation, inclusion, reflexivity, and responsiveness). It is continuously applied by researchers and practitioners to analyse innovation processes in different fields (see EU projects in the EU horizon cycle 2010-2020, for example, in climate change, digitalisation, and coal phase-out). As part of the ongoing three-year EU project RRI-LEADERS (Jan. 2021 – Dec. 2023), the Zurich University of Applied Sciences (ZHAW), and the Municipality of Thalwil are carrying out a series of measures to determine the embeddedness and significance of RRI keys and AIRR dimensions in the context of energy transition in Thalwil. Early in the year, interviews and focus groups were conducted with stakeholders from the Quadruple Helix (research and development, business, policy, and civil society). In addition, a comprehensive document analysis of the laws and ordinances relating to the energy transition in Thalwil was carried out, the results of which were discussed in depth at a workshop in summer 2021 with the stakeholders mentioned above.

The results of these steps provide an initial insight into the status quo of energy transition against the background of the RRI-AIRR approach. The results are reflected in the “Synthesis” chapter and then further processed in the analyses of strengths, weaknesses, opportunities, and threats (SWOT)[11] and threats, opportunities, weaknesses, and strengths (TOWS)[12]. This report follows with a description of the methodology, a synthesis, stakeholder mapping, SWOT and TOWS analyses, focus groups and policy recommendations and conclusions.

Preliminary results suggest that certain AIRR dimensions, such as anticipation in the form of forward-looking leadership, are already firmly embedded in policymaking, but that there is still room for improvement

[11] SWOT analysis is a strategic planning tool. It is used for positioning and strategy development of companies and other organisations as well as in personnel and management development.

[12] The TOWS matrix is derived from the results of the SWOT analysis and is used to derive meaningful strategic approaches from the internal and external factors previously identified.

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concerning other AIRR dimensions, such as inclusion (i.e. collaboration between representatives from business, government, civil society, and R&D) and reflexivity (i.e. evaluation of achieved goals).The chapter on TOWS offers specific recommendations for future action.

4.1 Introduction

This RRI Audit Interim Report by the municipality of Thalwil is based on research conducted between January and September 2021 as part of RRI-LEADERS project (duration 2021–2023), funded by the Horizon 2020 Programme. This included an intensive document analysis as well as interviews and focus groups with representatives of civil society, politicians and decision-makers, business people, and scientists dealing with urban and spatial development and energy transition.

The report provides an overview of the establishment of the RRI-AIRR approach in the municipal energy transition process and the status of energy transition in Thalwil. The concept of RRI has gained attention in recent years, both among policymakers and in academia. The model defines RRI keys, namely ethics, public engagement, gender equality, open access to data and scientific knowledge, and science education – understood as levers for implementing innovation topics. The RRI model, which is based on five guiding keys, is complemented by the AIRR dimensions (anticipation, inclusion, reflexivity, and responsiveness), representing the prerequisites for a sustainable innovation policy.

The basic assumption is that the energy transition can be driven forward based on technological and social innovation. However, broad support from various players is required to implement new technologies in energy transition sustainably and in the long term. In particular, the scientific RRI approach makes it possible to consider innovations against the background of the interests of various stakeholders (a detailed list is provided below) along the quadruple helix, who are new to the implementation of the energy transition in the municipality. The results of the following analyses show that most of the RRI guiding principles are considered beneficial for future measures in the energy sector (i.e. in the areas of mobility and housing).

The information used to prepare this report was collected in several stages. First, a semi-structured questionnaire was developed in the spring of 2021. Subsequently, 19 interviews were conducted to investigate the state of embeddedness of the RRI-AIRR approach among selected parties from research, politics, business, and civil society organisations in the context of energy transition in Thalwil. A subsequent focus group led by ZHAW validated the findings from the interviews with other Thalwil stakeholders from the groups mentioned above. The results will be used later in the research project to identify best practices and gaps, barriers, and measures based on them and provide policymakers with recommendations for energy transition in Thalwil based on the RRI-AIRR approach.

In the second stage, a comprehensive document analysis was conducted in the early summer of 2021. Specifically, the document analysis of communal, cantonal, and national laws and ordinances (including the Zurich Cantonal Structure Plan, legislative goals of the municipality of Thalwil (2018–2022)[13], communal

[13]At the end of September 2018, with the support of the community service center managers, the Municipal Council set out a series of 12 legislative objectives and priorities for the next four years, which are set out in this document. The legislative goals concern important strategic projects in connection with overriding requirements that the municipality must meet (e.g. CO_2 reduction).

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structure plan (28 October 2015)[14], communal energy plan[15] (2015, October) was carried out with the aim of better understanding the prerequisites of the energy transition in Thalwil against the background of RRI in depth. Followed by a workshop with representatives of the Municipality of Thalwil, the status of RRI integration in municipal and cantonal ordinances and legislative texts was further discussed. This also served to identify further resources, measures, and recommendations for action in Thalwil beyond the initial step and bring the various players to the discussion table.

These analysis findings were discussed again in a participatory workshop in July 2021, focusing on a more robust integration of RRI in the measures and administrative interpretation. A total of 15 stakeholders shared their knowledge on key areas of Thalwil's climate and energy policy and listened to a keynote speech on net-zero strategies in the neighbouring city of Zurich. They discussed the five thematic RRI keys and the AIRR dimensions relevant to improving Thalwil's climate and energy policy and specific measures that could be implemented to achieve the defined municipal policy goals. The aim was to synthesise specific fields of action for the energy transition and further implement RRI-AIRR in energy transition based on the document analysis findings and the focus groups from November 2021.

4.2 Policy area

Since 1998, Thalwil has been striving for environmentally and socially compatible development, and in the last twenty years, sustainability has become a major political issue. Following the adoption of "Agenda 21", the Municipal Council set up a steering group to support sustainable strategies. As a result, sustainability is a firmly established goal for Thalwil and is being addressed through targeted measures. The energy transition seeks to reduce the personal carbon footprint of residents and the municipality as a whole. Energy transition in Thalwil and the role of the RRI-AIRR approach in municipal policy are, therefore, the political focus of the municipality.

Local authorities can make a valuable contribution to energy transition. Long-term reduction of energy consumption by private and commercial consumers to net-zero CO_2, in particular through appropriate measures, is the goal of scientists and politicians alike, and to achieve this, steps must be taken at various levels. Structural elements and regulations that influence consumer lifestyle and actions (e.g., choice of electricity and heat supplier, waste management, land use, and construction) and environmental education and awareness-raising measures can be managed at the municipal level.

[14] The **municipal structure plan** for Thalwil consists of several sub-structure plans: settlement, landscape, transport, infrastructure, and public buildings and facilities. Thalwil is committed to sustainability and strives to achieve a balance between economic, ecological, and social aspects in its decision-making. The structure plan is a good long-term management tool for the municipality. The municipal structure plan was first introduced in 1997 and is revised every 15 to 20 years. As a rule, existing targets are further developed, and new targets introduced where necessary. Implementation focuses on devising options and realising sustainable solutions. The topics addressed in the sub-areas of the plan (e.g., building, mobility, and transport planning) include the development of concrete strategies taking into account economic and environmental sustainability.

[15] The **municipal energy plan** analysed the local heat supply and existing energy potential. The energy targets were adapted to the current energy policy guidelines and overarching goals and supplemented by an implementable catalogue of measures. The general objectives are an economical and environmentally friendly heat supply for the local building stock as well as a significant reduction of greenhouse gas emissions through an increased use of environmental heat and renewable energies. The main objective of the document is therefore to examine Thalwil's heat supply and the associated CO_2 emissions. The municipal energy plan is based on the requirements of the energy policy of the Canton of Zurich and on the guidelines of the above-mentioned "Energy City" label and was drawn up with the help of a group of energy experts from the fields of politics, society, research, and business.

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The RRI-AIRR approach, which takes equal account of the various parties and focuses on the governance element (i.e., political action), is a useful tool for analysing the multiple interests, obstacles, and drivers of local energy policy. Measures at the local level require mainstream support – especially in a direct democracy such as Switzerland – if they are to be successful in the long term. In other words, political activities need to be devised and planned as carefully as possible against the background of social processes, which requires forward-looking and long-term planning, classification, and consideration of the needs of the various players involved in the political process. With the RRI-AIRR approach, it is possible to analyse these.

As part of the mission statement and embeddedness in the municipality's legislative goals for 2018–2022, sustainable development has become a principal component of Thalwil's political instruments. The municipality expects that the RRI-LEADERS project will help to accelerate the energy transition, change the energy market, and make Thalwil a leader in renewable energy and sustainability. Raising public awareness of this sustainable energy policy is as important as introducing successful measures to implement the envisaged energy transition. The following core goals could be discussed and implemented:

- **Development of a financing instrument until 2025** for financing the municipal energy transition.
- **Building stock across the municipality.** Priority for renewable energy for municipal building stock[16] by 2050.
- **Buildings of the entire municipality/area**. In municipal buildings, a thermal energy demand reduction of 30% by 2035.
- **Municipally owned buildings.** In municipal buildings, a specific energy consumption reduction of 20 % (incl. hot water) and a share of renewable energies of 75 % (incl. hot water) by 2035.
- **Total vehicle fleet registered in Thalwil.** Climate-neutral fleet (biogas, electric or hydrogen drive) of the municipality by 2050.
- **Personal carbon footprint (direct and indirect emissions) of all town residents**: almost 0 t CO_2 eq. per capita (net-zero) by 2050.
- **Analysis and reporting of all energy and CO_2 flows** at the territorial level by 2030.
- **Territorial consumption**. A high degree of circularity for disposable consumer goods by 2030.
- **Utilities.** Biogas share of 30 % (from 20 % today) of total Gas Wasser Thalwil sales by 2030
- **Role-model function**. Strengthening the exemplary function of the Thalwil administration through specific measures.
- **Public engagement.** Improved participation/public engagement by all community residents and improved visibility of energy measures.

Important challenges in connection with the energy transition

Population growth requires more energy in heating and electricity: In 2020, the population numbered 18,263 and will grow by 1 per cent per year, with 29.6 per cent of the population being non-Swiss passport holders. The population density is 3,300 persons per km^2, and the average age is 42.9 years. While the age structure is comparable to that of the Canton of Zurich, the population density exceeds the cantonal average by a factor of three.

Promoting resident participation in the energy transition: The inclusion of all residents is an essential building block for a long-term development towards more sustainability and the reduction of energy consumption in Thalwil. The goal is to adopt and support, for example, new mobility concepts, technological innovations or, in general, tax and financial concepts that provide funds for sustainable investment.

[16] Municipal building stock is understood to include all buildings located in the municipal area.

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Attractive solutions for the energy transition against the background of the topography and the proximity to the Zurich conurbation:

- **Urban Planning.** This results in urban planning tasks (e.g., structuring new settlement areas so that the interests of the various population groups can be well negotiated against the backdrop of the energy transition) and the preservation of existing green spaces against the backdrop of increasing energy demand.
- **Sustainable Energy Sources.** Further expansion of solar energy, lake water, geothermal energy, waste heat (ARA), wood, and biogas.
- **Mobility.** Here, requirements arise that go beyond existing shared-bike concepts and e-mobility (creation of charging stations) and create opportunities for senior citizens. But mobility services are also essential for younger and especially working people in the community and contribute to its attractiveness. Since the municipality is in the Zurich city commuter belt and there is a high demand for mobility services, the reduction of greenhouse gases caused by the use of fossil fuels in Thalwil (incl. mobility) and their replacement by renewable energies is an important goal for almost all political parties.

Involvement of multiple stakeholders in energy transition, including entrepreneurship and industry. Over 90 per cent of the 1,300 predominantly small and medium-sized enterprises belong to the tertiary sector (services). Existing companies in the urban area must be encouraged to support the energy transition more strongly and take measures to drive forward the net-zero target in the corporate sector. In the long term, the location could retain its attractiveness as an innovative location for existing companies as well as attracting new ones.

Evaluating and creating further visibility through certification with the "Energy City" Gold Label[17]. Since 2010, Thalwil has been one of the "energy cities" – a European Energy Award programme label[18]. Together with the surrounding communities, Thalwil is actively committed to energy transition. One goal of the municipality is to reach the next certification level (i.e., gold) and thus prove that sustainability is actively practised in the municipality and that energy transition is being driven forward .

Key considerations for the transformative perspectives/political and social transformation process in the process of energy transition.

a. On a personal/individual level, the awareness of municipality residents needs to be changed so that action can be taken.
b. Additional funding must be generated (the budget must be approved by the municipal council or by the municipal assembly)

[17]An energy city is a municipality that is continuously committed to the efficient use of energy, climate protection, and renewable energies as well as to environmentally compatible mobility. The "Energy City" label is awarded every four years by the supporting association. Together with an accredited energy city consultant, an initial inventory with potential analysis is carried out. Based on this analysis, the municipality defines specific and tailor-made energy and climate policy measures for the following four years in a programme of activities. As soon as 50% of the possible measures have been implemented, the municipality can apply for a review by the independent label commission of the Energy City Association. For more information, visit https://www.local-energy.swiss/dam/jcr:0b72fbeb-4b5f-4369-b884-d5b6a3c0d6b2/Einfuehrung_Label_Energiestadt__August_2016_.pdf.

[18] Energy City Switzerland. Retrieved from https://energy-cities.eu/vision-mission/

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4.3 Synthesis of experiences related to RRI-AIRR

Anticipation

Anticipation is seen as an opportunity at the municipal level to address the future challenges of climate change proactively. Such perspectives on anticipatory leadership focus on the adaptability of organisational planning systems. The goal is to reduce future risk by strategically shaping political action to minimise risky scenarios and avoid destabilising developments.

During the project work, it has become clear that the people of Thalwil consider anticipatory governance at the community level to be a fundamental building block for implementing the energy transition. First, consistently anticipatory governance at the municipal (political) level not only helps mitigate the urgency of the energy transition and counteract the damage of climate change but also helps to reduce the costs incurred in the future (e.g. heating costs) in the long term. For example, the longer conventional parking spaces are created, the higher the cost for their subsequent conversion to e-mobility. Second, anticipatory governance rooted in local politics and governance helps develop sustainable solutions for populations that are difficult to implement at the individual level, for example, by planning the heating network for an entire neighbourhood years before the current system reaches the end of its life cycle. For example, suppose it becomes apparent that all heating systems in a neighbourhood will have to be replaced in the near future due to their expiring service life; in that case, the municipality can develop a concept for replacing the systems in advance. Third, it has been shown that anticipatory governance is crucial when promoting the participation of the population in political processes at an early stage; anticipatory governance promotes exchange between politics, business, and civil society by ensuring transparency and a voice in decision-making.

Representatives of the business community also cite anticipatory governance as an element of their internal organisational structure, as well as for the energy transition at the municipal level. As a key management principle for their companies in terms of risk assessment of internal decisions and practices (in the areas of purchasing, sales, consumer needs, and corporate responsibility), anticipatory governance helps to establish long-term processes. At the municipal level, this type of leadership allows companies to support energy transition by changing their business models over the long term to continue to profit while advancing the municipality's energy goals.

Concerning the energy transition, anticipation is structurally embedded in energy transition at various levels. On the one hand, advisory commissions were set up at the municipal level some time ago ("Energy Project Commission" and "Sustainability Steering Group"), which are regularly consulted on decisions by the Municipal Council. Further examples of the structural embedding of anticipation can be found in the further-analysed documents. For example, the *Kantonaler Richtplan Zürich (2019)* discusses both guidelines and measures based on future scenarios, a growing population, and new technologies. Such scenarios substantiate future energy consumption. Anticipation as a management tool means that costly, ecologically, and aesthetically unsatisfactory object protection measures do not arise. At the level of the municipality, a structure plan is drawn up that serves to coordinate spatial activities. In the spirit of forward-looking leadership, current and planned projects are coordinated, and their objectives are binding for all authorities.

Integration/inclusion

Thalwil respondents believe that inclusion is an essential guiding principle of energy transition planning in the national and municipal context. By inclusion, they understand the equal involvement of different stakeholders, including specialist and resident panels with their diverse interests. Since energy transition affects all levels of society, any measures must always be considered against the background of different interests to secure broad support in the long term. This is particularly important in Switzerland, as the political process often requires a

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public referendum (e.g. the "Thalwil Climate Initiative"). If a key stakeholder has been overlooked in the past, the likelihood of a project failing increases, especially in energy transition.

On the legal level, there are several indications of a desire to establish the guiding principle of "inclusion" in the laws relevant to energy transition in Thalwil. For example, promoting approaches can be found in the Canton of Zurich's Structure Plan (2019). In the case of mobility, efforts are being made to identify the needs of motorised transport and cyclists strategically and to network the various modes of transport to reduce motorised mobility gradually. In particular, the reduction of motorised traffic leads to energy savings. In addition, the Cantonal Structure Plan provides a coordinated network of footpaths and cycle paths across the municipalities, including historical traffic routes and wheelchair-accessible paths. The community's explicit legislative goals for 2018–2022 ensure that the diverse perspectives of a wide range of community stakeholders are being considered.

From the perspective of civil society, the local government must also involve those who can play a significant role in energy issues but who have little influence at the political level in shaping the energy transition (e.g. homeowners). This also includes creating communication channels to reach a broader section of the population in Thalwil and to anticipate their concerns. While various measures were discussed during the focus groups, it became clear that there is already some experience in organising events to strengthen commitment to energy transition in the community, for example, at the annual "energy aperitif" organised by the Ökopolis Association, when the people of Thalwil regularly exchange views on sustainability issues over a glass of wine. However, it is anticipated that more ideas of this kind will be developed and encouraged. This would be an important signal to focus on and represent the whole community by including residents who identify with the energy issue. Another way to strengthen inclusion would be to pay more attention to the different compositions (age, gender, level of education, etc.) when organising future public events. There are already good examples from Thalwil, such as the "Science et Cité"[19] discussion group, where strict attention is paid to a level playing field in terms of age and gender representation.

Inclusion at the community level is an essential key to the energy transition in Thalwil, requiring a more robust establishment of the issue at all levels, including business and civil society.

Reflexivity

Political respondents understand reflexivity as the need to integrate evaluation processes into the energy transition. While many measures are often adopted and implemented, there has only recently been a discussion on how the implementation processes can be included in a long-term learning and evaluation cycle. Support for a structural rooting of reflexivity was also found in dialogue with civil society stakeholders who consider reflexivity a learning process relevant for the energy transition in Thalwil. With a view to the region and the canton, there are many pilot projects (e.g. spatial planning, mobility, and housing) and a greater reflection on success factors. At the same time, the networking possibilities of ongoing processes are – according to the interviewees – increasingly oriented towards energy transition.

One facet of this guiding principle is measurability, which is particularly important for energy transition at the municipal level because many things are only tangible once they can be measured. Examples of the structural embedding of the issues in Thalwil are planning and evaluating measures and goals using a balanced scorecard approach (overview of all goals and rating them using a traffic light system). The "Energy City" label also makes energy transition and the implementation of specific actions measurable over time through regular audits. Unfortunately, there is no direct access to data that makes individual aspects of the energy transition visible (e.g. a "water status report") to all residents. The better-informed people are (such as through local government channels), the better the implementation works because residents will begin to think and act together.

[19]For more information, see https://www.science-et-cite.ch/en/

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Researchers also underlined the role of structurally established reflexivity as part of any research process, helping to make research findings transparent and mistakes and lessons visible to third parties. Stronger embeddedness of reflection possibilities – through the definition of indicators and targets – should be structurally anchored and established before implementation. The extent to which the existing sustainability commission in Thalwil could also be activated for this purpose should be discussed further. In particular, transparent communication of the results of reflection processes also gives residents "control" since political action can be critically questioned/validated by the public/other stakeholders. This should also help shape social change towards sustainability.

Reactivity/responsiveness

Part of the RRI-AIRR approach is also to examine the role of responsiveness as one of the four key dimensions. Responsiveness is defined as using the collective process of reflexivity to both set direction and influence the further course and pace of innovation through effective mechanisms of participatory and anticipatory governance (Stilgoe et al., 2013).

In the spirit of a responsible municipality, Thalwil began promoting sustainable development in different ways as early as 1998 (e.g. energy consumption and environmental education). Two of the twelve legislative goals of the municipality (2018–2022) address the topic of sustainable development, more specifically regarding energy transition in Thalwil, with the long-term net-zero target. This leads to long-term planning and an assumption of responsibility already being applied to the energy transition. Article 10, for example, describes the objective of a general reduction in greenhouse gas emissions, the continuous development of renewable energies, and efforts to keep the "Energy City" label. Other signals for the guiding principle of responsiveness can also be found at the level of the Municipal Structure Plan (2015). This aims to ensure that new open spaces in the settlement area improve residents' quality of life and that care services for the sick and elderly are further expanded. To make compliance and the success of such measures visible, control systems such as the monitoring of several criteria must be established.

The setting, implementing, and evaluating of long-term goals supported by the entire community are a sign of responsiveness. The municipality's target is an energy reduction of 30% and a reduction in the use of fossil fuels to 55% by 2035 (Municipal Council Resolution, 2014). Concerning energy transition, the energy plan in Thalwil is quite specific. In the spirit of responsible leadership, it also discusses recommendations for measures, such as ambient heat, geothermal energy, solar energy, and natural gas. The document contains clear energy targets, which are to be achieved through further measures yet to be developed. The municipality has identified the reduction of energy consumption through building renovations as one of the most critical aspects, and the further expansion of heating networks is also possible (in Thalwil, 38% of heat is still generated by oil). This requires building renovations and heating conversions in both the residential and commercial sectors.

A change process such as energy transition requires measures that can only be implemented through smaller or larger actions over time. These must consider several factors (including scientific findings, cantonal and national requirements, and socio-economic interests), and the options for action differ. For example, civil society can exert an influence, for example, by organising itself into associations, voting in elections, exerting pressure on politicians, and fostering popular support (e.g. the "Thalwil Climate Initiative"[20]). From the perspective of civil society, greater leverage in energy transition can be achieved at the municipal level if the authorities/politicians are sensitive to the needs of protagonists from the outset – ideally by leading the way (e.g. in heating networks or spatial planning).

[20] For more information, see https://www.thalwilerklimainitiative.ch

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Possibilities of an evaluation commission for energy projects were suggested to extend the teaching cycles. Consequently, if an action was not feasible as planned or did not have the desired effect, it would be vital to analyse/reflect on what did not work well and how to correct it. Policy makers in the focus group also discussed how to make these processes more dynamic, given the importance of responding to changing resident needs within the legislature, such as the changing energy supply needs of the population (electricity prices and demand). The decision-makers interviewed also mentioned this aspect from the corporate world as a decisive factor, which is also adopted in business models to remain attractive to customers (e.g. supply and demand for ecological products on the electricity market). The extent to which responsible leadership must be expanded and structurally rooted in administration is an essential factor in supporting Thalwil's energy transition.

Public engagement

The success of the energy transition and achievement of the net-zero CO_2 target in a municipality such as Thalwil depends primarily on the actions of residents. This was frequently highlighted in both the focus groups and interviews. Therefore, the goal must be to gain broad public support for the energy transition. In Thalwil, various events have been held in recent years to publicise energy transition, and as described above, through educational activities. These activities aim to increase public awareness and commitment to environmental issues and encourage people in the private and public sectors to act responsibly.

However, the understanding of public engagement within the RRI approach is that it should also include exchanges between researchers, policymakers, industry and civil society organisations, NGOs, and the public. This can manifest itself in open panels, opinion polls, and organised resident forums to identify solutions, accelerate the energy transition, and achieve net-zero CO_2 consumption.

However, some people are particularly active in this area and talk with local politicians and the local population. In particular, the Ökopolis Association[21] is a reliable energy transition partner in Thalwil, active in state-school education, and closely linked to the Sustainability Commission (and therefore with political decision-makers). The Association has also organised events to bring together different stakeholders to discuss energy issues at an "energy roundtable" or World Café.

