Brief Reports on Region-specific Challenges and Identified Areas for Joint Action

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1 Introduction

The following report includes four reports on region-specific challenges and identified areas for joint action (deliverable 3.1). Based on the mapping reports for each pilot territory (deliverable 1.2), respective literature review, interviews with regional experts and a first round of workshops, the objective of the report is to elaborate region-specific issues and challenges with a connection to RRI that could be addressed in the following pilot activities. Related activities are for instance preceding activities to build upon (local initiatives, interests and concerns), existing networks, joint-projects or partnerships to be leveraged (value chains, joint R&D, informal networks) or further regional stakeholders to get involved (new actors within the regional innovation systems, start-ups or mature industries). The purpose of the deliverable is to present the mentioned issues per territory according to a commonly agreed structure, which allows for comparing the different RRI dimension and ultimately to provide input for the currently planned scoping/co-creation workshops where the specific needs are to be concretized and the pilot activities to be developed.

The report will present the results separately for each regional case along a commonly agreed structure. After an introduction, a summary overview presents the extent and status of responsible research and innovation. The main basis for the summaries are the mapping work and the subsequent validation discussions within the project teams and with the regional stakeholders. Across the four regions, it becomes apparent, that both scope and specific operationalization of the different RRI dimensions is quite heterogeneous, indicating that the regional (and national) pre-conditions for RRI and the experience within the regions considerably deviate.

The following chapters for the regional cases represent the main parts in terms of touching upon the different challenges for a further integration of RRI into the respective innovation and production systems. Here, special emphasis is put on different types of challenges, for instance those, deriving from external factors or causes largely unamendable to local action, or those challenges being more conjoined to local actors. Examples for the first type are for instance requirements from funding agencies and incentives opposed to RRI dimensions or