Industry representatives consider public engagement with the energy transition in Thalwil to be necessary, although they are not yet very active in this area themselves. Energy companies also view greater public involvement as an opportunity to transfer know-how from the outside to the inside, sense needs, and maintain contact with the customer. Companies believe there are further opportunities for synergies here, but there is often a lack of motivation among the population. Civil society assumes that local politicians must take more responsibility for promoting public involvement by bringing different parties to the table through panels and events and creating channels to reach everyone. All the stakeholder groups interviewed agreed that the broader the support, the more can be achieved for energy transition in Thalwil. At the same time, it became clear in discussions that there is no consensus about which stakeholder groups should be responsible for generating more widespread interest. Although reference was made to political decision-makers in this context, party-political backgrounds mean that they are still at odds over the implementation and pace of the energy transition, and in turn, often refer back to the interests of business and civil society.

Open access

In the context of the RRI approach, open access means that research results and data relating to the planning of the energy transition in Thalwil should be available to interested parties free of charge. Furthermore, open access to the findings of publicly funded research in the form of energy data contributes to better and more efficient science and innovation in the public and private sectors. The results are structured as follows:

[21] For more information, see https://www.oekopolis.ch

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Business sector: Open access in the classical sense, namely "free access to research findings", is not relevant in the local industry's energy sector. However, open access is relevant for some industry players at the cantonal level if they do not want to miss opportunities in the strategic and innovative field. A significant obstacle in the energy sector for local companies in general is access to energy data (heating, electricity, etc.). Access to such data is often fundamental to a small energy cooperative or energy planner in Thalwil. However, the data is not accessible – or only with difficulty – and in some cases is not accessible or only in aggregated form.

C*ivil society* representatives in Thalwil have a different view of open access. In their opinion, they have little insight into scientific findings if they are not in the public domain. At the same time, open access is essential for them to provide argumentative support for vital initiatives (i.e. concerns that originate from the electorate and can significantly influence the legislative process at the municipal level in a bottom-up manner) and thereby make use of opportunities for political participation. From the point of view of knowledge transfer from research to society, this point is underlined, and initial approaches exist, for example, in the SwissEnergy programme[22] - a central federal platform for energy efficiency and renewable energies on which data and publications are made accessible.

As if that were not enough, data access must be expanded from the perspective of civil society players, data monitoring in the area of energy consumption (e.g. heating and solar energy) must be extended, and data located at the municipal level must also be made more easily accessible (i.e. the reduction of bureaucracy in data access must be accelerated). In the meantime, this point is already part of the Municipal Energy Plan (2015), which supports, for example, a solar register[23] to examine the suitability of individual roof surfaces and indicate their potential for solar power[24].

Transparency of data can also increase the willingness of the public and industry to contribute financially to the net-zero CO_2 target since the cost-benefit calculations for investments become more transparent for these stakeholders as well. However, this intention is point three of the municipality's legislative goals for 2018–2022. Accordingly, the digitisation and consequent accessibility of municipal administration data should be simplified and improved.

Gender equality

Gender equality is understood to mean the promotion of gender balance in decision-making. Gender equality improves the quality and social relevance of the knowledge, technology, and innovation produced. In discussion with stakeholders of the Quadruple Helix, it is apparent that there is hardly any structured approach to ensuring gender equality in the listed projects and measures for the energy transition in Thalwil. Furthermore, the stakeholders interviewed did not express the need for this. However, in the higher education sector and in companies, measures are continuously taken to ensure gender equality in the respective organisational context, including developing gender equality plans and monitoring gender relations. These often belong to the public sector and are subject to equality legislation (e.g., prevention of pay discrimination). In the SMEs surveyed, these rules often did not exist.

Overall, civil society protagonists were frequently unaware that gender equality might be of interest to the energy transition. At the same time, it was noted that the energy transition is a male-dominated area, and that discourse should be held on how women, in particular, could be more involved in the responsible bodies.

[22] Further explanations of the project can be found at https://www.bfe.admin.ch/bfe/en/home/swiss-federal-office-of-energy/the-swissenergy-programme.html

[23] Further explanations of the project can be found at https:// www.gis.thalwil.ch

[24] Interested property owners receive advice and detailed support for appropriate projects, and the Thalwil support programme provides targeted information and motivation – a good example of open access. However, awareness raising based on cost-benefit calculations and access to advice needs to be facilitated.

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Furthermore, all Thalwil residents must be involved and represented for this long-term project to be successful. However, this matter was quickly dismissed by the workshops, so there is still an awareness deficit that needs to be addressed by all parties.

Ethics

In discussions with Thalwil stakeholders, it became clear that energy transition can be understood as an ethical issue shaping a resource-conserving and environmentally conscious way of life, protecting the future and viability of other generations. Consequently, the term "ethics" is rarely used in connection with research, measures, or energy planning to achieve net CO_2 zero – but seen as a motivating factor. Here, the RRI key was perceived by interviewees and the focus groups as a central element for the energy transition in Thalwil.

Small businesses often act "to the best of their knowledge and belief" when it comes to ethical behaviour and do not have a written code of conduct, unlike larger companies with specific guidelines or similar instruments. Companies with many employees approach this issue more actively and strategically than, for example, the micro and craft enterprises often located in Thalwil. Larger companies, for example, are often obliged to give themselves relevance in terms of ethical issues, such as promoting corporate responsibility (e.g. purchasing sustainable electricity, avoiding grey emissions where possible). This also applies to companies in the public sector that social stakeholders require to prepare sustainability reports. For companies involved in the energy transition, ethical behaviour also has a credibility and reputation component since they are in the public eye.

In previous discussions with civil society and political players, it was challenging to establish anything about the procedural application of "ethics". This is because they view ethics as a motivating factor in creating a sustainable community life in harmony with the available resources. Consequently, they emphasise the motivational aspect of ethics that produces and underscores the net-zero CO_2 target. Nevertheless, some considerations seek to develop energy transition measures – particularly against the background of heterogeneous public interests – that are reflected in these measures and prevent discrimination.

While the motivational component seems understandable, against the backdrop of the term "ethics", it would be interesting to determine which social aspects are related to energy transition or can be triggered by it. Indeed, it may be possible to identify further barriers to energy transition in this way. An example of this was the summer workshop, which sparked a debate about social justice since energy transition could have financial implications for some people and potentially increase social segregation.

Science education

The range of opinions from the original interviewees underlined the need for "science education" related to energy transition in a municipal and national context. This key factor is about making scientific knowledge related to climate change and measures against climate change more accessible to the public, thereby increasing society's appetite for innovation and enabling further research and innovation. Therefore, it is unsurprising that the issue of science education is deeply rooted in the relevant legal texts and standards for Thalwil. For example, in the current legislative period 2018–2022 the second legislative goal (Cf. Legislaturziele Gemeinde Thalwil[25]) is the sustainable development and qualification of public employees (including administrative and janitorial staff), making this issue a core task for the administration. Similarly, the eighth legislative goal promotes environmentally conscious and future-oriented thinking and action in state schools, where environmental topics

[25] Legislaturziele Gemeinde Thalwil. (2018, November 22). Legislaturziele 2018-2022. Retrieved from https://www.thalwil.ch/_docn/2311342/Legislaturziele_2018-2022_Zusammenstellung_nach_Klausur_genehmigt.pdf

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are included in the curricula. The municipality and its stakeholders (e.g. the service centre infrastructure and wider society (energy officers and the Ökopolis Association) must ensure that local and global environmental issues are addressed in the classroom. Environmental education is promoted through the programme "PUSCH - Practical Environmental Protection" and, in this way, pupils are introduced to waste and environmental protection issues from an early age.

Industry and business representatives all consider science education related to energy transition necessary, although opinions vary depending on the size of the company. Small and medium-sized enterprises take few if any active/strategic measures regarding science education either in-house or externally. Even in larger companies, external training is still rare. For example, a major energy company in the region promotes science education by running an "education fund" sponsoring professorships, projects, and other activities (thereby positioning itself as an attractive employer).

Internally, science education in large companies in the energy sector is mainly carried out by enabling and promoting the further training of employees. Interestingly, industry and business representatives would also like to see greater scientific understanding about energy transition, as outdated and inaccurate knowledge sometimes hinders progress. The scientists interviewed often feel that they cannot ensure sufficient knowledge transfer to the public because of a lack of capacity and channels; this may be a point for future discussion. Civil society protagonists consider science education to be highly relevant for the energy transition in Thalwil, and to achieve a continuation of this knowledge transfer, scientific advisory boards will be formed at a political level or through the existing follow-up steering group in Thalwil. According to statements made by civil society protagonists, science and energy education for children and adults could be intensified. In past workshops, thought had also been given to creating attractive offers and information channels for this purpose

4.4 SWOT/TOWS analysis

Table 7: SWOT analysis of Thalwil municipality

Strengths	*Weaknesses*
S1 - Strategic municipal documents typically cover time frames of ten to fifteen years, purposefully preventing legislative (4-year-terms) disruptions **(anticipation).**	W1 - Communal structures are characterised by stringent rules and regulations, with a tendency of being too rigid and slow (**responsiveness).**
S2 - Written down in the municipal code, sustainability has been considered in municipal policymaking for over 20 years. Additionally, the "Sustainability Commission" actively engages in policymaking. Municipal energy planning is covered by an "Energy Officer" and accompanied by the "Energy Project Commission" **(reflexiveness).**	W2 - Despite energy-related information being readily available, its accessibility has been criticised. For example, how many subsidies are currently available and what sort of forms are required. To some extent, this is due to the complexity of energy topics; however, it could be improved nonetheless **(open access, science education).**
S3 - Strategic policy development follows an inclusive process involving experts, commissions, politicians, and laypeople **(inclusion).**	W3 - The energy challenge affects different parts of the municipal authorities. Strengthening the internal collaboration on energy topics beyond the individual "service centres" (DLZ) could benefit energy policies in general **(AIRR).**
S4 - The "Energy City" label works inherently with many AIRR elements. With Thalwil being a certified "Energy City", AIRR has been automatically	W4 - By mobilising a few people, the low participation rate in municipal assembly meetings (often <2% of all voters) may outperform public interest **(AIRR).**

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embedded in municipal processes and decisions **(AIRR).**	
S5 - The municipality of Thalwil uses several instruments to interact with the local community: social media channels (Instagram, Facebook), website (Thalwil informs) and a monthly office hour by the Municipal President **(public engagement).**	W5 - Thalwil's tax system has attracted many wealthy people, some of whom have the primary intention to save taxes. Many of them have an international background and non-Swiss passport holders are prevented from political participation. Others may not wish to participate in the community at all **(inclusion).**
Opportunities	***Threats***
O1 - The Swiss direct-democratic system can be a catalyst in forcing faster political responses regarding the energy transition (popular communal initiatives such as the "Climate Initiative" 2020 in Thalwil). **(responsiveness)**	T1 - The Swiss direct democratic system is partially characterised by slow processes and long reaction times **(responsiveness).**
O2 - Energy science still is a "male domain". Despite any assumed stereotypes, increased participation by women could benefit the energy transition **(gender equality).**	T2 - Some homeowners have little motivation to invest into renewable energy technologies and thus may actively engage against energy policies **(inclusion).**
O3 - The current climate narrative has some alarmist elements, which may fail to address sections of the community. Besides "solving climate change", other reasons for the energy transition include energy safety, energy independence, job creation or added value, which might convince a broader political range (**AIRR**).	T3 - As an implication of the Swiss citizen legislature (militia system) communal policy making is executed by laypeople, doing politics alongside other professions. This may delay or hinder fast action in the energy challenge **(science education).**
O4 - Use synergies with existing organisations that actively engage in the energy transition debate. For example, "energieschweiz" as an information platform, PUSCH in environmental education, Forum Energy Zurich for energy technology, and Science et Cité as a public engagement enabler **(inclusion, science education, public engagement).**	T4 - Highly complex issues, such as the energy transition harbouring the danger of disregarding or discouraging people from partaking in the discourse **(science education)**.
O5 - Some homeowners may simply not be able to afford clean energy technologies such as photovoltaics or a heat pump. How could (local) funds be tapped to invest in local infrastructure **(public engagement)?**	T5 - With an increasing focus on energy topics in municipal policymaking, the likelihood of ignoring other municipal issues may arise. Even though energy policies benefit society as a whole, they may neglect certain groups or individuals (**ethics**).
	T6 - Basic energy data (electricity, power, heating, etc.) is impossible or very difficult to access for the local industry (energy planners, energy cooperatives, etc.) but plays a central role in the energy transition. Data is widely scattered (in different levels of public authorities, but also within private entities) or only available in aggregated form. **(open access)**

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TOWS analysis

This section presents the **TOWS** (inversed SWOT matrix) analysis. The objective of the TOWS analysis is to outline dependencies and linkages between the internal and external factors identified in the SWOT analysis. Thus TOWS analysis provides the basis to elaborate development strategies and propose concrete actions which aim to take advantage of opportunities, leverage existing strengths, focus on minimising/mitigating external threats and address internal weaknesses.

Table 8: TOWS analysis of Thalwil municipality

INTERNAL STRENGTHS (S)	EXTERNAL OPPORTUNITIES (O)				
How can we use Strengths to develop Opportunities?	O1 - The Swiss direct-democratic system *can* be a catalyst in forcing faster political responses regarding the energy transition (popular communal initiatives, such as the "Climate Initiative" 2020 in Thalwil). (**responsiveness**)	O2 - Energy science is still a male domain. Despite any assumed stereotypes, increased participation by women could benefit the energy transition **(gender equality).**	O3 - The current climate narrative has some alarmist elements, which may fail to address sections of the community. Besides "solving climate change", other reasons for the energy transition include energy safety, energy independence, job creation or added value, which might convince a broader political range **(AIRR).**	O4 - Use synergies with existing organisations that actively engage in the energy transition debate. For example, "energieschweiz" as an information platform, PUSCH in environmental education, Forum Energy Zurich for energy technology, and Science et Cité as a public engagement enabler **(inclusion, science education, public engagement).**	O5 - Some homeowners may simply not be able to afford clean energy technologies such as photovoltaics or a heat pump. How could (local) funds be tapped to invest in local infrastructure **(public engagement)**?
S1 - Strategic municipal documents typically cover time frames of 10–15 years, purposefully preventing legislative (four-year-terms) disruptions (**anticipation**).	Anchor and support awareness for direct-democratic instruments (municipal assembly, municipal initiative) in strategic documents.	Promote gender equality by including the issue in strategic municipal documents.	Stress the positive aspects of the energy policies (local job creation, added value, energy security) in the energy plan.	Consider or adopt external strategies and policies that suit your own purposes.	-
S2 - Written down in the municipal code, sustainability has been considered in municipal policymaking for over 20 years. Additionally, the "Sustainability Commission" actively engages in policymaking. Municipal energy planning is covered by an "Energy Officer" and accompanied by the "Energy Project Commission" (**reflexiveness**).	Proactively engage with the initiators to generate a consensus early on.	Encourage greater participation by women in political commissions.	Stronger focus on the political consensus when developing strategies.	Reach out to external organisations that engage in energy-related topics.	Develop strategies for renewable energy funding (e.g. tap into local pension funds, financial institutions).

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S3 - Strategic policy development follows an inclusive process, where experts, commissions, politicians and laypeople are jointly involved (**inclusion**).		Identify policies to bring more women into the energy debate.	Think win-win-win (strategies where all involved parties profit)	Target interest groups rather than individuals.	Check strategy for political feasibility.
S4 - The "Energy City" label works inherently with many AIRR elements. With Thalwil being a certified "Energy City", AIRR has been automatically embedded in municipal processes and decisions (**AIRR**).	Align or adopt energy label processes into the potential policy initiative.	Identify energy label processes that could benefit from greater female integration.	Highlight the impact of successful energy policies in other municipalities (best practices).	Identify potential synergies with the label.	Consult best practices on how to attract funding.
S5 - The municipality of Thalwil uses several instruments to interact with the local community: social media channels (Instagram, Facebook), website (Thalwil informs) and a monthly office hour by the Municipal President (**public engagement**).	Allow for a short public window to engage in the discussion of a particular initiative.	Include women (e.g. mothers and housewives) in the energy debate.	Emphasise the positive side of energy measures in public communication.	Actively engage with existing groups and associations that have a stake or interest.	Ask the public for ideas about how to increase renewable funding.
INTERNAL WEAKNESSES (W)					
What Weaknesses should be eliminated to utilise Opportunities fully?	**O1** - The Swiss direct-democratic system *can* be a catalyst in forcing faster political responses regarding the energy transition (popular communal initiatives such as the "Climate Initiative" 2020 in Thalwil). (**responsiveness**)	**O2** - Energy science is still a male domain. Despite any assumed stereotypes, increased participation by women could benefit the energy transition (**gender equality**).	**O3** - The current climate narrative has some alarmist elements, which may fail to address parts of the community. Besides "solving climate change", there exist other reasons for the energy transition such as energy safety, energy independence, job creation or added value, which might convince a broader political range (**AIRR**).	**O4** - Use synergies with existing organisations that actively engage in the energy transition debate. For example, "energieschweiz" as an information platform, PUSCH in environmental education, Forum Energy Zurich for energy technology, and Science et Cité as a public engagement enabler (**inclusion, science education, public engagement**).	**O5** - Some homeowners may simply not be able to afford clean energy technologies such as photovoltaics or a heat pump. How could (local) funds be tapped to invest in local infrastructure (**public engagement**)?
W1 - Communal structures are characterised by stringent rules and regulations, with a tendency of being too rigid and slow (**responsiveness**).	Promote direct-democratic instruments to circumvent slow and rigid communal structures.	-	Pressure rigid and slow municipal structures by highlighting "positive urgency".	Critically assess existing rules and regulations and exploit current know-how (best practices of other municipalities).	Create boundary conditions that benefit renewable energy funding.

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W2 - Despite energy-related information being readily available, its accessibility has been criticised. For example, how many subsidies are currently available and what sort of forms are required. To some extent, this is due to the complexity of energy topics; however, it could be improved nonetheless (**open access, science education**).	Use a direct-democratic tool to foster science education.	Specifically target women with energy topics by adopting new approaches.	Improve the quality of the information being provided.	Work with the best existing tools and information sheets.	Highlight potential business cases which may be adopted by the private sector.
W3 - The energy challenge affects different parts of the municipal authorities. Strengthening internal collaboration on energy topics beyond the individual "service centres" (DLZ) could benefit energy policies in general (**AIRR**).	-	-	Stress the benefits for each department of the municipal administration.	-	-
W4 - By mobilising a few people, the low participation rate in municipal assembly meetings (often <2% of all voters) may outperform public interest (**AIRR**).	Introduce a parliament instead of the municipal assembly (political initiative required).	-	-	Address opposition to a popular referendum at an early stage and consider coping strategies used by other municipalities.	-
W5 - Thalwil's tax system has attracted many wealthy people, some of whom have the primary intention to save taxes. Many of them are non-Swiss passport holders and are prevented from political participation. Others may not wish to participate in the community at all (**inclusion**).	Develop strategies for the introduction of voting rights for non-Swiss passport holders.	-	-	Learn from highly educated expats or gain insights by adopting a different perspective	-

INTERNAL STRENGTHS (S)	EXTERNAL THREATS (T)					
How can we use Strengths to deal with Threats successfully?	T1 - The Swiss direct democratic system is partially characterised by slow processes and long reaction times (responsiveness).	T2 - Some homeowners have little motivation to invest in renewable energy technologies and may actively disagree with energy policies (inclusion).	T3 - An implication of the Swiss citizen legislature (militia system) is that laypeople carry out communal policymaking, combining politics with another profession. This	T4 - Highly complex issues, such as the energy transition harbour the danger of disregarding or discouraging people from the debate (science education).	T5 - With an increasing focus on energy topics in municipal policymaking, the likelihood of ignoring other communal issues may arise. Even though energy policies benefit society as a whole, they	T6 - Basic energy data (electricity, power, heating, etc.) is impossible or very difficult to access for the local industry (energy planners, energy cooperatives, etc.) but plays a central role in the

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			may delay or hinder fast action in the energy challenge (science education).		may neglect certain groups or individuals (ethics).	energy transition. Data is widely scattered (different level of public authorities, but also within private entities) or only available in aggregated form (open access).
S1 - Strategic municipal documents typically cover time frames of ten to fifteen years, purposefully preventing legislative (4-year-terms) disruptions (**anticipation**).		Ensure that strategic municipal documents create a favourable environment for homeowners to invest in renewable energy.				Set the legal basis to make energy data readily available when reviewing strategic documents.
S2 - Written down in the municipal code, sustainability has been considered in municipal policymaking for over 20 years. Additionally, the "Sustainability Commission" actively engages in policymaking. Municipal energy planning is covered by an "Energy Officer" and accompanied by the "Energy Project Commission" (**reflexiveness**).	Find ways to overcome administrative hurdles by using practical advice from the industry (e.g. heating replacement or the construction of a PV plant should be as easy as possible)	-	Consistently brief municipal council with the latest facts (e.g. policy briefs or fact sheets provided through the commissions)	Review municipal communication in terms of the energy topic (e.g. check official documents for a better understanding)	Discuss potential disruptions at an early stage and emphasise the positives rather than the negatives.	Municipal sustainability bodies should work towards greater open access (e.g. define the essential key metrics)
S3 - Strategic policy development follows an inclusive process involving experts, commissions, politicians, and laypeople (**inclusion**).		Involve the major opposition groups when fostering energy policies.		Make policy developing processes transparent and easy to understand.	Consult marginalised groups.	Ensure "data collecting" bodies (energy authorities, cantonal electricity, and energy companies, etc.) are onboard.
S4 - The "Energy City" label works inherently with many AIRR elements. With Thalwil being a certified an "Energy City", AIRR has been		Follow recommendations of best practice by the "energy-city" label.	Educate with best practice examples from the "energy-city" label.	Adopt information material from the "energy-city" label.		Consider the recommendations for individual metrics.

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automatically embedded in municipal processes and decisions (**AIRR**).						
S5 - The municipality of Thalwil uses several instruments to interact with the local community: social media channels (Instagram, Facebook), website (Thalwil informs) and a monthly office hour by the Municipal President (**public engagement**).	Learn more about the public perception of administrative hurdles.	Listen to the opposition and find common ground.		Evaluate any lack of understanding.	Identify the disadvantaged and try to find alternatives for them.	Develop user-friendly and appealing channels and data platforms.
INTERNAL WEAKNESSES (W)						
Which Weaknesses must be eliminated to fight Threats successfully?	**T1** - The Swiss direct democratic system is partially characterised by slow processes and long reaction times (**responsiveness**).	**T2** - Some homeowners have little motivation to invest in renewable energy technologies and may actively disagree with energy policies (**inclusion**).	**T3** - An implication of the Swiss citizen legislature (militia system) is that laypeople carry out communal policymaking, combining politics with another profession. This may delay or hinder fast action in the energy challenge (**science education**).	**T4** - Highly complex issues, such as the energy transition harbour the danger of disregarding or discouraging people from the debate (**science education**).	**T5** - With an increasing focus on energy topics in municipal policymaking, the likelihood of ignoring other communal issues may arise. Even though energy policies benefit society as a whole, they may neglect certain groups or individuals (**ethics**).	**T6** - Basic energy data (electricity, power, heating, etc.) is impossible or very difficult to access for the local industry (energy planners, energy cooperatives, etc.) but plays a central role in the energy transition. Data is widely scattered (different level of public authorities, but also within private entities) or only available in aggregated form (**open access**).
W1 - Communal structures are characterised by stringent rules and regulations, with a tendency of being too rigid and slow (**responsiveness**).	Revise existing regulations on their practicability.	Address regulations that enable systematic opposition.			Consider temporary solutions for affected people.	

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W2 - Despite energy-related information being readily available, its accessibility has been criticised. For example, how many subsidies are currently available and what sort of forms are required. To some extent, this is due to the complexity of energy topics; however, it could be improved nonetheless (**open access, science education**).		Systematically eliminate misinformation (of homeowners).	Provide the municipal council with the best material available (e.g. regular policy briefs).			Avoid misinformation with the help of solid and reliable data
W3 - The energy challenge affects different parts of the municipal authorities. Strengthening internal collaboration on energy topics beyond the individual "service centres" (DLZ) could benefit energy policies in general (**AIRR**).				Foster a better understanding of communal energy issues.	Learn about adverse policy effects within different service centres.	
W4 - By mobilising a few people, the low participation rate in municipal assembly meetings (often <2% of all voters) may outperform public interest (**AIRR**).				Focus on clear and straightforward formulation when preparing voter material.	Identify the marginalised at an early stage.	
W5 - Thalwil's tax system has attracted many wealthy people, some of whom have the primary intention to save taxes. Many of them are non-Swiss passport holders and are prevented from political participation. Others may not wish to participate in the community at all (**inclusion**).						Ensure that the non-Swiss population is informed about energy issues appropriately (language etc.)

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4.5 Identification of strategic policy priorities

Based on the SWOT/TOWS analysis, important strategic focal points for integrating the RRI-AIRR approach were identified. In this context, the RRI keys and the AIRR dimensions could be of particular importance for the energy transition in Thalwil. Technological solutions for the expansion of renewable energies have been known for some time, but there is a lack of broad social acceptance and recognition of the topic's relevance. The RRI-AIRR framework particularly emphasises these "soft" factors. The following is a selection of strategies that could be critically discussed in the focus groups:

1. Positive aspects of the energy transition are still frequently perceived as arduous, expensive, and time-consuming. As a result, positive factors, such as local added value and the associated job creation, or lessening dependence on a given energy supply, often remain hidden. The municipality of Thalwil could draw more attention to the advantages of renewable energy sources in its communications and root this more firmly in its corporate culture.
2. Learning from others: the 2,200 municipalities in Switzerland all have different strengths and weaknesses. Some communities are true pioneers in energy transition. In the meantime, there is a wealth of information and a palette of best practice examples. Above all, the Energy City label documents give prime examples of successful governance, which can be considered as an effort towards anticipation.
3. Financing the energy transition involves high investment, as do renewable energy systems. Thalwil has limited room for manoeuvre here but can function as an intermediary between lenders and homeowners. Other possibilities include investments by the administration's pension fund or the sale of shares to the population in an extensive PV system.
4. Although the energy industry is still primarily a male domain, better representation of women is likely to be valuable for many reasons. This could be achieved, for example, through a more mixed composition of political bodies and commissions. In addition, through targeted communication, women could be made more aware of energy and climate issues, contributing to a greater general understanding of this complex topic.
5. Exploiting synergies: the energy issue has preoccupied Switzerland for over 20 years, and during that time, many institutional players and groupings have emerged. Thalwil does not have to begin from scratch but should focus on collaborating with existing players and seeking dialogue with antagonists. The goal must always be to identify majorities for solutions that serve Thalwil's energy policy. Improved coordination between the various departments of the public administration would be straightforward and effective, which can be considered as an example of inclusion.
6. Energy transition requires the early setting of the course in a variety of planning instruments – spatial planning, landscape development, energy planning, procurement, and transport concepts, to name but a few. Thalwil must continue to make targeted use of this opportunity in the future to promote good framework conditions for the rapid expansion and conversion of the energy system. Examples of this are the target network planning for gas supply and the expansion of district heating in the municipal area.
7. Monitoring: to achieve the federal net-zero CO_2 target in Thalwil, a reduction path and the actual state must be defined. This can only be achieved with the help of objective criteria and corresponding measurements. In this context, the transparent presentation of sources and methodology is vital. The basis for this is the most comprehensive energy data possible, which the municipality makes freely available. In addition, of course, the necessary data protection regulations must be observed.
8. As an administration, Thalwil must set a good example. This includes the energy-efficient refurbishment of buildings, the replacement of renewable heating systems and, of course, the vigorous expansion of PV systems to municipal properties. The exemplary role begins with planning, continues with the realisation of new projects or procurement, and is particularly evident in maintenance and thus in the attitude of individual employees. With the help of targeted staff training, additional awareness could be raised, and resources saved. What can be considered as an effort towards scientific education.

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9. Through sustainable procurement, Thalwil can make an essential contribution to energy transition. For example, the locality or grey emissions of a product or service could be set as a purchasing criterion. In addition, electric vehicles are already increasingly being used instead of those with conventional combustion engines.
10. Simplified processes: the energy transition is closely interwoven with many official requirements, approval procedures, and subsidies. Barriers to a renewable heating system replacement or a PV system must be kept to a minimum. Unnecessarily complex bureaucracy not only deter investors but also leads to inefficient processes. Here, the municipality can remedy this by evaluating its processes and procedures, standardising them, and simplifying them if necessary.
11. Policy briefing: energy issues are diverse, complex, and among the most researched topics. Consequently, it can be challenging to keep up with the current state of the science. Through policy briefings, commissions could keep local councils systematically up to date.
12. Energy communication: a flood of information competes for our attention every day, but political consent demands reliable facts. Thalwil could improve communication on energy issues at various levels. Access to information on the municipality's website could be facilitated by linking the current best pages. Information boards or handouts in the entrance areas of civil buildings could sensitise the public to energy-related issues. In addition to continuing environmental education in Thalwil schools, campaigns to improve understanding among the general population could also be effective.
13. Alternatives for losers: like any transformative process, energy transition will not bypass specific industries or business models. To this end, it is necessary to anticipate any systematic disadvantages early and develop solutions if these fall within the municipality's jurisdiction. The municipality needs to be clear about which businesses or groups might be affected.
14. The direct democracy political system works well, but political processes can be very slow-moving. One disadvantage of a community meeting is that only a tiny proportion of the representative voting population has any real power. Here, the municipality could be more proactive with political participation processes such as surveys, resident panels, and discussion forums. All these could support the sustainable energy supply goals in Thalwil and can be seen as an effort towards public engagement.

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4.6 Summary of focus group discussions

At the beginning of November, four focus groups were held with representatives from the fields of business, politics, research, and civil society. Their collective aim was to deepen current understanding regarding the integration of the RRI-AIRR approach into the political focus and concerning the energy transition in Thalwil. The discussion focused on the vision, necessary changes, and strategies resulting from the energy transition vision and implementation of the RRI-AIRR key and its dimensions, and recommendations for integrating the RRI-AIRR approach.

Business focus group (with ten participants, held on 11 November 2021 in the premises of the municipality of Thalwil)

1. Vision for territorial development in the selected policy area by 2050: The municipality must achieve a net-zero CO_2 target by 2050 in line with national goals. It also highlights the challenges and tasks – as well as the social, technical, and economic opportunities – associated with this change in society as a whole. For example, alternative technologies in the areas of heating and heat generation, housing and entertainment, and scenarios of mobility and transport were discussed, accompanied by adaptations of existing and innovative new business models. In terms of opportunities, participants also emphasised the possibility of creating new jobs and tax revenue in the community.
2. Strategic priorities to achieve this transformation: At the level of spatial planning and in the approval procedures for construction projects, the participants saw enormous potential for shaping the energy transition at the municipal level. Criticism was levelled at lengthy approval procedures and the lack of (or

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inadequate) standards, as well as poor information-transparency at the municipal level concerning existing funding instruments. The first point included, in particular, the revision of the building code and, in general, the reduction of bureaucracy in approval procedures (e.g. specifically for photovoltaics and heat pumps). The second point also included the creation of innovative (financial) incentives for investments and their transparency at the municipal level. An incentive for additional investments by companies can be expected if the issue is supported visibly by the local administration, for example, by investing in an energy-saving vehicle fleet, real estate, and in a strategic communication initiative, such as introducing an energy barometer and regular communication about the investments and measures taken. This would make the community a tangible and visible role model.

3. How the RRI-AIRR approach fits best to achieve the intended transformation: In terms of AIRR dimensions anticipation and reactivity, the following examples were offered: Firstly, the forward-looking design of the building code on the part of the municipality, which can react flexibly to technical adjustments, and secondly, the design of heat generation is also a critical lever for the energy turnaround because every gas heating system that is replaced now will be in operation for another 30 years (i.e. until 2050) and not contribute to achieving the energy transition. Thirdly, ensuring affordability requires its own long-term strategy; for owners, calculation examples must be communicated and visually presented to show when an investment pays off. The AIRR dimension of inclusion is critical in bringing together expertise: for example, retrofitting heating systems requires an integrated approach that involves installers, architects, and other stakeholders. From the point of view of the business representatives, the design of data accessibility (open access) is a local government issue. It was noted that data is often limited or difficult to access, while information on the energy transition needs to be low-threshold, free of charge, prominent, and up to date. Criticism was made that advisory services often cease when the funding is exhausted. Here an extra budget is needed to safeguard counselling services. These services should be personal and offered in a comfortable, private setting such as the home. Incorporating RRI keys and AIRR dimensions helps identify interrelated energy transition control levers that stakeholders are often unaware of.
4. The role of the participating stakeholder group: Local government and politics can only create the framework conditions and function as role models. Ultimately, energy transition must be implemented by consumers and companies.
5. The role of the other stakeholder groups: The need to involve the trades, business, and industry more closely in the dialogue on measures for the energy transition was emphasised. The energy turnaround is relevant for all sectors and must encourage all entrepreneurial players in the community to rethink. For example, the municipality can promote working from home through a fast internet connection. At the same time, attractive leisure facilities (e.g. a local cinema) might encourage people to spend more free time in Thalwil and not travel out of the region. In the area of energy generation, participants saw great potential in the expansion of photovoltaic systems. While growth in the core zones has been severely restricted from the outset, there is still insufficient potential for developing photovoltaics on the often-decentralised industrial roofs (outside the town centre).
6. Recommendations: The stakeholders also emphasised a range of strengths that Thalwil has regarding energy transition. These highlighted existing support programmes, effective communication and healthy dialogue, and a tangible will to change. The participants saw opportunities for transformative change in the areas mentioned above, especially in mobility and heat supply.

Policymakers focus group (with five participants, held on 11 November 2021 in the premises of the municipality of Thalwil.

1. Vision for territorial development in the selected policy area by 2050: The main objective is to develop appropriate measures to achieve climate neutrality by 2050, including municipality-wide building stock. In municipal buildings, specific targets are energy reduction of 20 % (incl. hot water) and a share of renewable energies of 75 % (incl. hot water) by 2035. Total vehicle fleet registered in Thalwil: climate-neutral vehicle fleet (biogas, electric, or hydrogen drive) for the municipality by 2050. Rapid progress by the municipality in energy transition is crucial because the municipality has a role-model function concerning its own "low CO_2"

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lifestyle (e.g. for heating and heat supply). However, the local government can evaluate technological innovations ("Internet of Things") and the increased energy efficiency.

2. Strategic priorities to achieve this transformation: Participants stressed that the technical requirements and possibilities already exist today; the only question is how to get the community to support the process. There is a need for improved communication on sustainability and energy transition issues. There are currently many projects at the cantonal and municipal levels, but the information is only available to residents with a particular interest. Participants pleaded for a more targeted use of communication strategies and for communicating and highlighting successes during and after a project. However, there is often a lack of systematic monitoring of energy projects that could be made public. Moreover, communication should be linked to projects that residents can relate to in the first place; this must not simply create an additional flood of information but inform people about existing projects and awaken their interest in energy and climate issues. To improve existing funding opportunities and create new ones (such as heating and heat supply), it is worth considering new financing options such as leasing expensive heating systems over a certain period.
3. How the RRI-AIRR approach fits best to achieve the intended transformation: Since energy transition is a task for society as a whole, Thalwil residents need to become more aware of that goal at the community level. This is the starting point for AIRR's "inclusion" dimension; reaching the public is often a significant challenge from a policy perspective, as energy-related issues are often highly technical, expensive, and involve waivers. It was noted that although there are many projects today, the same few people are always involved, and only a few hundred people come to the special meeting. Most people are hard to reach and know little about energy planning and existing financing options. It is also an essential task regarding "open access" to identify the communication channels to address specific target groups. One option would be to target specific groups such as homeowners directly (emphasising long-term financial prospects, current technical status, and investment benefits) and increase collaboration between the community and the homeowners' association. The nature of the information transfer is crucial. Participants acknowledged a need for a change in the narrative – away from obligations and declarations of renunciation, emphasising the added value that the energy transition brings for people and the environment. Although, it has already been shown that the key facts about the energy transition are known, action is often not taken. In addition, the information offered in schools is to be expanded to turn children into multipliers (e.g. regarding energy-saving measures).
4. As far as gender equality is concerned, there are often very few women represented, especially among older participants. Yet, as voters and community members, women are important sources of input for energy measures and decisions that have received too little attention in the past.
5. The role of the participating stakeholder group: Municipal policy is a crucial pillar in shaping the framework conditions for the energy transition in Thalwil. Regarding the RRI-AIRR approach, coordination and long-term planning between the partners involved can be strengthened. Anticipatory communication must also be expanded so that, for example, major development projects are also communicated at an early stage. At the same time, there are already many successful examples where anticipation has already worked well (e.g. climate-adapted settlement development). Also, with relatively low-cost measures (e.g. CO_2 consumption indicators), the visualisation of data and thus the sensitisation of the population to the issue of energy transition can already be expanded.
6. The role of the other stakeholder groups: It is important to keep all stakeholder groups in mind; i.e. the rural population with specific needs, depending on the age group, which have to be taken into account for the energy transition to be cushioned socially. Only close cooperation between civil society, business, and policymakers can embed social and technological innovations that advance the energy transition.
7. Recommendations: The energy transition can succeed if all stakeholders become active across party lines, are committed to the issue, and engage in a deeper dialogue. Additional promotional opportunities must also be created at the cantonal level. Awareness-raising measures must begin sooner to involve the civilian population in measures and decision-making processes that can ultimately achieve a majority at the ballot box.

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Research focus group (with six participants conducted on 12 November 2021)

1. Vision for territorial development in the selected policy area by 2050: The Energy transition is necessary as CO_2 neutrality is targeted at the national level. However, thinking about the appropriate implementation is directed towards the municipal level.
2. Strategic priorities to achieve this transformation: While there are many prominent, alternative ways to generate and conserve energy, energy storage is rarely discussed. Here we need new solutions that are tested in the community, such as power-to-gas, smart grids. In addition, consideration should be given to how the municipality's resources (e.g. its vehicle fleet and buildings) can be made climate-neutral more quickly. The procurement of materials should also continue to be monitored for sustainability as a purchasing criterion, and this point should be visibly established (role-model function). If procurement guidelines already exist, they are still too rarely consulted. The expansion of the circular economy at the municipal level and in the administration could also be interesting. Digital platforms are also needed to promote participation in the community; corresponding offers can be found on the market (see Loco-Bubbles[26]). Gamification approaches were also mentioned, for example, encouraging competition between neighbourhoods within the municipality to see who is the most climate neutral. It would also be interesting to compare Thalwil directly with other municipalities in terms of the energy transition (carbon footprint). The data need not necessarily be communicated in abstract quantities such as tonnes of CO_2 but more comprehendible units such as parking spaces. In this way, the reduction path could be demonstrated.
3. How the RRI-AIRR approach fits best to achieve the intended transformation The RRI-AIRR approach and aspects related to leadership generated some interesting suggestions. Concerning anticipation, for example, looking to the future is essential, but planning must not be too rigid, otherwise options will be blocked. Nevertheless, planning periods of up to 20 years already exist in most areas (e.g. heating networks conversion etc.) Regarding the development of science education, it was proposed to launch an awareness-raising campaign to demonstrate the added value for residents and strengthen the will for change. In addition, there is already a strong information network that needs to be more focused and to facilitate the search for information such as funding for example for PV. A contact point within the municipality administration could be established for the purpose of funding support. There should also be a greater distinction between scientific and action knowledge, the latter being needed more. In addition to extending financial incentives, personal examples would help; if some neighbours put solar panels on the roof of their house, it would have a greater impact than other forms of campaigning. These individuals need to be identified. In this context, cooperation with existing (sports) clubs could be strengthened and public commitment increased. As for equality, diversity is always an asset; the inclusion of different perspectives (beyond gender) is always an asset because it is usually the same people who get involved. To this end, groups such as "climate youth" (who are not represented in Thalwil) must also be specifically addressed. Families could be addressed through specific topics, e.g. "What does Thalwil look like to our children?" Adopting female role models can also have a positive impact on consumer choice.
4. The role of the participating stakeholder group: The scientific community sees itself as a developer of technological innovations for tangible CO_2 reduction and social science findings for their integration. Specifically, scientists propose that issues such as information campaigns and energy measurement and calculation should also be accompanied and promoted by student work. In this context, scientists also see themselves as advisors and generators of ideas.
5. The role of the other stakeholder groups: This requires the involvement of all parties, in particular, politics, business, and civil society, accompanied by dialogue to stimulate technological and social innovations at the local level.
6. Recommendations: Previous successes in energy transition should also be presented more clearly to residents, the added value of energy transition should be communicated more clearly, gamification

[26] https://apps.apple.com/at/app/loco-bubbles/id1540301038

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approaches should be expanded, and awareness of the need for energy transition among citizens should be raised.

Civil Society focus group (with five participants, held on 10 November 2021 in the premises of the municipality of Thalwil)

1. Vision for territorial development in the selected policy area by 2050: The energy transition in Thalwil should be oriented towards national goals and implemented as quickly as possible. This requires an effort by society as a whole and involve business, politics, and civil society. In addition to heating and heat generation in private households, the main focus is on grey emissions (which can only be corrected by the municipality to a limited extent), but which cause the most significant CO_2 emissions. In this area, only civilians in the role of consumers and industries in the role of producers can act in a meaningful way.
2. Strategic priorities to achieve this transformation: The involvement of the average citizens in the processes of the energy transition is crucial at every point. Even if the people (local council) must decide the measures, this presupposes that the population is aware of its actions and changes (Attitude-Behaviour-Gap – as soon as it costs something, it becomes difficult). The energy transition can be implemented sufficiently quickly only through changes in behaviour and the willingness to make sustainable investments. In addition, approval procedures (specifically for heat pumps and photovoltaics) must be simplified and accelerated; otherwise, residents will perceive this as a negative incentive and resort to fossil-fuel technologies. The municipality must also think "outside the box" concerning best practice examples and take its lead from the successes of other municipalities and cantons. Specifically, consideration should be given to how mobility can be improved (e.g. bicycles and pavements).
3. How the RRI-AIRR approach fits best to achieve the intended transformation Individual aspects of the RRI-AIRR approach work very well with the issues of the energy transition. In the field of information and scientific education, there is often a lack of simple solutions and case-related calculation examples regarding investments made by private households (e.g. when buying a new heating system). Many homeowners are unaware of the long-term cost if they opt for a conventional fossil-fuel heating system. The municipality could expand its free advisory services here, and timely regulations are also needed concerning oil and gas heating systems. It is essential to consider how the new heating system can become an attractive "status symbol" and how such investments can also achieve an external effect. The facade of a house is often the focus of investment because of its visibility, but the heating system is invisible in the basement. The municipality could increase this visibility through campaigns. A more visually oriented form of communication should be found that appeals to a broader social spectrum when communicating action knowledge. Here too, participants suggested a marketing campaign and specific lead-users such as advertisers to promote a gamification effect, thereby giving CO_2 saving a competitive feel. Concerning public involvement, it would be necessary to consider how all social groups in the community might be included in discussions on the energy transition. For example, schools (including environmental schools) could be more involved in this process. In principle, several instruments, such as the Ökopolis Association, "energy aperitifs", and the Sustainability Steering Group, should be expanded more consistently.
4. The role of the participating stakeholder group: The main task of implementation and adaptation lies with civil society, although policymakers and business must create the framework conditions and products. Since civil society is not always aware of the tasks (or will not act), ways must be found to expand public interest in the topic further, even if the goals set by the 2050 energy transition policy still seem a long way off.
5. The role of the other stakeholder groups: Policymakers must set appropriate framework conditions, including planning scenarios, regulations, and the provision of essential data. This includes technical data, overviews of funding opportunities and guidance, and the municipality's progress. To develop a gamification character, comparability with other communities and updates on local progress are needed. For example, CO_2 barometers could be set up and solar panels equipped with a board showing their performance. Another idea was to offer prizes to people who make a particularly significant reduction in CO_2 emissions. Energy

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transition requires not only innovative technical solutions from research but also innovative approaches to implementation in the community.

6. Recommendations: Thalwil is a municipality that has been committed to sustainability for many years, but this is outwardly visible only to a limited extent. However, the successes achieved so far are reflected in the high quality of life and could be made more visible so that the residents continue to rise to the energy transition challenges in the future.

Analytical resumé

There were divided views between the groups on the goal of climate change. While the civil society and research representatives called for stricter targets, representatives from policymaking and business quickly moved to specific measures that could be implemented as soon as possible. In particular, the topic of heat, energy production, and the conversion of heating systems came up in this context, where mainly bureaucratic hurdles still block existing (financial) incentives. Overall, however, it was clear that viable means, technologies, and incentives already exist to make heat generation in private households more CO_2 efficient.

Thalwil has already made efforts to inform homeowners about opportunities and investments – such as PV and heat-pump systems – but general interest is still limited. In this context, gamification and game-based approaches were also discussed as possible ways to close the gap between attitude and behaviour (energy transition was predominantly perceived as positive by all participants) and to encourage residents to invest. It was also agreed that there are already many sustainability measures in the municipality, but these are not yet sufficiently visible (lack of communication). As a result, residents still lack the motivation to become more involved in energy-saving projects.

Concerning the RRI-AIRR approach, it was clear that although this approach is unknown per se, individual dimensions such as anticipation and inclusion (and keys such as scientific education and open access) are accepted as critical guiding principles for the energy transition. In particular, an ongoing conscious reflection at the municipal administration on how all stakeholders can be involved at an early stage in the overall goal of the energy transition at the measures and strategy levels appears to be one of the most urgent requirements. Without the involvement of residents (who bear the greatest responsibility for participation in the energy transition owing to grey emissions), specific and rapid implementation will fail at the ballot box because there is no groundswell of political support for behavioural change. The four focus groups discussed many specific examples and actions that could serve as incentives and suggestions for public adoption.

4.7 Conclusions and policy recommendations

The RRI Audit Report for Thalwil provides a summary analysis based on the mapping analysis of the R&I ecosystem and stakeholders, the results of the SWOT and TOWS analyses, and the regional focus group reports.

Thalwil is in an excellent position to achieve the energy transition since many measures have already been implemented over the past 20 years. As a result, sustainability is already established as a guiding principle in the municipality's legislative goals for 2018–2022, while the national orientation calls for net-zero CO_2 consumption by 2050. Nevertheless, Thalwil's policy goals are ambitious and include the strategic objectives from the section "The Policy Area: Energy Transition in Thalwil"

Specifically, the research to date has explored how the RRI-AIRR approach can provide additional clarity to achieve these goals. To this end, the extent to which the AIRR dimensions and RRI keys are already embedded today and where they could be further expanded was examined.

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Anticipation: As far as anticipatory guidance is concerned, there were already clear indications of systematic embeddedness at the municipal level, reflected in legislative texts and existing projects. It is also clear that forward-looking leadership is an important political instrument for involving the entire population and other stakeholders from industry/trade and civil society organisations in the energy transition. For a start, this strengthens commitment to the process since many measures extend into the individual decision-making sphere and require additional financial resources.

Furthermore, forward-looking leadership promotes exchange between politics, business, and civil society by ensuring transparency and a voice in decision-making. On the one hand, advisory committees such as the Energy Project Group and the Sustainability Committee have been developed; on the other hand, they could play a more critical role in analysing future scenarios and making recommendations for political decisions. To this end, the role of these commissions and their involvement in the political process at the local level should be re-examined.

The analysis also showed that greater cooperation on energy issues between municipalities could be developed, at least at the project and action levels. In this context – and also at the action level – it would be helpful to learn more about innovations and good practices from the national and international context and adopt ideas well-applied in other areas. Project commissions should conduct this task with support from science and research representatives. Anticipation could be strengthened by these and other measures listed in the report.

Another important pillar for the energy transition in this context is tapping additional financial resources, for example, based on other tax revenues, committed financial resources, or cantonal subsidies. This will create incentives for private investment (e.g. in renovations and generally to gain planning security).

The involvement of the various stakeholders beneath the umbrella of energy transition can be seen under the heading “inclusion”; here, there are already many examples in the community pointing to a systematic anchoring of these AIRR dimensions. Nevertheless, it is necessary to promote energy transition and sustainability in a targeted manner and, in particular, to establish target group-specific communication, which has also been shown in previous focus groups.

A well-devised campaign that allows the positive aspects of the energy transition to be given greater prominence, (e.g. that energy transition creates new jobs and a higher quality of life in the community) would significantly increase the willingness of the population to become involved. Another critical aspect of inclusion is the systematic creation of collaborative partnerships. In the last 20 years, many contact points and projects in energy production have also been established at the cantonal level. These resources could be better used through enhanced cooperation, while exchanges between existing working groups should also be strengthened at a local level.

The need to catch up in the area of monitoring projects and measures also became apparent. To achieve the net-zero CO_2 target in Thalwil set by the government, a reduction path and the actual situation must be defined. This can only be achieved with the help of objective criteria and appropriate measurements. The basis for this is the most comprehensive energy data possible, which the municipality makes freely available.

The expansion of science education, already included in two 2018–2022 municipal legislative goals, is also an important pillar in advancing the energy transition. The eighth legislative goal in Thalwil also promotes environmentally conscious and future-oriented thinking and action in state schools, which is why environmental topics are to be included in all curricula. In this way, the next generation is already being educated to live in a sustainable and resource-conserving way and function as multipliers in the community.

With the “Energy City” energy label, Thalwil is already ahead of many towns and municipalities in Switzerland. The community can build on this success and act as a role model for the entire region and reaching the next

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category – gold status – would be a valuable milestone. This report lists many proposals that will achieve this goal.

4.8 References

Canton of Zurich. Kantonaler Richtplan (2019, October). Retrieved from https://www.zh.ch/content/dam/zhweb/bilder-dokumente/themen/planen-bauen/raumplanung/dokumente/richtplaene/Besch_KR_Richtplantext.pdf

Gemeinde Thalwil. (2015, October). Kommunaler Richtplan Thalwil 2015. Retrieved from https://www.thalwil.ch/_docn/625844/1_KRP_TeilA_FestlegungenErlauterungen.pdf

Gemeinde Thalwil. (2018, November 22). Legislaturziele 2018-2022. Retrieved from https://www.thalwil.ch/_docn/2311342/Legislaturziele_2018-2022_Zusammenstellung_nach_Klausur_genehmigt.pdf

Gemeinde Thalwil. (2019, January 11). Thalwil ist für weitere vier Jahre Energiestadt. Retrieved from https://www.thalwil.ch/aktuellesinformationen/632905

Gemeinde Thalwil. (2020). Kommunaler Energieplan. PLANAR. Retrieved from thalwil.ch: http://www.thalwil.ch/de/wohinf/infrastruktur/energieplanung

Stilgoe, J., Owen, R., & Macnaghten, P. (2013). Developing a framework for responsible innovation. Research policy, 42(9), 1568-1580.

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Chapter 5: RRI Audit Report of the City of Sabadell and the Region of Catalonia

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Summary

The present document is the culmination of RRI-LEADERS' first stage of work for mainstreaming the RRI-AIRR approach in policy goals, implementation routines and strategies in Sabadell and Catalonia, specifically in three chosen areas of the innovation ecosystem: Smart Specialisation in Circular Economy, Active Ageing, and Intelligent Design in Industry. It lays the foundations for understanding how the actors in these policy areas might benefit from the adoption of an RRI-AIRR approach by i) mapping and analysing the R&I ecosystem and its stakeholders; ii) identifying strategic policy priorities; and finally, iii) proposing policy recommendations.

The main conclusion of the document, following a series of research activities (interviews, focus groups and a participatory workshop), is that the RRI keys and AIRR dimensions are *de facto* implemented in the organisations that the participants represent. This is especially true for gender equality – which is compulsory by law – and anticipation – which is essential in any innovation process and in the establishment of strategic plans. However, the RRI approach as such is not known or explicitly mentioned in policy plans, and its application shows considerable room for improvement. This is the case for public engagement and inclusiveness, which are emphasised in the territorial policies on Smart Specialisation because of the huge potential they represent for integrating diverse – and sometimes divergent – perspectives in research and innovation (R&I). Likewise, it should be noted that no significant differences in RRI implementation and potential were found between the three policy foci, as RRI is a cross-cutting concept whose practical application is significantly influenced by cultural and political idiosyncrasy outside the economic sector.

Catalonia and Sabadell are determined by the territorial Smart Specialisation Strategy, RIS3CAT, which aims to tackle the great social and economic challenges of this century by fostering three vectors: industrial tradition, quality of life, and green and/or circular economy. Thus, the most efficient action to speed up the implementation of the RRI-AIRR approach would have to take this strategy into account and reinforce the existing RRI-linked activities and tools in the territory. In view of this, the proposed policy recommendations are:

- **To capitalise and build on the previous and simultaneous initiatives and activities developed in the territory**. The Catalan Government is playing an active role in embedding public engagement and inclusiveness in the new RIS3CAT, MFF2021-2027 and NGEU projects, which will shape most future innovation processes. It is therefore important to ensure that these initiatives are well known and actively used as springboards for promoting the RRI approach.
- **To formalise and disseminate practical guidelines and information about the RRI-AIRR approach** with the active involvement of the quadruple helix stakeholders through:
  - Participation and interaction through formal and informal meeting points, activities or forums.
  - Exchange and sharing of experiences and results linked to the RRI-AIRR approach, to promote transparency and cooperation, and build public trust in these kinds of processes.
  - Capacity-building linked to the participation of the quadruple helix stakeholders in the activities and initiatives of RIS3CAT in general and PECT-Vallès in particular.

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- **To boost specific aspects of the RRI-AIRR approach that are less common or underdeveloped** among the quadruple helix stakeholders, such as public engagement, ethics, open access, reflexivity and inclusiveness.

5.1 Introduction

This report is the result of an analysis in the area of Sabadell and Catalonia on the current implementation of the RRI keys (ethics, gender equality, science education, public participation and open access) and the AIRR dimensions (anticipation, inclusiveness, reflexivity and responsiveness) in i) local and regional policies and ii) organisations that represent the quadruple helix model (research and academia, business, policymaking, and civil society) in the policy foci of Smart Specialisation in Circular Economy, Active Ageing and Intelligent Design Applied to Industry. An objective of this analysis was to identify barriers to and opportunities for the integration of the RRI-AIRR approach in territorial development policies and in organisations in these policy foci.

The analysis is based on the findings obtained in three different phases. The first phase, which began in March 2021, consisted of semi-structured qualitative interviews with actors in the territorial R&I eco-system, focused on stakeholders' experience with and interest in RRI.

The second phase, which started in June 2021, consisted of desk research and analysis of the regional and local policy initiatives and documents, with the aim of checking if and how the RRI keys and the AIRR dimensions are embedded (or not) in the three policy areas. The first two phases were each completed with two online workshops (a focus group and a participatory workshop) in April and July 2021. The participants were representatives of the quadruple helix stakeholders, and the aim was to collect their feedback on the preliminary findings regarding the RRI-AIRR approach in Sabadell and Catalonia in the above-mentioned policies.

The third phase, which spanned the period between October and November 2021, consisted of a reflection on the findings from the previous phases. It incorporated a Strength-Weakness-Opportunity-Threat (SWOT) and TOWS analysis, and feedback obtained in four separate focus groups that included representatives from research, business, policy making and civil society.

The results were used to identify strategic policy priorities and formulate policy recommendations for implementing the RRI-AIRR approach in Smart Specialisation in Circular Economy, Active Ageing and Intelligent Design Applied to Industry. This constitutes the starting point for developing the Transformative Outlook, which is intended to provide a future-oriented action plan that includes strategies and measures for implementing the intended transformation in Sabadell and Catalonia, and thus improve RRI integration in local policy making.

The first section of this report describes the methodology of the review and the territorial policy areas. The next section synthesises stakeholders' experiences of RRI keys and AIRR dimensions, maps these experiences, and provides the results of a SWOT and TOWS analysis aimed at identifying strategic policy priorities. The last section summarises the results of the four focus groups held in November 2021, explains the proposed policy recommendations, and sets out some final conclusions.

The methodology involved in the elaboration of this report consisted of the following tasks in chronological order:

1. Interviews with 17 stakeholders from the research/academic, business, policymaking and civil society sectors (quadruple helix) between 25 March and 17 April 2021. The stakeholders filled in an online questionnaire about their knowledge of and practical experience with RRI keys and AIRR dimensions. The aim of this questionnaire was to identify opportunities for integrating RRI keys and AIRR dimensions in participants' organisations.

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2. An online focus workshop, carried out on 25th April 2021 with 12 stakeholders from research/academia, policy making, civil society and business, with the aim of further exploring the findings from the analysis of the previous interviews.
3. Analysis in June 2021 of the following policy documents regarding Smart Specialisation issues in Catalonia and Sabadell city:
    - *Strategy for the Smart Specialisation of Catalonia* (RIS3CAT)[27], the research and innovation (R&I) actions and programmes framework established by the Catalan Government for the period 2014-2020[28] to provide support for the generation and development of innovative projects.
    - *Specialisation and Territorial Competitiveness Project "Vallès Industrial"* (PECT Vallès Industrial[29]), which "aims to promote this territory as a benchmark in the specialisation domain of industrial systems and to become a centre for innovation and design in this field". To this end, the city council of Sabadell is collaborating with several agents from the local and regional innovation ecosystem, such as universities, business associations, technological centres and other municipalities, on Circular Economy, Active Ageing and Intelligent Design applied to Industry.
    - Interreg current Project *RELOS3: From Regional to Local: Successful deployment of the Smart Specialisation Strategies*[30], which seeks to implement regional Smart Specialisation Strategies (RIS3) in the local context by actively involving local authorities, innovation agents and companies. This project is led by PES-Sabadell.
    - *National Agreement for the Knowledge Society*[31], a result of the collaboration between the major quadruple helix actors to foster Catalonia's knowledge transfer towards the productive fabric in the interest of society.
4. Participatory workshop in July 2021 with 10 stakeholders from organisations other than those involved in the interviews and focus workshop, to examine the perceptions of territorial stakeholders with regard to responsibility (in research and innovation), the RRI keys and AIRR dimensions, and their relevance to the overall development policy in the territory.
5. Analysis of the post-COVID recovery plan proposed by Next Generation Catalonia[32] to activate "… *ambitious recovery programs which serve to make structural transformations and increase resilience…*", and which affects the three policy foci of Circular Economy, Active Ageing and Intelligent Design in Industry.
6. Analytical review of the territorial findings of the previous tasks, including a SWOT and TOWS matrix, in October 2021.
7. Four focus groups organised with representatives from research, business, policy making and civil society separately, to comment and reflect on the analytical review.
8. Inclusion of the focus group participants' views in the final document, "Catalonia and Sabadell RRI Audit Report".

This methodology, and therefore this document, reflects the project's spirit of co-creation, with the direct involvement of a variety of relevant stakeholders to integrate their perspectives and views after the analysis.

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[27] http://catalunya2020.gencat.cat/web/.content/00_catalunya2020/Documents/angles/fitxers/pla-accio-ris3cat-2018-en.pdf

[28] Due to the COVID-19 crisis, at the time of writing of this report, the new plan has not yet been fully developed and RIS3CAT 2014-2020 is still in force.

[29] https://web.sabadell.cat/pect/que-es

[30] RELOS3 | Interreg Europe

[31] http://empresa.gencat.cat/ca/intern/pnsc

[32] http://economia.gencat.cat/web/.content/20_departament_gabinet_tecnic/arxius/pla-recuperacio-europa/next-generation-catalonia.pdf

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5.2 Policy areas

The Catalan Government and the City Council of Sabadell are committed to the growth and industrial revitalisation of the territory. In Sabadell, these objectives are based on five main axes: healthcare, logistics, research and technology, aeronautics, and design and fabrics. These strategic lines are set up through the promotion and development of different projects and activities aimed at encouraging innovation, new technologies, knowledge and activities associated with the industry. Sustainability represents a cross-cutting vector in these processes.

As part of this economic development strategy, Sabadell is now leading a project within the framework of the Research and Innovation Strategy for Smart Specialisation in Catalonia (RIS3CAT) through its Economic Development Agency. This is a Territorial Specialisation and Competitiveness Project (PECT) that aims to promote the territory as a benchmark in the specialisation domain of industrial systems in Catalonia. Therefore, our policy focus seeks to reinforce the territorial innovation ecosystem by carrying out projects based on 3 policy areas:

- **Intelligent Design Applied to Industry.** Many agents working in the field of design in the territory (companies, universities, research organisations, technological centres) are helping to meet current industry needs. This powerful ecosystem, focused on design and with a clear technological base, is supported by local and regional administrations, which are committed to enriching it by promoting the participation of local citizens.
- **Active Ageing**, which means improving the health of the elderly population. Several agents in the city linked to the field of health play a leading role in promoting new projects to deal with challenges affecting the elderly. In addition, one of the city's universities is committed to developing educational material on this subject, and to promoting entrepreneurship in the field of health care. In Sabadell, universities, companies, the city council and local citizens are coming together to advance and innovate in the field of Active Ageing.
- **Boosting the Circular Economy in industrial systems**, to improve resource efficiency, reduce costs and promote synergies between companies through the exchange of materials, energy and water. Promoting Circular Economy actions improves the competitiveness of the territory's business fabric.

In line with RIS3CAT, there is a specific interest in Catalonia and in the municipality in promoting sustainability and Circular Economy. This has led to the implementation of the industrial symbiosis project in Sabadell´s industrial park among companies and other facilities, and to the promotion of some other municipal projects, such as those of local energy communities that try to optimise solar energy generation by connecting companies with public administrations and citizens. From an RRI perspective, the territory aims to expand the range of Circular Economy actions by creating participatory workshops on project proposals for citizens, public administration and other stakeholders such as universities or business associations.

The policy foci serve to reinforce the territorial innovation ecosystem, in line with the current strategic priorities:

- Reducing carbon footprint by implementing clean energy systems, and developing Circular Economy projects with the quadruple helix stakeholders (companies, research/academia, local administration and citizens, who will have to be advised and guided by R+I agents).
- Highlighting the capacities, experience and potential of people over the age of 55, thus promoting research and innovation in products and services adapted to their needs.
- Placing industry and services to industry at a higher level of competence through innovation, design and technology, with the active support of the universities near Sabadell.

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The following challenges have been identified:

Research and academia

One of the main problems concerns responsiveness and the need to create flexible structures to respond to social challenges. It is necessary to build critical mass on the inclusion of RRI in research and academia dynamics, and to create a shared agenda with shared challenges and objectives for the different stakeholders of the territory.

Civil society

The inadequate implementation of open access prevents firms and civil society from accessing information and knowledge that could help them to develop innovative services and create new or better business models. Anticipation is considered very relevant, and anticipatory governance should be implemented bottom up. A higher level of public-private collaboration in the field of RRI and communication activities has been identified as an important challenge.

Business

When developing public procurement and innovation processes, the main challenge for firms is to prioritise social responsibility criteria and needs over economic criteria that do not respond to real social demands. The business sector agrees that public administrations should raise awareness of RRI and its implementation, as only then will companies feel compelled to introduce this policy.

5.3 Synthesis of experiences related to RRI-AIRR

RRI keys

All the RRI keys are considered important, and some are *de facto* implemented, by all the organisations interviewed. The degree of implementation depends on the typology, mission and resources of each organisation. Gender equality is the key that is most uniformly implemented because of its legal mandate. Public engagement is the least implemented key, though it is being strongly promoted in the main territorial policies on Smart Specialisation, RIS3CAT and RELOS3, in light of the huge potential it represents for integrating RRI in R&I. Ethics, science education and open access each display their own particularities, as explained below with regard to the three policy foci of Circular Economy, Active Ageing and Intelligent Design in Industry.

Ethics

Ethics is a basic RRI key in the policy foci of Circular Economy and Active Ageing, as it involves sensitive social matters and subjects such as the environment and the elderly population.

Ethics is the most frequently implemented RRI key in the research and academic sector. This implementation is reflected in guidelines, ethics committees and research codes of conduct. Reputation is vital for these organisations, and they have made an important effort to comply with research integrity and quality standards.

In the business sector, ethics is addressed through ethical commitments to security, environmental protection and human rights issues. However, companies can face the dilemma of having to choose between ethical and economic objectives, which sometimes contradict each other. In this context, it is important to stress that the companies studied for this report are aware of the public expectations that they need to do more to put environmental and elderly people's interests before mere economic profit.

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The citizens and representatives of research and business communities who attended the workshops regard policymakers as the main promoters and guardians of environmental and ethical standards. Aside from complying with ethics regulations themselves (setting an example), policymakers are also expected to include compulsory ethical commitments in laws, regulations, plans, funding and monitoring for compliance, especially with regard to environmental and social matters such as the Circular Economy or Active Ageing. However, this key understanding is not clearly addressed in the Smart Specialisation territorial plans (RIS3CAT and RELOS3), probably because ethics is taken for granted or assumed.

Gender equality

Gender perspective is important in the policy foci of Active Ageing and Intelligent Design in Industry. Regarding Active Ageing, women constitute the majority of the elderly population, owing to their higher life expectancy[33], and also the vast majority of caregivers[34]. Consequently, female perspectives must be taken into account in any plan or action to be put into practice. In contrast, the industrial sector has traditionally involved more men[35]. Women's involvement must be encouraged as part of Intelligent Design in Industry.

Gender equality, which is compulsory by law, is the most widely implemented RRI key in the territory. This key appears in RIS3CAT, and relevant plans have been established in all kinds of public and private sectors in the territory. In addition, women have been included and promoted in careers and places that used to include men almost exclusively. However, much work is still required to fight salary imbalance[36] (which currently favours men), get more women into top jobs[37] and include female perspectives in studies and territorial plans. The latter aspect is crucial in the case of Active Ageing for the reasons set out above. Furthermore, parenthood still affects working women more than it does their male counterparts because of pervading cultural conditioning factors.

It is necessary to carry out thorough official assessments of gender equality compliance on a regular basis, publish the results in open access platforms, and subsequently implement the relevant corrective measures.

Science education

This key affects all three policy foci (Circular Economy, Active Ageing and Intelligent Design in Industry). The more educated people become in these matters, the more sensitive and community-aware their behaviour and, in consequence, the higher their demands and expectations for improvements and actions by public powers, research teams and private companies.

The science education effort is encouraged and supported by the EU and by regional and local public administrations, as seen, for example, in the Catalan Government's National Agreement for the Knowledge Society[38]. This agreement is the fruit of the collaboration between the major quadruple helix actors for fostering Catalonia's knowledge transfer towards the productive fabric in the interest of society.

Science education is mostly implemented in the research and academia sector, which is to be expected, since researchers and academics are producers and disseminators of scientific knowledge. Their contribution has included organising different scientific dissemination activities aimed at Catalan schools, families and lay citizens. Some of these activities address environmental protection, recycling and healthy living, all of which are relevant to the RRI-LEADERS project. Science education in the territory is mainly aimed at young or middle-aged

[33] https://www.idescat.cat/indicadors/?id=ue&n=10106
[34] https://www.peretarres.org/premsa/sala-de-premsa/noticies/80-de-les-cuidadores-no-professionals-son-dones
[35] https://gpaq.upc.edu/lldades/indicador.asp?index=1_1_5
[36] https://www.idescat.cat/indicadors/?id=ue&n=10128
[37] https://www.eada.edu/ca/actualitat/noticies/2021/05/bretxa-salarial-i-presencia-de-la-dona-en-posicions-directives-2021
[38] http://empresa.gencat.cat/ca/intern/pnsc

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people, disregarding the eldest segment of the population. Given that people aged over 65 years accounted for 19% of the regional population in 2021 (according to the Statistical Institute of Catalonia[39]), steps should be taken to involve them in more science education events, not only to increase their knowledge, but also to provide social and mental stimulation, helping them to lead healthier and more meaningful lives.

A similar science education gap is found in industrial design and digitalisation. Given the complexity of these subjects, the gap encompasses people of all ages, though at the school level, robotics and programming initiatives (i.e., Scratch[40]) have recently appeared outside the official school curriculum. Greater collaboration with universities to improve teacher training could help to address this problem.

The main issue with science education is that no clear and common guidelines are provided to ensure its implementation in the most fruitful and innovative way. Science education is left in the hands of individual research centres and academic institutions, and its implementation sometimes depends on certain individuals' willingness and availability. It would be useful to establish common bases and spaces for creating closer collaboration between the different interested stakeholders. For example, students, teachers, elderly people and private companies could design science education programmes together to satisfy all their needs, then subsequently participate in the evaluation and dissemination of the results.

Open Access

Open access is a very important RRI key in Circular Economy, Active Ageing and Intelligent Design in Industry, since accessing the latest knowledge and developments is essential for any innovation effort dealing with the environment, recycling, ageing, health or digitalisation.

Though all the quadruple helix stakeholders recognise the importance of open access, there remain barriers to its practical implementation. While researchers and academics support the spirit of open access, they often choose to publish in certain prestigious subscription-based journals, prioritising reputation and career-enhancing potential over other considerations.

Another important aspect is communication: in short, how best to disseminate complex research studies to lay citizens, policymakers and businesspeople, all of whom stand to benefit from science education. More efforts should be made to train researchers and/or the staff of communication departments in universities and research centres to improve the communication of science and innovation matters to different audiences, keeping in mind the need and preferred channels of each target groups.

Open access is not usually addressed in the business sector, since most companies are not producers of knowledge. For those that are, however, intellectual property has become a thorny issue. Companies regard this RRI key as relevant, but confess that in practice they do not give it the consideration it deserves. It would be helpful to introduce initiatives aimed at communicating the potential benefits of research results for organisations' products, services, human resources management and processes.

Policymakers and public administrations are considered by the rest of the stakeholders to be the main open access promoters. Through the above-mentioned National Agreement for the Knowledge Society, the Catalan Government has set up the Catalonia Research Portal[41] (Portal de la Recerca de Catalunya), with links to the European Open Science Cloud, which enables free and easy access to the research outputs produced by publicly funded organisations.

[39] https://www.idescat.cat/pub/?id=inddt&n=915
[40] https://scratch.mit.edu/
[41] https://portalrecerca.csuc.cat/

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Public engagement

Although Catalonia's culture of public engagement is not generally reflected in the quadruple helix sectors, interesting examples have been implemented by each. In the case of policymakers and public administrations, examples include the above-mentioned National Agreement for the Knowledge Society and the project led by Sabadell City Hall in the framework of the Interreg EU calls, "RELOS3: From Regional to Local. Successful deployment of the Smart Specialisation Strategies", which actively involves business, innovation and research and local authorities in Circular Economy, Active Ageing and Intelligent Design in Industry. Likewise, RIS3CAT explicitly mentions the need for public engagement.

In the research and academic sector, there are examples of indirect public engagement in cases linked to citizen science, and direct public engagement in research studies and public consultations. However, this engagement is mainly related to environmental[42] or health issues[43] and has been implemented in a unidirectional way (downstream): neither citizens nor businesses, or even policymakers, participate in the design or posterior analysis.

Incorporating the different perspectives of citizens, researchers and policymakers in the work of the business sector is considered beneficial. This is difficult to put into practice, however, owing to time constraints, mistrust (different types of stakeholders often speak different "languages" and sometimes show divergent interests), funding constraints and the day-to-day demands at work.

Public engagement of lay citizens is uncommon, for two main reasons: 1) Most citizens have never heard of Intelligent Design in Industry, and those that have tend to regard it as a distant issue and are not willing to engage in related participative processes; 2) In Active Ageing, public engagement is complicated, owing to the traditional passivity of this segment of the population, health problems associated with old age, and unfamiliarity with certain scientific aspects. However, with regard to Circular Economy, people are becoming more aware of environmental matters and are more likely to engage in participative processes related to environmental protection.

AIRR dimensions

Despite some differences in the interpretation of terms, stakeholders who participated in the interviews and the two workshops considered that AIRR dimensions were not only important, but were also *de facto* implemented, especially anticipation. Some dimensions are explicitly mentioned in the main territorial policies on Smart Specialisation, RIS3CAT and RELOS3 (e.g. inclusiveness), while others are referred to implicitly (reflexivity and responsiveness).

Anticipation

Anticipation is the most commonly implemented AIRR dimension in all the organisations in the territory dealing with Circular Economy, Active Ageing and Intelligent Design in Industry. Its implementation is essential for establishing priorities, strategic plans and roadmaps, aside from being an inherent part of any innovation process. It is also included in RIS3CAT for setting the path towards the future R&D and innovation policy in the territory, anticipating the impact of RIS3CAT actions.

[42] Comissió per a l'impuls de la ciència ciutadana i natura (CICCNA) http://mediambient.gencat.cat/ca/05_ambits_dactuacio/educacio_i_sostenibilitat/educacio_per_a_la_sostenibilitat/ciencia-ciutadana-natura/comissio-impuls-ciencia-ciutadana-natura/

[43] A good example would be CitieS-Health: Citizen Science on Health Issues in Urban Environments, implemented by ISGlobal in 2018 https://www.isglobal.org/ca/-/arranca-cities-health-ciencia-ciudadana-sobre-cuestiones-de-salud-en-entornos-urbanos

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However, anticipation is a task undertaken by high-ranking members of staff within the organisations, while lower ranking human resources are mostly excluded. This is a mistake, as they could contribute interesting and diverse perspectives, and including them in the process would increase their sense of belonging and attachment to the organisation.

Inclusion

Inclusion is scarcely implemented for reasons similar to those mentioned in the section on public engagement. Civil society and lay citizens have a low interest in research and innovation processes, for reasons related to culture, difficulty of access, lack of scientific and innovation knowledge, and budgetary and time constraints.

This dimension is highlighted in RIS3CAT and RELOS3, which emphasise the need for quadruple helix participation in the governance and innovation system. Inclusiveness should be promoted and enhanced, given its potential to add value in the R&I processes and results across the territory. Implementing this dimension involves: 1) understanding better the needs and challenges facing the community; 2) creating opportunities for co-creation and new ideas; 3) helping to build trust and align values between different sectors and communities; and d) assessing and validating R&I to ensure no one is left behind.

Reflexivity

A certain degree of reflexivity is *de facto* implemented in all the organisations engaging with Circular Economy, Active Ageing and Intelligent Design in Industry. This is particularly the case in research and business after the assessment phase and before undertaking any improvement in final products and services. Reflexivity perhaps does not apply to the same extent in internal processes, which are often overlooked, though an exception to this tendency is found in Intelligent Design in Industry, which is based on upgrading the entire manufacturing process and value chain through Industry 4.0 mechanisms, leading to improvements in innovation, design, and creativity for smart manufacturing and smart products.

Policymakers often rely on external expertise provided by researchers and sometimes business. In fact, the research sector is often a reflexivity “provider” for both business and policymakers, having even established units or specific mandates for this task. It would therefore be useful to promote and establish common guidelines, training, formal agreements and regular meetings amongst the different stakeholders for conducting thoughtful reflexivity exercises.

This dimension is incorporated in RIS3CAT, in the section discussing the potential impact of the proposed actions, which underscores the importance of impact in organisations’ paths of innovation, adaptation and success.

Responsiveness

A certain degree of responsiveness is implemented by all the organisations, with obvious differences due to the typology, objectives and internal functioning of each. In the case of the business sector, responsiveness is heavily influenced by its profit-oriented rationale, while in the case of policymakers and public administrations, the political cycle (four years) interferes with changes in managerial teams, priorities and public sector approaches. There is greater stability in the research and academic sector, though the responsiveness of public research and academic organisations can also be affected by external political decisions.

RIS3CAT accommodates this dimension through the readaptation of actions to address the needs and expectations of all the stakeholders and better respond to new developments.

This AIRR dimension is particularly relevant in Active Ageing and Circular Economy, which deal with socially sensitive subjects and matters that greatly depend on territorial policy decisions.

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5.4 SWOT/TOWS analysis

Table 9: SWOT analysis of Sabadell

Strengths	*Weaknesses*
S1 - Certain RRI keys (science education, gender equality, ethics) are *de facto* implemented by the research/academia, business and policy making stakeholders. This experience can be used and even enriched by other organisations.	**W1** - Organisations lack knowledge of the RRI/AIRR approach and its potential benefits, and also lack official guidelines.
S2 - Anticipation and reflexivity exercises are *de facto* implemented by the quadruple helix stakeholders' organisations. This experience can be used and enriched by other organisations.	**W2** - Short-term economic aspects and own internal objectives are prioritised over other considerations like RRI/AIRR.
S3 - RIS3CAT and PECT Vallès Industrial explicitly mention public engagement and inclusiveness of authorities and social and innovation actors in the territory for creating common working arenas.	**W3** - There is a lack of participative culture in the organisations.
S4 - EU-Interreg project RELOS3 includes Circular Economy, Active Ageing and Intelligent Design in Industry as objectives with concrete actions to be developed with quadruple Helix collaboration.	**W4** - The whole RRI/AIRR approach is not included in plans and regulations; and keys like ethics, public engagement and science education are not even recommended for organisations.
	W5 - Regional and local policymaking and decision-making is down-stream and expert consultation is neither regular nor formally established.
Opportunities	***Threats***
O1 - Changes in the mentality of Catalan society facilitate the adoption and extension of certain RRI keys, such as public engagement, ethics and transparency (open access).	**T1** - Difficulties in the identification and access to new groups of stakeholders not traditionally included in collaborative processes hamper inclusiveness.
O2 - The new reactivation plan of EU Next Generation facilitates the implementation of RRI/AIRR-linked initiatives and prioritisation of sustainability issues.	**T2** - There is a certain degree of passivity, reluctance to change and bureaucracy in the public administrations, causing delays in the implementation of new measures and plans and/or corrective measures (responsiveness).
O3 - Public administration is perceived by the rest of the stakeholders as the promotor and guardian of certain RRI keys (ethics, open access, science education). If public administrations "set an example", it could stimulate the remaining stakeholders to adopt the RRI/AIRR approach, which they consider to be important.	**T3** - Rivalry and competition exists between stakeholders with different levels of power, pressure and influence (lobbies) in the territory, resulting in problems of coherency in strategic planning and mistrust when having to engage in collaborative processes.
O4 - The universalisation of the use of the internet and digital solutions (software or apps) facilitate the implementation of open access, science education, public engagement and reflexivity exercises.	**T4** - The high speed of technological change hinders the capacity of firms to integrate the solutions that best facilitate public participation and inclusiveness (especially for the policy focus of Intelligent Design in Industry).

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TOWS analysis

The findings described in the synthesis of experiences related to RRI-AIRR and in the SWOT analysis can be boiled down to two main conclusions. Firstly, most of the identified strengths and weaknesses, as well as most of the opportunities and threats, are common to the three policy areas. Secondly, RIS3CAT is a well-developed framework for innovation and development strategies and works with the RRI-AIRR approach. This means that **Sabadell and Catalonia can and must capitalise on their own activities to define strategies for effectively implementing RRI-AIRR in the territory**.

The table below proposes strategies for building on strengths and opportunities in order to control weaknesses and threats. Strategies that impact all the opportunities and threats have been selected over other alternatives. Strategies that can be used in different policy areas have also been favoured. The result is a compact set of strategies that can be efficiently implemented by the different stakeholders.

Table 10: TOWs analysis of Sabadell

How can we use Strengths to successfully deal with Threats?	**T1 - Difficulties in the identification and access to new groups of stakeholders not traditionally included in collaborative processes hamper inclusiveness.**	**T2 - There is a certain degree of passivity, reluctance to change and bureaucracy in the public administrations, causing delays in the implementation of new measures and plans and/or corrective measures (responsiveness).**	**T3 - Rivalry and competition exists between stakeholders with different levels of power, pressure and influence (lobbies) in the territory, resulting in problems of coherency in strategic planning and mistrust when having to engage in collaborative processes.**	**T4 - The high speed of technological change hinders the capacity of firms to integrate the solutions that best facilitate public participation and inclusiveness (especially for the policy focus of Intelligent Design in Industry).**
S1 - Certain RRI keys (science education, gender equality, ethics) are de facto implemented by the research/academia, business and policy making stakeholders. This experience can be used and even enriched by other organisations.	Establish formal and informal meeting points for the quadruple helix stakeholders to exchange experiences and views regarding the application of RRI keys, and for fostering mutual trust. This should be reinforced through their joint participation in workshops and capacity-building initiatives linked to the 2021-2027 EU Funds framework and the RIS3CAT activities.		Formalise and disseminate evaluation and planning tools and strategies of the different quadruple helix stakeholders, fostering trust and participation through an open platform. This is especially important for the stakeholders traditionally less involved in planning and participation processes. The existing Unicorn Challenges	

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			Platform enables the creation of such spaces.	
S2 - Anticipation and reflexivity exercises are de facto implemented by the quadruple helix stakeholders' organisations. This experience can be used and enriched by other organisations.	Formalise and disseminate evaluation and planning tools and strategies of the different quadruple helix stakeholders, fostering trust and participation through an open platform. This is especially important for the stakeholders historically less involved in planning and participation processes. The existing Unicorn Challenges Platform enables the creation of such spaces	Use guidelines and examples provided by the Catalan Government to participate in the NGEU initiatives (as well as in future EU Funds projects) and thus improve the use of the full RRI approach in the public administration.		Provide examples of how to use new technologies to improve planning and decision-making.
S3 - RIS3CAT and PECT Vallès Industrial explicitly mention public engagement and inclusiveness of authorities and social and innovation actors in the territory for creating common working arenas.		Extend RIS3CAT's use of the RRI approach in the 2014-2020 and 2021-2027 frameworks to shape new projects with the public administration leadership.	Extend RIS3CAT's use of RRI guidelines and tools (such as the AREA framework or the shared agendas) in the 2014-2020 and 2021-2027 frameworks to build common projects and initiatives in a safe and trustful environment.	
S4 - EU-Interreg project RELOS3 includes Circular Economy, Active Ageing and Intelligent Design in Industry as objectives with concrete actions to be developed with quadruple Helix collaboration.	Use the experiences, tools and knowledge gained in RELOS3 activities (such as future workshops and guidelines about the RIS3) to foster and promote public participation with a focus on local social challenges.	Use the tools obtained in RELOS3 activities (such as workshops and guidelines about the RIS3 local implementation) to feed into the design and future implementation of EU-funded projects, fostering and promoting public participation with a focus on local social challenges.		

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What Weaknesses should be eliminated to make the most of Opportunities?	**O1 - Changes in the mentality of Catalan society facilitate the adoption and extension of certain RRI keys, such as public engagement, ethics and transparency (open access).**	**O2 - The new reactivation plan of EU Next Generation facilitates the implementation of RRI/AIRR-linked initiatives and prioritisation of sustainability issues.**	**O3 - Public administration is perceived by the rest of the stakeholders as the promotor and guardian of certain RRI keys (ethics, open access, science education). If public administrations "set an example", it could stimulate the remaining stakeholders to adopt the RRI/AIRR approach, which they consider to be important.**	**O4 - The universalisation of the use of the internet and digital solutions (software or apps) facilitate the implementation of open access, science education, public engagement and reflexivity exercises.**
W1 - Organisations lack knowledge of the RRI/AIRR approach and its potential benefits, and also lack official guidelines.	Use public activities and forums to encourage the dissemination of stakeholders' previous experiences in certain RRI keys, and thus ease the transition to a full application of the RRI-AIRR approach. In these activities, public participation must be also encouraged.	Use the different available guidelines, such as those developed as part of RIS3CAT, to improve the integration of the RRI approach into new projects linked to the NGEU framework.	Include specific requirements for participation in projects and contracts to enforce the implementation of keys and dimensions.	
W2 - Short-term economic aspects and own internal objectives are prioritised over other considerations like RRI/AIRR.		Use different available guidelines, such as those developed as part of RIS3CAT, to improve the integration of a long-term perspective and RRI approaches into new projects.	Use the Public Procurement of Innovation (PPI) instrument, the Cohesion Funds and other public funding instruments focused on innovation and business to reinforce the RRI-AIRR approach.	
W3 - There is a lack of participative culture in the organisations.		Use guidelines and examples provided by public administrations (such as the Catalan Government) to participate in the NGEU initiatives and thus improve the governance of the quadruple helix stakeholders.	Use the guidelines and examples provided by the public administrations (such as the Catalan Government) to participate in public tenders and any project under public administrations' leadership and thus improve the governance of the quadruple helix stakeholders.	

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W4 - The whole RRI/AIRR approach is not included in plans and regulations; and keys like ethics, public engagement and science education are not even recommended for organisations.		Use the different available guidelines, such as those developed as part of RIS3CAT, to improve the integration of a long-term perspective and RRI approaches into new projects.	Implement new requirements for accessing public funding for research, innovation or competitiveness, as the RIS3CAT is proposing for the 2021-2027 period in Catalonia, to improve the integration of the RRI-AIRR approach.	
W5 - Regional and local policymaking and decision-making is down-stream and expert consultation is neither regular nor formally established.				Use new platforms such as the Unicorn Challenge Platform to foster participation of the public and of the quadruple helix stakeholders.

Which Weaknesses must be eliminated, to successfully fight Threats?	**T1 - Difficulties in the identification and access to new groups of stakeholders not traditionally included in collaborative processes hamper inclusiveness.**	**T2 - There is a certain degree of passivity, reluctance to change and bureaucracy in the public administrations, causing delays in the implementation of new measures and plans and/or corrective measures (responsiveness).**	**T3 - Rivalry and competition exists between stakeholders with different levels of power, pressure and influence (lobbies) in the territory, resulting in problems of coherency in strategic planning and mistrust when having to engage in collaborative processes.**	**T4 - The high speed of technological change hinders the capacity of firms to integrate the solutions that best facilitate public participation and inclusiveness (especially for the policy focus of Intelligent Design in Industry).**
W1 - Organisations lack knowledge of the RRI/AIRR approach and its potential benefits, and	Encourage formal and informal meeting points for the quadruple helix stakeholders to exchange views regarding the RRI keys application, and for	Use the available guidelines, such as those developed as part of RIS3CAT, to improve the integration of the RRI approach into new projects		

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also lack official guidelines.	fostering mutual trust. This should promote the participation of all the quadruple helix stakeholders.			
W2 - Short-term economic aspects and own internal objectives are prioritised over other considerations like RRI/AIRR.		Incorporate the principles of inclusion and responsiveness, using guidelines and examples provided by the Catalan Government, to participate in the NGEU initiatives as well as the future EU Funds projects, extending the effects to private companies in particular.	Use the available guidelines, such as those developed as part of RIS3CAT, to foster collaboration, cooperation and long-term thinking when developing new projects within the NGEU and EU Funds frameworks.	Use the Public Procurement of Innovation (PPI) instrument with the RRI approach to successfully integrate innovation and new technologies in the different sectors.
W3 - There is a lack of participative culture in the organisations.	Encourage formal and informal meeting points for the quadruple helix stakeholders to exchange views regarding the RRI keys application, and for fostering mutual trust. This should also promote the participation of different organisational levels within the stakeholders' organisations.	Use the guidelines and examples provided by public administrations (such as the Catalan Government) to participate in public tenders and any project under public administrations' leadership and thus improve the governance of the quadruple helix stakeholders.		
W4 - The whole RRI/AIRR approach is not included in plans and regulations; and keys like ethics, public engagement and science education are not even recommended for organisations.		Implement new requirements for accessing public funding for research, innovation or competitiveness, as the RIS3CAT is proposing for the 2021-2027 period in Catalonia, to improve the integration of the RRI-AIRR approach. This should foster cooperation and collaboration under a common objective.		
W5 - Regional and local policymaking and decision-making is down-	Use new platforms, such as the Unicorn Challenge Platform, to foster participation of the	Use methodologies such as those proposed by the Catalan Government in the Entrepreneurial Discovery Process, as well as shared agendas and collaboration processes, to		

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stream and expert consultation is neither regular nor formally established.	public and of the quadruple helix stakeholders. This should encourage the inclusion of new stakeholders who are not usually involved in participation processes.	improve the design and implementation of new projects by public administrations.	

How can we use Strengths to develop Opportunities?	**O1 - Changes in the mentality of Catalan society facilitate the adoption and extension of certain RRI keys, such as public engagement, ethics and transparency (open access).**	**O2 - The new reactivation plan of EU Next Generation facilitates the implementation of RRI/AIRR-linked initiatives and prioritisation of sustainability issues.**	**O3 - Public administration is perceived by the rest of the stakeholders as the promotor and guardian of certain RRI keys (ethics, open access, science education). If public administrations "set an example", it could stimulate the remaining stakeholders to adopt the RRI/AIRR approach, which they consider to be important.**	**O4 - The universalisation of the use of the internet and digital solutions (software or apps) facilitate the implementation of open access, science education, public engagement and reflexivity exercises.**
S1 - Certain RRI keys (science education, gender equality, ethics) are de facto implemented by the research/ academia, business and policy making stakeholders. This experience can be used and even enriched by other organisations.	Encourage the dissemination of stakeholders' previous experiences with certain RRI keys to ease the transition to a full application of the RRI-AIRR approach.		Use activities (workshops, meetings, etc.) developed by public administrations and related to local development and public participation to disseminate stakeholders' previous experiences with certain RRI keys	Use new platforms, such as the Unicorn Challenge Platform, to foster participation of the public and of the quadruple helix stakeholders.
S2 - Anticipation and reflexivity exercises are de facto implemented by		Use the guidelines and examples provided by public administrations (such as the Catalan Government) to participate in the NGEU initiatives		

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the quadruple helix stakeholders' organisations. This experience can be used and enriched by other organisations.		and thus improve the current planning strategies of the different quadruple helix stakeholders.		
S3 - RIS3CAT and PECT Vallès Industrial explicitly mention public engagement and inclusiveness of authorities and social and innovation actors in the territory for creating common working arenas.		Capitalise on the RIS3CAT and PECT Vallès initiatives and their implementation of the RRI-AIRR framework to disseminate new tools and public and private initiatives regarding the NGEU with an embedded use of the RRI approach.	Extend the RIS3CAT's use of the RRI-approach in the 2014-2020 and 2021-2027 frameworks to shape new projects with the public administration's leadership.	Use new platforms, such as the Unicorn Challenge Platform, to foster participation of the public and of the quadruple helix stakeholders.
S4 - EU-Interreg project RELOS3 includes Circular Economy, Active Ageing and Intelligent Design in Industry as objectives with concrete actions to be developed with quadruple Helix collaboration.		Use the experiences, tools and knowledge gained through RELOS3 activities (such as future workshops and guidelines about the RIS3) to feed into the design and future implementation of NGEU projects, thus fostering and promoting public participation with a focus on local social challenges.		

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5.5 Identification of strategic policy priorities

General Policy Context

To develop any Smart Specialisation project in the Catalan territory, all quadruple helix agents and stakeholders must take into account the current RIS3CAT framework and its strategic priorities, guidelines and initiatives. RIS3CAT has been working on co-design and co-creation paradigms, linked to the RRI spirit, for the innovation ecosystem and territorial development. It is therefore vital that the quadruple helix stakeholders' vision and experiences are also addressed in the new RIS3CAT Strategy for 2021-2027.

Most of the key elements detected in the SWOT and TOWS analysis have cross-sectional and institutional characteristics, rather than being sector-specific or strictly policy-related. This is especially true for strengths and weaknesses, but also for opportunities and threats. Focusing on and prioritising these common elements could have a greater impact on the presence of the RRI-AIRR approach than any other alternative.

Circular Economy

Regarding the policy area of Circular Economy, the main priorities and methods for increasing the adoption of the RRI-AIRR approach should be:

- **Using the RRI-AIRR approach as "the common approach" for any new Circular Economy initiative of the quadruple helix agents and stakeholders in the territory**. It is critical to have a high degree of technological and social innovation as well as a broad implication and participation of all the quadruple helix stakeholders. This would support resilience and adaptation in the face of potential context changes. To make the RRI-AIRR approach feasible, it is important to:
  - Increase the **dissemination of the RRI-AIRR approach**, in formal and informal forums, meetings, or collaboration opportunities of the quadruple helix stakeholders. These actions should be accompanied by **guidelines and diffusion materials** to facilitate understanding and practical application.
  - **Share the experiences and results** of those with a more extensive background in the use of the RRI-AIRR approach. Some of the quadruple helix stakeholders in Sabadell and Catalonia have already worked with or applied the approach (for instance, by participating in some RIS3CAT initiatives or projects), and their experiences can be used to speed up the adoption process and develop a catch-up strategy for stakeholders with little or no experience in strategy or innovation planning and implementation. This would build deeper and more widespread public trust in participation processes.
  - **Leverage public administration prescription and purchasing capacities** to increase the use of the RRI-AIRR approach. The public administrations in Sabadell and Catalonia play a key role in the Circular Economy projects and initiatives. They are leading different projects linked to this policy area within the NGEU[44] and MFF2021-2027[45] frameworks, and they have substantial purchasing power for these kinds of products and services. The adoption of the RRI-AIRR approach in both frameworks could have a significant impact on its presence in the territory.
- **Capitalising on the RIS3CAT framework and on PECT-Vallès and RELOS3 activities**. The ongoing and future development of RIS3CAT 2021-2027 includes different collaboration and co-design activities (workshops, working groups, etc.) in which Sabadell has the opportunity to participate whilst promoting the quadruple helix stakeholders' involvement. In addition, PECT-Vallès is promoting different actions related to Circular Economy and developing deeper collaboration agreements amongst the quadruple helix agents in the territory. In this context, the most efficient strategy would be to capitalise on these efforts to embed the RRI-AIRR approach in the different activities by making use of all the guidelines and tools developed for the

[44] https://ec.europa.eu/info/strategy/recovery-plan-europe_en
[45] https://www.consilium.europa.eu/en/policies/the-eu-budget/long-term-eu-budget-2021-2027/#

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implementation of RIS3CAT and PECT-Vallès, such as the Unicorn Challenges Platform, which was developed as part of the HubB30 initiative. It is also necessary to ensure that the Sabadell and Vallès Occidental perspectives are included in the new RIS3CAT framework.

- **Forming clusters and encouraging cooperation as prerequisites for the Circular Economy initiatives**. RIS3CAT and PECT Vallès are already working on promoting the involvement and close collaboration of the quadruple helix agents and stakeholders in Sabadell and the Vallès Occidental. The RIS3CAT approach to smart Specialisation in relation to the Circular Economy also emphasises the need for close collaboration within the quadruple helix framework, where the RRI-AIRR approach plays a key role. It is an opportunity to build on these axes to foster cooperation and clustering around the Circular Economy projects whilst incorporating the RRI approach as a tool for facilitating the cooperation effort.
- **Incorporating planning and evaluation improvements into the design and implementation of Circular Economy projects** through sharing of experiences and know-how amongst the quadruple helix stakeholders in Sabadell. During these two phases – planning and evaluation – there are opportunities for the more experienced stakeholders to spread their knowledge of all the RRI keys and AIRR domains, with the support of the public administrations.

Active Ageing

Most of the policy priorities and strategies in the Active Ageing policy area have features in common with those proposed for Circular Economy. This section will focus on some specific elements of the Active Ageing policy area whilst reiterating many of the priorities described above (such as capitalisation, clustering, collaboration, planning, etc.). In the area of Active Ageing, then, the key priorities and strategies involve:

- **Increased use of the RRI-AIRR approach to meet the growing need for new and innovative products and services related to elderly people**. Innovation and social challenges are both key components of any new project or initiative, but are especially important given the growing need for new and innovative solutions for providing services or products to elderly people. Here the RRI approach could play a central role, and its implementation would require:
  - Increased **dissemination of the RRI-AIRR approach**, both in formal and informal forums, meetings, or collaboration opportunities of the quadruple helix stakeholders.
  - **Leverage of public administration prescription and purchasing capacities**, especially when they play a key role in the consumption and dissemination of new products and services focused on elderly people. Public administrations can help to establish the RRI-AIRR approach as a standard in any project or contract they lead.
- **Capitalisation of the RIS3CAT framework and the PECT-Vallès and RELOS3 activities**. Again, the most efficient strategy is to capitalise on the existing efforts of the Catalan Government and different stakeholders in the Vallès Occidental to embed the RRI-AIRR approach in the different activities by making use of all the guidelines and tools developed for the implementation of RIS3CAT and PECT-Vallès, such as the UCityLab Project[46] with the Covadonga Urban Lab in the Covadonga neighbourhood of Sabadell, the CatLabs[47] instrument, and the Unicorn Challenges Platform[48]. These tools provide a growing framework of public activities where the RRI approach is advertised, and promote the participation of many stakeholders with little or no experience in innovation or public policies processes.
- **Participation and active involvement of the quadruple helix stakeholders in Sabadell and Vallès Occidental**. One of the key elements of the RRI-AIRR approach is the active implication of the quadruple helix stakeholders, especially citizens. A special effort is required to include older people, who tend not to get

[46] https://www.ucitylab.eu/
[47] https://catlabs.cat/
[48] http://unicorn-project.eu/

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involved in participation processes, particularly processes focused on innovation. Using the tools, guidelines and activities provided by RIS3CAT, PECT-Vallès or RELOS3 (such as the RISCAT Monitoring Collection of guidelines, Shared Agendas tool, Unicorn Challenges Platform, CatLabs initiative, co-design policy workshops, Covadonga City Lab, etc.), it is possible to increase the participation of all stakeholders, and especially elderly people, to ensure the effective use of the RRI-AIRR approach. Combined with other initiatives, such as citizen science activities or co-design and co-development processes, involving these stakeholders can facilitate RRI use in the innovation processes in Sabadell.

Intelligent Design in Industry

As with Active Ageing, this section will focus on elements that are specific to the policy area, though the basic priorities and proposals are the same as those discussed in the previous two sections. Regarding the Intelligent Design policy focus, these specific elements are:

- **Use of the RRI-AIRR approach in the context of fast evolving technologies and product cycles**. Innovation and social challenge are again key considerations when applying the Intelligent Design paradigm to new products and/or services for the industry. This is reinforced by the speed of technological changes and the need to innovate to stay ahead or even catch up, and the key role that RRI can play in improving the quality of that innovation. To ensure RRI adoption, it is important to:
  - Increase the **dissemination of the RRI-AIRR approach**, both in formal and informal forums, meetings, or collaboration opportunities of the quadruple helix stakeholders.
  - **Leverage public administration prescription and purchasing capacities** using the means that the legislation and administrative processes provide, such as the public procurement of innovative solutions (PPI). This could help to bring to the market new products with a higher RRI component.
  - Capitalisation of the RIS3CAT framework and the PECT-Vallès and RELOS3 activities regarding industry 4.0 and intelligent design. Once again, Sabadell and Catalonia can capitalise on the efforts of other initiatives to embed the RRI-AIRR approach in the different activities by using the guidelines and tools developed for the implementation of RIS3CAT and PECT-Vallès. All these resources include specific actions linked to different Key Enabling Technologies, industry 4.0 or Intelligent Design, and can be used as a platform for increasing the presence of the RRI-AIRR approach with the involvement of the quadruple helix stakeholders with more experience.

5.6 Summary of focus group discussions

Analytical summary

The four focus groups, organised online in November 2021, showed similar and complementary views on the topics discussed. Most of the participants belonged to the area of Active Ageing, so the discussion focused mainly on this topic, which they regarded as having the greatest potential for the inclusion of the RRI-AIRR approach. They even considered that Active Ageing could act as a driver for developing solutions in Circular Economy and Intelligent Design in Industry. The four groups agreed that the elderly could be promoters and users of solutions that ensure a more efficient use of resources, or that they could provide their views on ageing-related challenges. Policies aimed at Active Ageing solutions (co-housing for example) could create opportunities for innovation and experimentation.

Regarding transformative changes, all four groups highlighted the need for participation to be open to all kind of stakeholders (including companies), since the current participatory processes usually excludes lay citizens. This aspect received particular attention in the business and citizens' focus groups. Policy makers focused more on science education and mentioned the need to use existing participatory channels to integrate RRI into the

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chosen policy areas. The transformation of the production and consumption model was also mentioned in the citizens and the public sector focus groups.

Participants agreed that there is a danger of a digital and technological divide and polarisation of people. In this sense, all groups considered that public engagement and ethics are essential RRI keys for researchers and business to ensure proper solutions (in Active Ageing, but also Industrial Design) and for policy makers to establish the necessary regulations. Citizens and business alike highlighted the importance of gender equality, acknowledging that there are still deficiencies in this area. Science education was considered essential for citizens and policy makers to increase knowledge and awareness of the needs linked to ageing, the impact of technology, and the urgency of adopting more sustainable lifestyles.

The dimensions that sparked the most discussion in all four groups were anticipation, reflexivity and inclusion. Citizens focused on the need to consider inclusion in a broad way, to reach citizens of all ages, educational levels, ethnicities, etc. They considered that to achieve this, research and innovation language would have to be adapted. The other groups covered the topic of inclusion in a more general way. Researchers considered that reflexivity could help them to become aware of the impact of their work, while policy makers admitted that anticipation is sometimes absent in policies despite being an essential dimension.

All discussants agreed that all agents should collaborate in the implementation of transformative changes. Citizens and business representatives agreed that there needs to be greater collaboration between them and that the role of public administration is to put them in contact, though without interfering too much once the connection is made. Policy makers expressed a similar opinion, highlighting the need to promote existing participatory channels.

All groups considered that the last question, "Recommendations for integrating the RRI keys and AIRR dimensions in the identified strategic policy priorities", was difficult to answer, or had already been answered in their previous responses. Policy makers mentioned the importance of having enough resources to integrate the RRI keys and AIRR dimensions in the policy priorities, while citizens and business coincided in the need to focus on connecting all the different agents.

Focus group with business representatives (5 participants)

1. Vision for the development of your territory in the chosen policy area(s) by 2030 (2050)

The discussants considered that the three policy areas of Sabadell/Catalonia have the potential to be included in a cross-sectional vision of a more sustainable and inclusive territory, where Circular Economy drives the promotion of solutions in Active Ageing and Design. According to this perspective, seniors can be a key asset for society and for business, helping to identify and design sustainable solutions to challenges related to an ageing society that must become environmentally sustainable, with innovation as a tool to shape these solutions. The participants discussed the benefit of co-living versus retirement homes for the elderly: the former living model enables practical experience with Circular Economy and even Design, since residents live in a more autonomous way.

2. What is the transformative change that your territory should go through to achieve this vision? Which are the strategic policy priorities stemming from the vision?

The main change should be increased co-responsibility of the different agents involved. Public administration should be able to identify emerging initiatives in the policy areas and support their development, especially at the local level. Regarding strategic policy, information must be made accessible to the private sector, a key agent in the provision of local solutions to the challenges of Active Ageing and Circular Economy. It was mentioned

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that business sector stakeholders, especially SMEs, are frequently unaware of collaboration possibilities with civil society that could help them to develop innovations or transfer research results to commercial products and services. Access to and dissemination of these initiatives are therefore key priorities.

3. How the RRI framework, or individual RRI keys could support the process of transformative change?

Public engagement and ethics are the most important keys for supporting transformative change. Public engagement is needed to ensure that agents are committed to working together and are co-responsible for the identification of challenges and solutions. Ethics is closely related to the previous key, as unethical initiatives will not achieve the goal of providing solutions that benefit the whole of society. Gender equality was also deemed essential: although it is enforced by law, there are still huge deficiencies in this area.

4. How the integration of the AIRR dimensions could support the process of transformative change?

The participants considered responsiveness to be essential for adapting to a changing society, and believed it would be more effective if all agents were included in the process of change. A good responsiveness strategy would allow for more significant transformation and should go together with a clear strategy that includes the vision of all agents.

5. How do you perceive the role of *business* in the process of this transformative change for achieving the identified policy priorities?

As a provider of resources, the business sector is a key actor in this change, but it cannot work alone as it has its own agenda based on profitability. The public sector must help the business sector to understand the need for collaboration with other agents.

6. Recommendations for integrating the RRI keys and AIRR dimensions in the identified strategic policy priorities

An effective strategy would promote easy access to information and intensify collaboration among the different territorial agents.

<u>Focus group with civil society representatives (6 participants)</u>

1. Vision for the development of your territory in the chosen policy area(s) by 2030 (2050)

Active Ageing was the main focus in this group. The members considered that, before building a vision, it is necessary to achieve a common understanding of what Active Ageing is. The whole of society, including the elderly, must share this vision, and participate in the design of solutions to Active Ageing challenges. This group also envisioned a territory in which all agents participate in the design of solutions to promote Circular Economy

2. What is the transformative change that your territory should go through to achieve this vision? Which are the strategic policy priorities stemming from the vision?

Achieving transformative change requires the inclusion of citizens. Participants mentioned that citizens feel disoriented about the near future, regarding technological transformation as a key challenge. Participants perceived a danger of social polarisation that must be tackled by involving citizens in research and productive processes. Technology is leaving part of society behind: many people have to use it without understanding it. To solve this problem, accessible debates and dissemination spaces are needed. Likewise, participatory processes must involve lay citizens and not only organised entities or NGOs.

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Strategic policy priorities are education, guaranteeing access to information and adapting "R&I" language to different audiences. In this sense, it is essential to provide resources to identify the "left behind" citizens and to involve them in participatory processes.

3. How the RRI framework, or individual RRI keys could support the process of transformative change?

Public engagement was considered essential for achieving change. Ethics and open access are needed to ensure a) transparency in the design of tools and processes; and b) the inclusion of all groups. Education will foster technological literacy, which will improve chances of participation. The discussants believed that RRI policies should go beyond gender equality to incorporate other, equally relevant perspectives (class, ethnicity, educational level, etc.).

4. How the integration of the AIRR dimensions could support the process of transformative change?

For these stakeholders, reflexivity is the starting point for identifying needs and pitfalls, as well as good practices that can be adapted to cope with the transformative change. However, they considered that all four dimensions are needed and interrelated. They pointed out that for reflexivity to be effective, all agents must be included, and the language adapted to ensure understanding and participation.

5. How do you perceive the role of *civil society* in the process of this transformative change for achieving the identified policy priorities?

According to the discussants, civil society must be included in the development of innovative solutions in the chosen policy areas. In this sense, the business sector must be made to understand the advantages of this inclusion. Even though public administration can play the role of intermediary, it should not interfere, merely establish common objectives and principles.

6. Recommendations for integrating the RRI keys and AIRR dimensions in the identified strategic policy priorities

The discussants again stressed the importance of public administrations connecting agents, without "interfering" in their collaboration. Education and training are key for promoting participation. The third sector should also be considered a key agent that can help to reach lay citizens.

Focus group with policy makers (5 participants)

1. Vision for the development of your territory in the chosen policy area(s) by 2030 (2050)

This group considered Active Ageing to be a key policy area with the potential to influence actions in the other two (Circular Economy and Design). The members' vision is of a new productive and social model that enables healthy ageing, respecting people's needs, and benefitting from retired people's life experience. They propose a new model of retirement based on co-living at home or in spaces and environments that are respectful and sustainable. This group considered it necessary to involve the elderly in the promotion of Circular Economy, Design and Technology solutions that meet their needs.

2. What is the transformative change that your territory should go through to achieve this vision? Which are the strategic policy priorities stemming from the vision?

The group believed that the production and consumption model must be transformed, and citizens should be involved in policy design, to achieve a real collective action. All citizens should reflect on the impact of ageing and design policies. A real transformation would require more efficient use of existing resources, avoiding redundancies in the services offered. The promotion of inclusive technological solutions that can be used by all is a key priority; in this sense, Smart Specialisation Strategies should be more open to citizens, to create shared

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agendas. Promotion of the collaborative economy and education policies is required to make citizens aware of the need to act. Lastly, the participants mentioned that at the local level, the commercial sector can act as a contact point for reaching old people and involving them in the design of solutions to their challenges. They also mentioned an existing participatory forum for old people in Catalonia, which could be used to implement RRI.

3. **How the RRI framework, or individual RRI keys could support the process of transformative change?**

Through public engagement and ethics, companies can be made aware of the need to collaborate with citizens in the design of new products and services. The public sector should support this process with informative campaigns targeted at both firms and civil society.

4. **How the integration of the AIRR dimensions could support the process of transformative change?**

Anticipation helps stakeholders to understand the context and prepare for the future, but it is not always included in policy design. Inclusiveness is essential for achieving a real transformation as it implies taking complementary views into account, benefitting public administration and other stakeholders.

5. **How do you perceive the role of *public sector* in the process of this transformative change for achieving the identified policy priorities?**

The public sector should facilitate the transformation, promoting existing participatory channels for the elderly and connecting them with the private and research sectors, without interfering in the processes.

6. **Recommendations for integrating the RRI keys and AIRR dimensions in the identified strategic policy priorities**

More resources are necessary to implement transformative policies, but it is also a question of promoting the capabilities and resources of old people (and other collectives) to provide solutions to Active Ageing challenges, making people the protagonists of their own proposals and solutions.

<u>Focus group with researchers (8 participants)</u>

1. **Vision for the development of your territory in the chosen policy area(s) by 2030 (2050)**

Promoting an Active Ageing strategy that considers social and emotional issues. Elderly people are not a homogenous group, so policies should be tailor-made. This group envisioned a territory where people are aware of the need to be involved in policy design and have the power to find solutions to challenges. Digitalisation and technology should be key in this process, but it is crucial to ensure that everybody understands it – both its advantages and risks – and are able to benefit from it. Technology must be humanised, to find and apply solutions to ageing problems, but also in Design and Circular Economy.

2. **What is the transformative change that your territory should go through to achieve this vision? Which are the strategic policy priorities stemming from the vision?**

This group believed that the most important transformation would involve ensuring that research and innovation is applicable in daily life and is open to different citizens and companies, since at present, only some take part in collaborative R&I processes. As the “baby boomers” reach old age, they will be more familiar with technology and digitalisation, so new possibilities for this collaboration will emerge. A change of culture in society regarding participation is also considered a strategic priority. There is a need to improve how research responds to societal challenges, for instance in the case of social sciences, which paradoxically seem disconnected from citizens’ real needs.

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3. **How the RRI framework, or individual RRI keys could support the process of transformative change?**

In the debate on how to prevent the dehumanisation that technology might bring to solutions for Active Ageing, the discussants mentioned that public engagement is essential, as it implies that all agents participate in this debate. Ethics is needed to ensure that new legislation and regulations regarding technology, science and innovation are developed with a "humanistic" perspective. The group even proposed rewarding institutions that include RRI practices to incentivise its application in research.

4. **How the integration of the AIRR dimensions could support the process of transformative change?**

Inclusion ensures diversity in participation when creating solutions for Active Ageing or other policy priorities. Acknowledging diversity in the elderly collective (diversity of ethnicity, class, health situation, etc.) is very important in our society. Likewise, reflexivity can make researchers more aware of the need to collaborate with citizens in the design of better (technological) solutions.

5. **How do you perceive the role of *research* in the process of this transformative change for achieving the identified policy priorities?**

Research plays a key role, but the sector should be more open to the collaboration of citizens in the provision of solutions. There are already some initiatives in place, but co-creation needs to be more widespread. Researchers must be aware of the ethical implications of their work, particularly when designing technological solutions for ageing based on digitalisation. Collaboration with citizens and supervision by public administration is needed to ensure this "humanised" technology.

6. **Recommendations for integrating the RRI keys and AIRR dimensions in the identified strategic policy priorities**

Responses to this question centred on the same solutions mentioned above.

5.7 Policy recommendations and conclusions

The main conclusions regarding an effective implementation of the RRI-AIRR approach in Sabadell and Catalonia reveal that:

- Although there are some specific traits and characteristics linked to each policy area, most are institutional, structural, and common to Circular Economy, Active Ageing, and Intelligent Design in Industry. This facilitates the implementation of common policies and instruments that can be applied to all three areas. On the other hand, certain cultural, behavioural and institutional traits, (i.e., individualism, resistance to change, hierarchical structures), are hard to modify, and a long-term vision and commitment are therefore required for the RRI-AIRR approach to be adopted.
- Several initiatives in Catalonia and in Sabadell are directly or indirectly linked to the RRI-AIRR approach. Among these, initiatives for local and sustainable development promoted by the Catalan Government through RIS3CAT and, indirectly, PECT-Vallès, are the most important ones. Bearing this in mind, the most efficient strategy would consist of building on the existing initiatives and tools to speed up the application of the RRI-AIRR approach. Likewise, RIS3CAT provides a framework that must be included in any local initiative. For instance, the quadruple helix stakeholders from Sabadell and Catalonia can ensure their voices heard and considered in the final RRI-AIRR framework provided by the new RIS3CAT for the 2021-2027 period.
- Some of the RRI-AIRR keys and dimensions are already present in Sabadell and Catalonia, though to different degrees, depending on the characteristics of the different quadruple helix stakeholders. It is crucial to

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disseminate the RRI keys and AIRR dimensions to reinforce **cooperation, exchange and sharing of previous experiences and results, as well as the mobilisation and involvement of citizens, embracing inclusiveness** in the broadest way possible.

Therefore, the main policy recommendations are:

- **To capitalise and build on previous and simultaneous projects and activities** in the territory. The Catalan Government is playing an active role in embedding public engagement and inclusiveness in the new RIS3CAT, MFF2021-2027 and NGEU projects, which will shape most of the future innovation processes. It is important to ensure that these initiatives are well known and actively used as springboards for the promotion of the RRI approach. The quadruple helix stakeholders from Sabadell must play an active role in the design and implementation of RIS3CAT, MFF2021-2027 and NGEU in Catalonia.
- **To formalise and disseminate practical guidelines and information** about the RRI-AIRR approach, with the active involvement of the quadruple helix stakeholders, through:
  - Participation and interaction in **formal and informal meeting points, activities or forums** where there is room for discussion, collaboration or even "match-making" activities with sharing of experiences, expertise, needs, etc., regarding the RRI approach.
  - **Exchange and sharing of experiences and results** linked to the RRI-AIRR approach, promoting transparency, cooperation and building of public trust in this kind of process.
  - **Capacity-building linked to the participation of the quadruple helix stakeholders in the activities and initiatives of RIS3CAT and PECT-Vallès**, as a practical way of subsequently transferring those experiences to their own projects and processes.
- To **boost specific aspects of the RRI-AIRR keys and dimensions that are less common** or underdeveloped among the quadruple helix stakeholders, such as:
  - Science education and public engagement: fostering the empowerment of civil society and lay citizens, and involving them in design and creation processes, always bearing in mind their heterogeneity and different needs. It is also vital to promote activities such as citizen-science projects and/or involve the educational sector (primary and secondary schools) to capitalise on knowledge and experiences and to increase the openness of processes, results and science education.
  - Ethics: promoting public engagement and monitoring of any ethical issue linked to innovation processes, by providing tools and platforms where concerns or complaints can be manifested. This RRI key is especially relevant in Active Ageing and Circular Economy.
  - Open access: increasing the transparency of the innovation processes and the involvement of public administrations, with a specific focus on organising and disseminating the information created by these stakeholders so that business or any other interested stakeholder can benefit from it.
  - Gender equality: through transparent monitoring of the different levels of compliance in processes and projects, facilitating discussion and the provision of solutions or measures to ensure an appropriate level of compliance. It is important to include this element as an initial and critical part of any process or project, rather than a last-minute add-on.
  - Anticipation and reflexivity: ensuring all stakeholders gain a better understanding of the tools and processes involved in implementing these keys. From different staff levels in organisations to lay citizens, active exchanges and interactions must be established through agreements, meetings or even formal guidelines or training, to guarantee a level playing field and encourage the active involvement of them all.
  - Inclusiveness: promoting the participation of all quadruple helix stakeholders irrespective of their final degree of involvement in the implementation phase would improve the governance and the design processes in the projects and activities linked to initiatives such as RIS3CAT or NGEU.

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- Responsiveness: increasing the weight of the monitoring and evaluation processes. This can be achieved through the tools and activities provided, for example, RIS3CAT, which has a long-standing record of yearly reports and in-depth evaluations both in the strategic and operational dimensions.

5.8 References

Ajuntament de Sabadell. (n.d.). *PECT: Vallès Industrial. Innovació i Disseny de la Indústria Europea*. Retrieved 22 October 2021, from https://web.sabadell.cat/pect/que-es

Consorci de Serveis Universitaris de Catalunya (CSUC). (2016, January 1). *Portal de la Recerca de Catalunya (PRC)*. CSUC. Retrieved 22 October 2021, from https://portalrecerca.csuc.cat/

EADA Business School. (2021, July 19). *Bretxa salarial i presència de la dona en posicions directives 2021*. Retrieved 22 October 2021, from https://www.eada.edu/ca/actualitat/noticies/2021/05/bretxa-salarial-i-presencia-de-la-dona-en-posicions-directives-2021

European Commission. (2020, November 11). *Recovery plan for Europe*. European Commission - European Commission. Retrieved 3 November 2021, from https://ec.europa.eu/info/strategy/recovery-plan-europe_en

European Council. (2021, May 31). *Long-term EU budget 2021–2027 and recovery package*. Retrieved 3 November 2021, from https://www.consilium.europa.eu/en/policies/the-eu-budget/long-term-eu-budget-2021-2027/#

Fundació Pere Tarrés. (2020, April 1). *El 80% de les cuidadores no professionals són dones*. Pere Tarrés. Retrieved 22 October 2021, from https://www.peretarres.org/premsa/sala-de-premsa/noticies/80-de-les-cuidadores-no-professionals-son-dones

Generalitat de Catalunya. (2016, November 1). *La xarxa CATLAB és part del programa CATLABS*. Catlabs. Retrieved 3 November 2021, from https://catlabs.cat/

Generalitat de Catalunya. (2018, May). *RIS3CAT Action Plan 2015–2020*. https://catalunya2020.gencat.cat/web/.content/00_catalunya2020/Documents/angles/fitxers/pla-accio-ris3cat-2018-en.pdf

Generalitat de Catalunya. (2019, November 7). *Pacte Nacional per a la Societat del Coneixement – PN@SC*. Gencat. Retrieved 22 October 2021, from http://empresa.gencat.cat/ca/intern/pnsc

Generalitat de Catalunya. (2020, June 4). *La RIS3CAT 2021–2027 i la política d'innovació transformativa – Tatiana Fernández i Alberto Pezzi L'impuls de trajectòries de desenvolupament sostenibles i inclusives, per superar la crisi de la COVID-19*. EAPC blog. Retrieved 3 November 2021, from https://eapc.blog.gencat.cat/2020/05/26/la-ris3cat-2021-2027-i-la-politica-dinnovacio-transformativa-tatiana-fernandez-i-alberto-pezzi/

Generalitat de Catalunya. (2021a, January 12). *Comissió per a l'impuls de la ciència ciutadana i natura (CICCNA)*. Gencat. Retrieved 22 October 2021, from http://mediambient.gencat.cat/ca/05_ambits_dactuacio/educacio_i_sostenibilitat/educacio_per_a_la_sostenibilitat/ciencia-ciutadana-natura/comissio-impuls-ciencia-ciutadana-natura/

Generalitat de Catalunya. (2021b, February). *Next Generation Catalonia*. https://economia.gencat.cat/web/.content/20_departament_gabinet_tecnic/arxius/pla-recuperacio-europa/next-generation-catalonia.pdf

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101006439

Generalitat de Catalunya. (2021c, November 7). *Pacte Nacional per a la Societat del Coneixement – PN@SC*. Gencat. Retrieved 22 October 2021, from http://empresa.gencat.cat/ca/intern/pnsc

Idescat. (2021a, March 5). *Idescat. Indicadors de la Unió Europea. Bretxa salarial entre homes i dones.* Gencat. Retrieved 22 October 2021, from https://www.idescat.cat/indicadors/?id=ue&n=10128

Idescat. (2021b, May 21). *Idescat. Indicadors demogràfics i de territori. Estructura per edats, envelliment i dependència. Catalunya*. Gencat. Retrieved 22 October 2021, from https://www.idescat.cat/pub/?id=inddt&n=915

Idescat. (2021c, September 23). *Idescat. Indicadors de la Unió Europea. Esperança de vida en néixer. Per sexe.* Gencat. Retrieved 22 October 2021, from https://www.idescat.cat/indicadors/?id=ue&n=10106

Institut de Salut Global de Barcelona. (2018, February 7). *Arrenca CitieS-Health: ciència ciutadana sobre qüestions salut en entorns urbans*. ISGlobal. Retrieved 22 October 2021, from https://www.isglobal.org/ca/-/arranca-cities-health-ciencia-ciudadana-sobre-cuestiones-de-salud-en-entornos-urbanos

Interreg Europe. (2021, June 1). *RELOS3*. Retrieved 22 October 2021, from https://www.interregeurope.eu/relos3/

Scratch. (2008, December 6). *Scratch - Imagine, Program, Share*. Retrieved 22 October 2021, from https://scratch.mit.edu/

UCITYLAB. (2021, March 11). *UCITYLAB – University-City Action Lab*. Retrieved 3 November 2021, from https://www.ucitylab.eu/

UNICORN project. (2019, January 2). *UNICORN project*. UNICORN. Retrieved 3 November 2021, from http://unicorn-project.eu/

United Nations. (2018, April 20). *THE 17 GOALS | Sustainable Development*. Retrieved 3 November 2021, from https://sdgs.un.org/goals

Universitat Politècnica de Catalunya. (2021, April 1). *Llibre de dades*. UPC. Retrieved 22 October 2021, from https://gpaq.upc.edu/lldades/indicador.asp?index=1_1_5

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Chapter 6: Conclusions

Synthesis of the territorial audit reports

The RRI audits are a culmination of a year-long work to assess the relevance of the RRI-AIRR approach for territorial governance in four territories: municipalities of Sofia (Bulgaria) and Thalwil (Switzerland), region of Western Macedonia (Greece) and city of Sabadell (Catalonia, Spain). The audits examined and described the diverse range of practices and policy developments in the policy areas chosen by the participating territories that have either already integrated or have the potential to integrate the RRI keys and AIRR dimensions. The audits have identified the RRI-relevant policy goals and targets, juxtaposed strengths and weaknesses of applying the RRI-AIRR approach in the territorial governance with threats and opportunities, mapped the relevant stakeholders, launched an intensive inclusive and co-creation process, spelled out strategic policy priorities and offered a list of recommendations for an effective and meaningful uptake of RRI-AIRR approach as a guiding framework in territorial governance of R&I.

The RRI audit reports are based on a critical reassessment of findings from "D2.1 Map on Stakeholder Relationships and Interdependencies and Report on Stakeholder Needs, Interests, Power and Influence" and "D2.2 Report on the RRI policy discourse in the involved territories," but also on research and co-creation activities performed specifically for the purpose of the reports: the SWOT and the TOWS analysis of the chosen policy areas, identification of strategic policy priorities and four focus groups in each of the four territories (one with participants from science, one with participants from public bodies, one with business and industry representatives, and one with civil society actors).

The territorial RRI audits represent a crucial input for the development of detailed transformative outlooks – the future-oriented strategies and action plans for embedding the RRI keys and AIRR dimensions into both processes and outcomes of the territorial policy agendas.

The state-of-play in regard to RRI keys and AIRR dimensions in the four territories

Given the divergent profiles of the four territories and the different policy areas they selected to examine in terms of existing or potential application of RRI-AIRR approach in the territorial governance, it might come as a surprise that the commonalities in the reports outnumber the dissimilarities. One overarching common feature is that the RRI-AIRR terminology and vocabulary are largely unknown and are not used outside the somewhat limited circle of academics and researchers (and in some cases policymakers) with experience of working on EU-funded research projects. RRI keys and AIRR dimensions are rarely formally included in policy documents, codes and procedures. Despite that, the audit reports attest that a number of principles comparable to RRI keys and AIRR dimensions are relatively well embedded not just in policy documents and plans, but also in the modus operandi of a variety of territorial stakeholders.

In Sofia municipality, keys such as public engagement, open access and gender equality, and dimensions such as inclusiveness, anticipation and responsiveness are widely and adequately applied, while science education, ethics and reflexivity are not practiced on a satisfactory level. In Thalwil, anticipation, inclusiveness and open access are likewise already firmly embedded in policymaking, but there is room for improvement concerning science education, public engagement and reflexivity. Public engagement and inclusiveness play an important role in the policy design in the region of Western Macedonia, which also places considerable attention to the benefits of providing open access to data and information and to the practice of anticipatory governance. Less

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developed principles are again science education and reflexivity. Sabadell is the only territory, which highlights its strict adherence to the norms of gender equality and ethics, which are perceived as less relevant or important by other territories, and underlines the measures undertaken to ensure quality science education. Again in contrast to other territories, public engagement and inclusiveness are less prominent in Sabadell, while the unsatisfactory application of reflexive governance can be noted as a common feature of all four territories.

The quadruple helix stakeholders differ considerably in terms of their knowledge of the RRI keys and AIRR dimensions and attach very different value and importance to individual keys and dimensions. Each stakeholder group also assesses its own level of engagement and responsibility regarding the RRI-AIRR implementation in terms and scope that differs from other groups. These differences in practices and perceptions are often more prominent than differences between territories.

Ethics

Ethics is the most important RRI key in the research and academic sector. Academic institutions usually adhere to their own formal ethical codes and guidelines that govern all educational and research processes, and many have ethics committees or similar bodies.

Ethics is also a crucial aspect for the business community, where it covers a broad array of issues – from corporate social responsibility to security, environment protection and human rights. Similarly to academic institutions, larger companies often have written codes of conduct or comparable instruments, which is not the case for small and medium enterprises. The public sector companies are more likely to adhere to written ethical guidelines compared to the private ones. Unlike in academia, where unethical practices are seldom beneficial, business companies might encounter situations where they need to choose between ethical commitments and economic benefits. Here the civil society and the policymakers can play a decisive role – the well-informed and educated society (in the role of consumers) may exert pressure on businesses to apply higher ethical standards, while the policymakers can make the non-compliance with some of these standards punishable or at least costly.

Policymakers are often perceived by the other stakeholders as the main promoters and guardians of ethical requirements and norms. Apart from the firm societal expectation to fully comply with ethics regulations themselves and in this way set an example, policymakers are also expected to propose, prepare and pass the relevant laws and regulations, and include ethical requirements into funding and monitoring mechanisms. In territories where the low levels of trust in public institutions can be observed, ethics and integrity are seen as crucial prerequisites for reversing this situation and the basis for responsible, accountable and transparent governance.

Civil society representatives recognise the motivational aspect of ethics in certain areas, for example in promoting a sustainable community life and protection of environment. Ethics also implies responsibility to future generations.

Public engagement

Public engagement is the most important RRI key for territorial authorities and public bodies in general. It is often perceived as a social contract between institutions and citizens, and its role is most emphasised in connection with development, implementation, monitoring, and assessment of policies. Public engagement creates a sense of shared responsibility, solidarity and trust in public institutions and as such, it is vital for ensuring accountability and transparency of the governance.

That said, the views about what public engagement is and how it should be practiced diverge substantially among stakeholders. For some, engagement starts and ends with communication. The audit reports show that

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in many cases, policymakers and researchers are similarly quick to claim how dedicated they are to engaging with other stakeholders, but a closer look at their practices easily reveals that the engagement activities rarely go further than providing certain information. This approach can in some cases be even counterproductive, as one-way communication and dissemination activities often sink in the information flood and are incapable of impeding the high levels of disinformation concerning scientific research and results, which we can witness in recent years. Additional obstacle is that the media, which could act as an intermediary between the science and society, seldom have the needed training and knowledge to cover science subjects.

Some stakeholders from academia and business understand and apply public engagement in a somewhat broader way – as a means of receiving feedback from the citizens, clients and/or end users of services. For companies, public engagement can be an opportunity to receive information about needs and expectations of the customers, although some reservations were expressed regarding the perceived lack of motivation among the population to participate. Other barriers include lack of time among stakeholders, mistrust (different types of stakeholders often speak different "languages" and sometimes show divergent interests) and funding constraints.

A common problem observed in all territories is insufficient inclusion and engagement of vulnerable and underrepresented groups (persons with special needs, minorities, immigrants and refugees, elderly, and the young).

Despite the criticism expressed above (regarding the limited understanding and use of public engagement), policymakers should also be commended in cases when they have meaningfully and productively engaged different stakeholders and the public in co-creation of policies and thus in the participatory decision-making. One such example is the development of the Digital Transition Strategy for Sofia – a document that came about as a result of a broad consultation process involving over 100 stakeholder organisations. In Western Macedonia, public consultations have been an important tool in the creation of the energy transition policies, such as clean energy development, industry manufacturing activities, and actions for sustainable tourism. The Catalan Government has embedded public engagement in the new Research and Innovation Strategy for Smart Specialisation in Catalonia.

In general, most stakeholders from across the quadruple helix model agree that public engagement is a crucial factor for gaining support for the policymaking process, on condition that the methods of engagement are appropriate both for the specifics of the policy topic and the characteristics of the concerned target groups. There are opinions that politicians and policymakers should take more responsibility for promoting public involvement by bringing different parties to the table and creating channels for participation.

Open access

Open access to data and information is essential in many policy areas, and supported by most quadruple helix stakeholders in all four territories. There is a practically unanimous view that open access must be granted for any data that has been produced using public money. Access to data increases the quality and quantity of ideas, fosters collaboration and sharing of knowledge, enables experimentation and drives forth the progress of the research and innovation ecosystems. Furthermore, unobstructed access to information can also increase the public support for policy objectives as it makes the entire policy process more transparent and predictable. It has been noted that the recent years have brought a considerable improvement in terms of access to, usage of, and quality of available data and information.

Despite these advantages, several barriers hinder effortless and smooth attainment of data. To begin with, in some of the examined territories the public services that would in practice guarantee and provide open access to data are not yet sufficiently developed. The collected data are often not standardised and compatible, are

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available only in aggregated form, are hard to find and obtain, and mechanisms for verification and processing of data are not in place. On the positive side, these deficiencies are being addressed (e.g. in Sofia an online platform for data exchange and open data accessible to public and private companies is being developed as part of the digital transition of the municipality, while in the case of Thalwil, a central federal platform provides access to data on energy efficiency and renewable energy).

A perennial dilemma (especially for researchers and businesses) is whether to give priority to open access or to protection of intellectual property rights, and how to balance the two aspects. While open access to data is essential for development of research and innovation, data are also a very valuable asset, which provides advantage over the competitors. For researchers and academics, publishing in prestigious journals, which are not open access, can be more important than supporting the free access to their research work, as career-enhancing publication record can prevail over other considerations.

Similarly to the discussion on public engagement, policymakers are seen by other stakeholders (especially academia and civil society) as responsible for attaining a balance between conflicting interest groups, and for making sure that the interests of public institutions are protected against big companies, which use data for commercial gain. Policymakers are also sometimes called upon to identify, establish and maintain the proper communication channels to address specific target groups, although responsibilities of all stakeholder groups in this respect should not be overlooked. One example is the Catalan government and its National Agreement for the Knowledge Society that led to establishment of the Catalonia Research Portal, which enables the free and easy access to the research outputs produced by publicly funded organisations.

Gender equality

Gender equality is generally understood in narrow terms of policies and practices that ensure the balanced participation and equal rights of both genders, and is supported by all stakeholders as it improves the quality and social relevance of the knowledge, technology, and innovation produced.

That said, there are huge differences in approaches to ensuring gender equality within different policy areas. Gender issues are hardly considered as relevant for the energy transition in Thalwil, although it was noted that the process could benefit if it was less male-dominated and appropriate measures were taken to facilitate a more active participation of women. Similarly, gender equality measures are absent from the youth policies and the Digital Transformation Strategy of Sofia municipality. In contrast, gender perspective is very important in Sabadell's policy areas of active ageing and intelligent design in industry, albeit for different reasons. In the first case, women are in the focus of policies and actions because they constitute the majority of elderly people and because most caregivers are female, while in the second area the situation is just the contrary, hence the need to encourage women's involvement.

As far as different stakeholder groups are concerned, research and academic institutions are usually the ones in which formal measures are taken to ensure gender equality. This included developing gender equality plans and monitoring gender relations. At the same time, in some territories, for example Sofia municipality, women outnumber men in the research and academia sector partially for reasons, which paradoxically arise from the prevailing gender *inequality* in the society – low salaries of researchers and professors in universities are less attractive for the majority of males who therefore prefer other professions. This can be considered a manifestation of the gender-based differences in renumeration and the gendered division of labour in Bulgaria/Sofia. In general, all four territories still have (to a varying degree) issues with salary imbalance, low percentage of women in high management positions, and the inclusion of female perspectives in studies and territorial plans.

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Organisations, especially the public ones, are also obliged to respect the national and/or territorial legislation on equality and non-discrimination. In some territories, part of these obligations involves proactive measures such as the inclusion and promotion of women in careers and places where they are underrepresented.

In all four territories and across all stakeholder groups gender equality was seen as too narrow a term. Instead, the notions of diversity and inclusion of all groups in society (persons with disabilities, ethnic and religious minorities, immigrants) were brought to the fore. In Sofia and Western Macedonia, particular attention was given also to the demographic problems – the ageing population and continuing brain drain of the young. To reverse this trend, measures to retain young talents and offering them competitive opportunities for living, studying, and working need to be prioritised.

Science education

In all territories, the exceptional importance of science education has been underlined: the more informed and educated people are in the matters of science, research and innovation, the higher their demands and expectations regarding the policies and actions in these fields. Science education is emphasised as key to cultivating highly-skilled human capital. There is a direct correlation between science education and the levels of innovation. Science education also enhances the capacity to adequately identify and assess emerging needs and priorities, and ensures science-based quality input to policymaking.

Not surprisingly, all stakeholder groups look at the research and academic sector as being responsible for planning, organisation and delivery of science education, seeing it as relatable to policy development only in specific cases. While citizens of all ages are considered as rightful recipients of science education, most attention is reasonably given to the youngest segments of the population, with most progressive views advocating the inclusion of STEM disciplines as early as kindergarten. In territories with negative demographic trends, equally vocal are the voices underling the need to put in place more science education events for the senior citizens (over 65 years-old), as this would provide them with a social and mental stimulus, helping them to lead healthier and more meaningful lives.

Despite its recognised importance, science education is often left in the hands of individual research centres and academic institutions. In the region of Western Macedonia, STEM disciplines have been side-tracked until recently, but the transition towards a low-carbon economy has necessitated a shift in the educational priorities, hence new investments are being made into upgrading and creating research infrastructure to support STEM-related activities. Importance of science education for the successful energy transition has been noted in the municipality of Thalwil as well, as testified by several relevant legal texts and standards dealing with measures against climate change in which science education has been deeply rooted (legislative goals for the period 2018-2022 include qualification of public employees in the field of sustainable development and promotion of environmentally conscious and future-oriented thinking in state schools).

Science education is not always associated only with STEM disciplines – Sofia stakeholders noted that science education is becoming a critical factor for building sustainable and resilient city systems, and also highlighted the aspects of digitalisation and digital literacy.

Anticipation

Among the AIRR dimensions, anticipation appears to be the one most firmly embedded in the territorial policymaking. Understood as both an opportunity and a necessity at the territorial level for understanding and addressing the future challenges, anticipatory governance helps to reduce future risk and avoid destabilising developments. Its implementation is essential for establishing long-term priorities, and developing strategic

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plans and roadmaps. For the business stakeholders, anticipation is an essential element of their internal organisational structure and a key management principle in terms of risk assessment of decisions and practices.

Anticipation is closely linked to other AIRR dimensions and RRI keys, and can support them – for example, forward-looking leadership is an important political instrument for the active involvement of citizens in political processes at an early stage, as it promotes exchange between politics, business, and civil society by ensuring transparency and a voice in decision-making.

Examples of good anticipatory practices can be found in several territories. In Thalwil, the municipal advisory commissions are regularly consulted on decisions taken by the Municipal Council and involved in the design of future scenarios.

In Sofia, the importance of anticipatory governance has been underlined, but at the same time the lack of experience with developing foresight scenarios has been noted. Stakeholders recommend that the city administration strengthens its capacity for anticipatory policymaking, including foresight studies, horizon scanning, and definition of strategic goals. The need to improve the anticipatory governance has been expressed also by stakeholders in the Western Macedonia, especially in the direction of foreseeing the positive and negative effects that the current transition model may bring to all participating actors.

Sabadell report notes that anticipation is typically a task undertaken by high-ranking members of the staff, and these activities often leave out the lower ranking human resources who could otherwise contribute their interesting and diverse perspectives. Such involvement would also increase the workers' sense of belonging to a given organisation.

Inclusiveness

A common feature of all territorial RRI audit reports is that many stakeholders find it difficult to distinguish between inclusiveness and public engagement – both are frequently understood as a means of receiving feedback from the societal actors regarding policies, measures and actions, or as equal collaboration between representatives from business, government, civil society, and R&D. In this light, the Western Macedonia report highlights as a good example of inclusiveness in the development of policies the process for the preparation of the Just Transition Plan. During this process, municipal councils, labour centres, chambers, trade unions, scientific and research institutes and citizens were involved in regular and open consultations.

Inclusiveness is specifically mentioned in the main territorial policy documents about Smart Specialisation in Catalonia/Sabadell (RIS3CAT and RELOS3), which emphasise the need for quadruple helix participation in the governance and innovation system, but in practice it is rarely implemented. The most important barriers for more active inclusion of civil society and lay citizens in research and innovation processes are their lack of scientific and innovation knowledge and related irresponsiveness to initiatives for accessing them, and also budgetary and time constraints.

Contradicting these barriers are the opinions of the citizens and civil society representatives that a broad inclusion in R&I processes, encompassing all types of citizens regardless of their age, educational level, origin, etc, is obligatory for achieving a real transformation, as this implies taking into account all the diversity of societal needs and views. The systematic creation of collaborative partnerships is therefore a critical aspect of inclusiveness.

Inclusive strategies must not leave anyone behind and need to ensure active participation of vulnerable and underrepresented groups, such as teenagers, women, elderly, disabled and minorities. In this respect, Sofia municipality has established in 2021 a committee to consult and oversee the implementation of a range of

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measures aimed at people with hearing disabilities, while the Sofia Youth Strategy explicitly mentions the need to include young people in policy- and decision-making.

Responsiveness

In all four territories, public bodies are generally seen as responsive and ready to take into consideration the needs of citizens when designing policies, although in some cases (e.g. Sofia municipality) centralised communication and decision-making can sometimes prevent the promotion of bottom-up initiatives and ideas. Responsiveness is largely understood as the task of policymakers and manifested through their recognition and consideration for the needs, goals and expectations of the entire community.

Not surprisingly, some territories are more successful and have a longer tradition in applying the principles of responsive governance. The peculiarities of the Swiss system of direct democracy mean that Thalwil municipality is way ahead of other participating territories regarding the practices of responding to communal initiatives (such as the "Climate Initiative" 2020). On the other hand, as noted in the Thalwil report, such processes also have their shortcomings, such as slowness and long reaction times. Other obstacles to effective responsiveness are the profit-oriented rationale in the case of the business sector, and the limited length of the political cycle for policymakers and public administrations. The research and academic sector is not limited by these factors; however their responsiveness capacity can be affected by external political decisions.

Reflexivity

Reflexivity seems to be the least implemented of the four AIRR dimensions according to the territorial RRI audit reports. Among the most notable obstacles are the centralised policymaking processes and institutional settings that leave little room to regional and local actors to apply the principles of reflexive governance. Reflexivity is also a problem in those territories where decision-taking is overtly bureaucratic.

While practiced by all stakeholders to a certain extent, reflexivity seems to be most important for the policymakers. The annual assessments and monitoring are examples of reflexive and accountable governance. In Sofia report, digitalisation was mentioned as an important driver for reflexivity. Utilising digital tools will update the internal administrative procedures for self-assessment and reflexive governance, making them more effective through introduction of standardised protocols for monitoring and evaluation.

Policymakers often rely on external expertise provided by researchers and sometimes business to rethink and possibly adapt their policies and practices. In this respect, the research sector is most often given the "task" to provide a reflexive opinion and thus confirm or adjust the selected policy course. Less frequently, but not uncommon, the business sector also solicits similar services from the researchers.

Of course, researchers and academics apply reflexivity also to their own work, as this is the only way to be aware of impacts resulting from their work, and to identify needs, pitfalls and good practices. Reflexivity can furthermore make researchers more aware of the need to collaborate with citizens in the design of better solutions. Researchers also underlined the role of structurally established reflexivity as part of any research process, helping to make research findings transparent.

The civil society stakeholders consider reflexivity as a learning process that can provide input and information for the policy governance. In particular, transparent communication of the results of reflection procedures gives the citizens a sense of "control" over the political process, since the political actions can be critically questioned and validated by the public. Such validation is a crucial precondition for any transformative change.

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Annexes: Stakeholders mapping and synthesis of experiences related to RRI-AIRR

Table 11: Systemic categorisation of stakeholders for the region of Western Macedonia

	Stakeholders with high levels of interest in RRI-AIRR approach	Stakeholders with high levels of experience in RRI-AIRR approach	Stakeholders with high levels of influence on RRI-AIRR approach in practice	Stakeholders with high levels of power
Name of stakeholder	**Policymakers**			
RIS Structure of Western Macedonia	Interested in science education	Experience with public engagement, ethics, open access, and gender equality Experience with anticipation	Influence regarding reflexivity and responsiveness	
Region of Western Macedonia (RWM)	Interested in science education	High experience with public engagement, ethics, open access and gender equality. Region is a local government organisation that follows legal framework and state rules related to the above issues.	High level of influence in anticipation, reflexivity and responsiveness. It has the overall role and responsibility for the design and implementation of the development plans at a regional level.	Region of Western Macedonia is a secondary organisation of local government of the Greek state with full budgetary and administrative power to support the implementation of the necessary policies.
Vice Governor Unit for Energy, Infrastructure and Environment	High interest in science education especially concerning renewable energy sources and also the hydrogen technology	High experience with public engagement, ethics, open access and gender equality.	High level of influence in anticipation, reflexivity and responsiveness. Region of Western Macedonia has the responsibility for the regional "just transition plan" in cooperation with the local and national authorities in cooperation with the Vice Governor for development transition plan. Also, the overall responsibility for the environmental issues in the transition to the post lignite era.	
Vice Governor Unit for Developmental Transition Planning	Interest in science education	High experience with public engagement, ethics, open access and gender equality	High level of influence in anticipation, reflexivity and responsiveness. He has the overall responsibility on the matters of the "Territorial Plan for Fair Transition of the Region", for the activation of energy communities and in general the new model of clean energy in cooperation with the Vice Governor of Energy.	
Vice Governor Unit for Rural Development	High interest in science education especially for	High experience with public engagement, ethics, open access and gender equality	High level of influence in anticipation, reflexivity and responsiveness.	

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	innovative rural development programmes		He has the overall responsibility on the Regional Rural development plan 2021-2025	
Regional Development Fund (RDF)	Interested in science education	High Experience with public engagement, ethics and open access. Follows local law and formal procedures. Experience with gender equality. experience with anticipation, reflexivity and responsiveness		Power to support organisational and administrational functions of Region of Western Macedonia. Power to control the utilisation of Regional, National and European resources.
Municipality of Kozani	Interested in science education	High experience with public engagement, ethics, open access and gender equality as a local organisation that follows legal framework and state rules related to the above issues.		The Municipality of Kozani is a public administration entity and a primary local government organisation with budgetary and administrative power to support the implementation of the necessary policies.
Waste Management Company of Western Macedonia (DIADYMA SA)	Interested in science education and inclusiveness	Experience with public engagement, ethics, gender equality and open access. High experience with anticipation, reflexivity and responsiveness according to their important role as active members of the energy community.		
Development Company of Western Macedonia SA (ANKO)	Interested in science education	Experience with ethics, gender equality, public engagement and open access. The company has undertaken the role of technical consultant for the post coal transition in the region.	Influence in anticipation, reflexivity and responsiveness	
Research and Academia				
Unit of Academic Issues of the University of Western Macedonia	Interest in open access Interest in public engagement	High level of experience with gender equality, ethics and public engagement according to the gender equality committee and the Committee/ Code of Conduct the University has. High level of experience in anticipation on academic issues	High level of influence regarding science education	High level of power in science education and open access
Institute of Civil Protection	Interest in public engagement	High level of experience with gender equality, ethics and public engagement according to the Gender Equality Committee and the Committee/ Code of Conduct the University has. High level of experience in inclusiveness and public engagement on civil protection issues	High level of influence regarding public engagement and inclusiveness	High level of power in public engagement

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Institute of Economic Analysis and Entrepreneurship	Interest in open access Interest in public engagement and science education	High level of experience with gender equality, ethics and public engagement according to the Gender Equality Committee and the Committee/ Code of Conduct the University has. High level of experience in anticipation and responsiveness on economic and entrepreneurship issues	High level of influence regarding anticipation	High level of power in science education and open access
Department of Chemical Engineering of the University of Western Macedonia	Interest in open access Interest in responsiveness	High level of experience with gender equality, ethics and public engagement according to the Gender Equality Committee and the Committee/ Code of Conduct the University has. High level of experience in anticipation on research issues (energy communities and Green University)	High level of influence regarding inclusiveness and responsiveness	
Air and Waste Management Laboratory-AWMA Lab	Interest in open access Interest public engagement	High level of experience with gender equality, ethics and public engagement according to the Gender Equality Committee and the Committee/ Code of Conduct the University has. High level of experience in reflexivity and inclusiveness on research issues (Air and Waste Management)	High level of influence regarding inclusiveness	Air and Waste Management Laboratory-AWMA Lab
Environmental technology laboratory	Interest in open access Interest in responsiveness	High level of experience with gender equality, ethics and public engagement according to the Gender Equality Committee and the Committee/ Code of Conduct the University has. High level of experience in anticipation on research issues (Energy Communities and Green University)	High level of influence regarding reflexiveness	Environmental technology laboratory
Laboratory of Alternative Fuels & Environmental Catalysis, LAFEC	Interest in open access Interest in responsiveness	High level of experience with gender equality, ethics and public engagement according to the Gender Equality Committee and the Committee/ Code of Conduct the University has. High level of experience in anticipation on research issues (Alternative Fuels and Catalysis)	High level of influence regarding responsiveness	
Department of Mechanical Engineering	Interest in open access Interest in responsiveness	High level of experience with the issues of gender equality, ethics and public engagement according to the Gender Equality Committee and the Committee/ Code of Conduct the University has. High level of experience with anticipation on the research issues (energy and new technologies)	High level of influence on inclusiveness and responsiveness	
Laboratory of Fluid Mechanics and Turbomachinery	Interest in open access Interest in reflexiveness	High level of experience with the issues of gender equality, ethics and public engagement according to the Gender Equality Committee and the Committee/ Code of Conduct the University has.	High level of influence on responsiveness	Laboratory of Fluid Mechanics and Turbomachinery

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		High level of experience with responsiveness on the research issues (Fluid Mechanics and Turbines)		
Energy and Pollution Control Systems Engineering Laboratory	Interest in open access Interest in responsiveness	High level of experience with the issues of gender equality, ethics and public engagement according to the Gender Equality Committee and the Committee/ Code of Conduct the University has. High level of experience with responsiveness on the research issues (Energy and Pollution Control Systems)	High level of influence on responsiveness	
Laboratory of Mechanical Processes and Quality Control	Interest in open access Interest in science education	High level of experience with gender equality, ethics and public engagement according to the Gender Equality Committee and the Committee/ Code of Conduct the University has. High level of experience in responsiveness on research issues (Mechanical Processes and Quality Control)	High level of influence regarding responsiveness	
Laboratory of Quantitative Methods of Operations Research and Statistics in Engineering (MORSELab)	Interest in open access	High level of experience with gender equality, ethics and public engagement according to the Gender Equality Committee and the Committee/ Code of Conduct the University has. High level of experience in anticipation and responsiveness on research issues (Quantitative Methods of Operations Research and Statistics in Engineering)	High level of influence regarding anticipation and responsiveness	
Centre for Renewable & Alternative Energy Sources & Rational Use of Energy	Interest in open access Interest in responsiveness	High level of experience with the issues of gender equality, ethics and public engagement according to the Gender Equality Committee and the Committee/ Code of Conduct the University has. High level of experience with anticipation on the research issues (RES and Alternative Energy)	High level of influence on science education and responsiveness	
Centre for Testing of Materials and Constructions	Interest in open access Interest in anticipation	High level of experience with the issues of gender equality, ethics and public engagement according to the Gender Equality Committee and the Committee/ Code of Conduct the University has. High level of experience with reflexivity on the research issues (Material Testing and Constructions)	High level of influence on inclusiveness and responsiveness	
Laboratory of Vibration & Machine Dynamics	Interest in open access Interest in science education	High level of experience with gender equality, ethics and public engagement according to the Gender Equality Committee and the Committee/ Code of Conduct the University has.	High level of influence regarding reflexivity and responsiveness	

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		High level of experience in responsiveness and reflexivity on research issues (Vibration and Machine Dynamics		
Laboratory of Magnetic and Electric Analysis for Non-Destructive Evaluation (Meander)	Interest in responsiveness	High level of experience with the issues of gender equality, ethics and public engagement according to the Gender Equality Committee and the Committee/ Code of Conduct the University has. High level of experience with anticipation on the research issues (Non distractive Testing)	High level of influence on reflexiveness	
Department of Electrical and Computer Engineering (ECE)	Interest in responsiveness	High level of experience with the issues of gender equality, ethics and public engagement according to the Gender Equality Committee and the Committee/ Code of Conduct the University has. High level of experience with anticipation on the research issues (new technologies)	High level of influence on inclusiveness because of the interaction with the regional authority, other domestic and foreign universities, and businesses. High influence on responsiveness regarding the implementation of new technologies in the post coal phase.	
Laboratory of Applied and Computational Electromagnetism	Interest in responsiveness	High level of experience with the issues of gender equality, ethics and public engagement according to the Gender Equality Committee and the Committee/ Code of Conduct the University has. High level of experience with anticipation on the research issues (Computational Electromagnetism)	High level of influence on Inclusiveness because of the interaction with the regional authority, other domestic and foreign universities, and businesses.	Laboratory of Applied and Computational Electromagnetism
Laboratory of Electronic Health and Biomedical Technology	Interest in open access Interest in public engagement	High level of experience with the issues of gender equality, ethics and public engagement according to the Gender Equality Committee and the Committee/ Code of Conduct the University has. High level of experience with inclusiveness and responsiveness on the research issues (Electronic Health and Biomedical Technology)	High level of influence regarding inclusiveness and responsiveness	
Internet Lab of Things and Applications	Interest in open access Interest in public engagement	High level of experience with the issues of gender equality, ethics and public engagement according to the Gender Equality Committee and the Committee/ Code of Conduct the University has. High level of experience with inclusiveness and responsiveness on the research issues (IoT and Applications)	High level of influence regarding responsiveness	
Laboratory of Networks and Advanced Services	Interest in anticipation	High level of experience with the issues of gender equality, ethics and public engagement according to the Gender Equality Committee and the Committee/ Code of Conduct the University has. High level of experience with anticipation on the research issues (Networks)	High level of influence on responsiveness	

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Laboratory of Robotics, Integrated and Integrated Systems	Interest in responsiveness	High level of experience with the issues of gender equality, ethics and public engagement according to the Gender Equality Committee and the Committee/ Code of Conduct the University has. High level of experience with anticipation on the research issues (Robotics)	High level of influence on inclusiveness because of the interaction with the regional authority, other domestic and foreign universities, and businesses.	
Department of Regional Development and Cross Border Studies	Interest in open access Interest in science education	High level of experience with gender equality, ethics and public engagement according to the Gender Equality Committee and the Committee/ Code of Conduct the University has. High level of experience in inclusiveness and science education on the research issues (Regional Development and Cross Border issues)	High level of influence regarding science education	High level of power in science education and open access
Management of Technology Research Lab	Interest in open access Interest in public engagement	High level of experience with gender equality, ethics and public engagement according to the Gender Equality Committee and the Committee/ Code of Conduct the University has. High level of experience in inclusiveness and responsiveness on the research issues (Management of Technology)	High level of influence regarding responsiveness and anticipation	
National Centre for Research and Technological Development (CERTH)	Interest in open access	Experience with the gender equality, ethics and public engagement. High level of experience with inclusiveness.	Influence regarding anticipation, reflexivity and responsiveness. The research centre has a critical role to the post-coal phase in issues related to the change of the energy mix, the implementation of new technologies and the needed constant updating and forecasting of strategies and actions.	
Businesses				
Public Electricity Company (PPC)	High interest in anticipation, reflexivity and responsiveness. The PPC company has a central role in the post-coal era, following a business transformative plan.	Experience with gender equality, ethics, public engagement.		Power to support the future actions of the energy transition based on its know-how and experience in energy issues as a leading company on the energy factor in Greece
Cluster of Bioeconomy and Environment of Western Macedonia (CluBE)	Interest in responsiveness and science education. Interest in anticipation, reflexivity and responsiveness.	High levels of experience with gender equality, ethics, public engagement and open access (the requirements of the European Programmes the Cluster is involved in).		

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BELLIS SA	Interest in public engagement, open access, gender equality, ethics and scientific education	Experience with anticipation, reflexivity and responsiveness		
BAGATZOUNIS MARKOS & SONS SA	Interest in public engagement, open access	High experience with gender equality and ethics, following a code of conduct. High experience with science education by the continuous collaborations with scientific bodies and significant achievements in recycling and the pharmaceutical uses of their products. Experience with anticipation, reflexivity and responsiveness.		
ETHELEO LP	Interest in public engagement, open access, gender equality, scientific education	High experience with ethics by following a code of conduct and certifications of product quality. Experience with anticipation, reflexivity and responsiveness.		
B&T COMPOSITES	Interest in gender equality, open access, science education	High experience with public engagement and ethics. The company is certified by multiple ISO certifications, by official European product certifications and European materials certifications. Experience with anticipation, inclusiveness reflexivity and responsiveness.		
ALFA WOOD GROUP	Interest in open access, gender equality	High experience with public engagement and ethics. The company focuses on recycling biomass waste from the production process, as well as its waste. Also, promotes and supports the use of renewable energy. The company is certified by state organisations as well as international organisations. High experience with anticipation, inclusiveness, reflexivity and responsiveness. Adheres to strict standards and commitments for its production line, comply with applicable legal requirements.		
ALFA	Interest in open access, gender equality, science education	High experience with public engagement and ethics. The company has awards as a traditional Greek Company and on the Marketing and Communication sector. Also, an Innovation Award. High experience with anticipation, reflexivity and responsiveness.		

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DIOSCURIDES	High Interest in open access and science education. There is a cooperation with organic farmers, with agricultural cooperatives and with educational & social Institutions. Also, a collaboration with the Agricultural University of Athens.	High experience with public engagement and ethics, inclusiveness by following a code of conduct and certifications of product quality. Experience with anticipation, reflexivity and responsiveness		
PITENIS BROS SA	Interest in open access, gender equality, science education	High experience with public engagement and ethics by following a code of conduct. Is certified by and implements the System Assurance & Quality Management and awarded with Quality Award. High experience with anticipation, reflexivity and responsiveness. The company has high quality production and modern facilities. Also has a high level of exports.		
KAMKOUTIS	Interest in gender equality and science education	High experience in open access, public engagement. It has modern/ innovative facilities and mechanical equipment by following strict controls. There are many visitors to the winery since 2006 and many winery events, workshops, receptions, etc. Experience with anticipation, reflexivity and responsiveness.		
NGOs				
"Social Cooperative Enterprises" ZEIDORON	Interest in open access, public engagement, gender equality.	Experience with anticipation, reflexivity and responsiveness.		It promotes local and collective interest, employment through vocational rehabilitation of vulnerable social groups, social cohesion and strengthens local regional development.

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Table 12: Systemic categorisation of stakeholders for the Sofia municipality

Stakeholder organisation	Stakeholders with high levels of interest in RRI	Stakeholders with high levels of experience in RRI	Stakeholders with high levels of influence on RRI in practice	Stakeholders with high levels of power
Research and Academia				
Technology Transfer Office		Experience with science education, public engagement, ethics		
International Business School	Interest in science education, ethics, gender equality, public engagement	Experience with science education, public engagement, ethics		
Sofia University St. Kliment Ohridski	Interest in science education, ethics, gender equality, public engagement, open access	Experience with all RRI-AIRR keys	Potential influence on ethics, science education, gender equality, open access	
University of National and World Economy	Interest in science education, ethics, gender equality, public engagement, open access	Experience with all RRI-AIRR keys	Potential influence on ethics, science education, gender equality, open access	
University of Library and Information Technologies	Interest in science education, ethics, gender equality, public engagement, open access	Experience with ethics, science education, public engagement, gender equality, open access		
Sofia Tech Park	Interest in science education, ethics, gender equality, public engagement, open access	Experience with science education, public engagement, ethics	Potential influence on science education, ethics, open access	
Businesses				
Electric Vehicles Industrial Cluster	Interest in science education, public engagement, open access	Experience with science education, public engagement	Potential influence on science education, open access practices	
Innovation capital				
Virtech Ltd.	Interest in science education, open access			
Microsoft	Interest in science education, public engagement, open access	Experience with science ed, public engagement, open access		
Bulgarian Start-up Association	Interest in science education, ethics, open access	Experience with science education, open access		
Lime	Interested in open access			
Obecto Digital Cooperative	Interested in open access, science education	Experience in public engagement, ethics		

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PolicyConsult Ltd	Interest in public engagement, open access	Experience in public engagement		
Policymakers				
Programme Europe		Experience with public engagement and inclusiveness		
SofiaPlan		Experience with all RRI keys	Influence regarding all RRI keys and AIRR principles	Power to reassess decision-taking practices through reflection
Sofia Investment Agency	Interest in open access, science education	Experience with AIRR (responsiveness, reflexivity, anticipatory governance)	Influence regarding all RRI keys and AIRR principles	
Sport and Youth Activities Directorate, Sofia Municipality	Interest in science education, gender equality, open access	Experience with public engagement science education	Influence regarding all RRI keys	
Innovative Sofia	Interest in all RRI keys	Experience with all RRI keys		Power to reassess decision-taking practices through anticipatory governance, responsiveness
State Institute for Culture	Interest in gender equality, ethics			
EU Committee of the Regions (BG representative)	Interest in all RRI keys	Strong experience with all RRI-AIRR dimensions	Influence regarding all RRI keys	Power to influence debate and change in smart city policies
British Council Sofia	Interest in science education, gender equality, open access	Experience with public engagement science education	Influence regarding science education, public engagement	
State Agency for E-government	Interest in open all RRI keys	Strong experience with open access	Influence regarding all RRI keys, esp. open access	Power to influence policies and practices regarding open access
State Agency for Research and innovation	Interest in all RRI-AIRR dimensions	Experience with all RRI-AIRR dimensions	Influence regarding all RRI-AIRR dimensions	Power to influence all RRI-AIRR dimensions
Sofena	Interest in science education, public engagement	Experience with RRI-AIRR dimensions	Influence regarding all RRI-AIRR dimensions	
National Association of Municipalities in Bulgaria	Interest in all RRI-AIRR dimensions	Experience in all RRI-AIRR dimensions	Influence regarding all RRI-AIRR dimensions	
National Centre for Public Health and Analyses	Interest in science education, ethics, open access	Experience in ethics, open access, science education		
NGOs and civil society				
NGO Links	Interest in open access, public engagement	Experience with open access, public engagement, ethics	Potential to influence practices regarding open access	
Rinker center	Interest in public engagement, science education	Experience with science education		

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Bulgarian School of Politics	Interest in open access, public engagement, gender equality		Potential to influence practices regarding RRI keys	
Foundation "The Duke of Edinburgh's International Award – Bulgaria"	Interest in public engagement, science education	Experience with public engagement, science education		
Maria's World Foundation	Interest in public engagement, gender equality, ethics, open access	Experience with public engagement, ethics, gender equality	Potential to influence ethics, gender equality, responsiveness, inclusiveness	
Reach for Change Bulgaria	Interest in public engagement, science education, ethics, gender equality	Experience with public engagement, ethics		
SOfiaGREEN project	Interest in science education, open access, public engagement	Experience with public engagement, open access, science education	Potential to influence practices re: public engagement, open access, science education, responsiveness, anticipatory governance	
Health & Life Science Cluster	Interest in science education, open access, public engagement, ethics, gender equality	Experience with ethics, science education, open access		
Workshop for Civic Initiatives	Interest in public engagement, gender equality, ethics, open access	Experience with all RRI-AIRR dimensions	Potential to influence public engagement, science education, open access	
Association Parents	Interest in public engagement, science education	Experience in public education	Potential to influence public engagement, science education, ethics	
Institute for Regional and International Studies	Interest in public engagement, open access	Experience with public engagement		
Bulgarian Council on Refugees and Migrants	Interest in public engagement, gender equality, ethics, open access	Experience with public engagement, ethics, gender equality		
Forum Civic Participation	Interest in all RRI-AIRR dimensions	Experience with all RRI-AIRR dimensions	Potential to influence all RRI keys	
BCause Foundation	Interest in all RRI-AIRR dimensions	Experience with all RRI-AIRR dimensions		
Association Bulgarian Women in Technology	Interest in science education, gender equality	Experience with science education, gender equality		

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Table 13: Systemic categorisation of stakeholders in Thalwil

Stakeholder organisations	Stakeholders with high levels of interest concerning RRI in practice	Stakeholders with high levels of experience in RRI	Stakeholders with high levels of influence on RRI in practice	Stakeholders with high levels of power
(Territorial) Policy Makers				
Federal Department of the Environment, Transport, Energy and Communications (DETEC)		Experience in the balance of interests (AIRR)	Sustainability as a core value (reflexiveness)	
Swiss Federal Office for Energy (SFOE)		Experience with anticipation, science education, and public engagement	Funding of research and information platforms (science education)	
Cantonal Office for Spatial Planning (ARE)			Setting specific rules and regulations (AIRR)	Cantonal authority
Cantonal Office for Waste, Water, Energy and Air (AWEL)			Setting specific rules and regulations (AIRR)	Cantonal authority
Swiss People's Party Thalwil (SVP)				Major political party (22%)
Liberal party Thalwil (FDP)				Major political party (20%)
Green Liberal Party Thalwil (GLP)				Major political party (17%)
Social Democratic Party Thalwil (SP)				Major political party (15%)
Green Party Thalwil (GP)				
Center Thalwil (centre)				
Municipal Council (GR)			General governance (AIRR)	Executive power
Commission for Planning and Construction (PBK)			Advisory role (AIRR, science education)	Advisory board
Steering Committee Sustainability (StGN)			Advisory role (AIRR, science education)	Advisory board
Project Commission Energy (PK Energy)			Advisory role (AIRR, science education)	Advisory board
Research and Academia				
Swiss Federal Institute of Technology (ETH)	Pioneer in transdisciplinary research and education	Research in energy science engagement, science education)		
University of Zurich (UZH)		Research in ethics and open access		
Zurich University of Applied Sciences (ZHAW)	Territorial partner in RRI-LEADERS	Energy research and societal change (responsiveness)		
Eastern Switzerland University of Applied Sciences (OST)		Teaching in spatial development (anticipation)	Engage with municipality	
Civil Society				

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Energy City Label Association	Strong collaboration with municipalities	Highly experienced with label development (AIRR)	Audit municipalities (public engagement, science education)	
Energy Panel Zurich (EPZ)		Offers public tours (science education and public engagement)		
Village Association Thalwil (DVT)				Interest group
Village Association Gattikon (DVG)				Interest group
Ökopolis Thalwil –Sustainability Association	High interest in sustainability (reflexiveness)			
Small Trade and Industry Association Thalwil (HGV)				
Thalwil residents				Can launch a political initiative
Business Sector				
Electricity Utilities of the Canton of Zurich (EKZ)				Holds power monopoly, operates DH network
Energy 360°				
ewz energy solutions				Operates district heating network
Energy Cooperative Zimmerberg (EZS)				
Gas Water Thalwil[49]				Utility that sells water and gas (monopolist)
PLANAR AG for Spatial Development		Experts in sustainable development	Advises the municipality on energy issues	
Homeowners Association Thalwil-Rüschlikon-Oberrieden (HEV)				
Precision Landing GmbH				
Naef energy technology		Offers sustainable energy solutions		

[49]Gas Water Thalwil is a public body run by the municipality.

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Table 14: Systemic categorisation of stakeholders for the City of Sabadell and Catalonia

	Stakeholders with high levels of interest in RRI	Stakeholders with high levels of experience in RRI	Stakeholders with high levels of influence on RRI in practice	Stakeholders with high levels of power
Policymakers				
Generalitat de Catalunya (Catalan Government)	Interested in anticipation, reflexivity and responsive governance			Power to implement responsiveness actions in the territory
Actividades Integradas, SA (Nodus Barberà)	Interested in public engagement and responsive governance			
Economic Promotion. Generalitat de Catalunya	Interested in public engagement, anticipation, reflexivity and responsive governance			Power to implement responsiveness actions in the territory
Active Ageing Office. Generalitat de Catalunya	Interested in public engagement, anticipation, reflexivity and responsive governance			Power to implement responsiveness actions in the territory
Martorell City Hall	Interested in public engagement, inclusiveness			Limited capacity for responsiveness
Consorci de la Zona Franca	Interested in public engagement, anticipation, reflexivity			
Nodus Barberà. Barberà City Hall	Interested in public engagement, inclusiveness			Limited capacity for responsiveness
Research and Academia				
ISGlobal	Interested in public engagement, science education and gender equality	Experience in reflexivity	Influence in reflexivity	
UAB	Interested in research ethics and open access		Influence in research ethics, gender equality	
ESADE	Interested in research ethics and open access		Influence in gender equality and anticipation	
BSC	Interested in science education, gender balance and public engagement		Influence in reflexivity	
ICREA	Interested in research ethics and gender equality		Influence in anticipation and responsiveness	
ESDI	Interested in research ethics and public engagement	Experience in employment of the territorial innovation polices		
CORE Smart and Sustainable Cities, UAB	Interest in public engagement and ethics in research	Experience in interaction between different quadruple helix stakeholders		

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Parc Taulí Research and Innovation Institute	Interested in public engagement and science education		Influence in research ethics to promote the wellness of their patients	
Centre for research in agricultural Genomics (CRAG)	Interested in public engagement	Experience in gender equality		
University and Research Grants Management Agency (AGAUR)	Interested in research ethics and gender equality	Experience in science education and open access		
Rector's Office at UAB	Interested in research ethics, public engagement and gender equality	Experience in science education, reflexivity		
Research Park, UAB	Interested in research ethics, public engagement and gender equality			
Ramon Llull University	Interested in research ethics, public engagement, inclusiveness			
International University of Catalonia	Interested in research ethics, public engagement, inclusiveness			
Ramon Llull University	Interested in research ethics, public engagement, inclusiveness			
Robotics and Industrial IT Institute, Polytechnic University of Catalonia.	Interested in public engagement, research ethics			
Businesses				
SEAT	Interested in research ethics and gender equality			Power to implement sustainability actions, such as reducing pollution and waste
Sorigué	Interested in gender balance and research ethics			
Barça Innovation Hub (Football Club Barcelona)			Influence in public engagement	
ADASA Sistemas S.A.U.	Interested in science dissemination			
FI GROUP			Influence in the policies in public administration	
Inèdit			Influence in sustainability and eco-innovation strategies	
Start-up VEnvirotech Biotechnology	Interested in research ethics and open access			
Start-up B'ZEOS (Compostable food packaging)	Interested in research ethics and open access			
Packaging Cluster	Interested in research ethics in business			

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INNOVAFORUM	Interested in citizen engagement and ethics			
VITALA	Interested in citizen engagement and open access			
Innovement	Interested in public engagement, ethics and open access			
Fika Consultoria	Interested in public engagement, ethics and open access			
NGOs and civil society				
Cambra Oficial de Comerç, Indústria, Serveis i Navegació de Barcelona	Interested in research ethics in business		Influence in public engagement	
Agencia per la competitivitat de l'Empresa Generalitat de Catalunya, ACCIO	Interest in ethics in business		Influence in anticipation, reflexivity in business	Power to promote and transform companies to situate them as a benchmark
Fundació TIC Salut Social	Interested in ethics and citizen engagement			
Voluntaris en Assessoria Empresarial VAE	Interested in ethics and citizen engagement			
Individual citizens	Interested in ethics and citizen engagement			
Fundació CIPO	Interested in ethics and citizen engagement			
Fundació MAIN	Interested in ethics and citizen engagement			
Chapter2	Interested in ethics and citizen engagement			

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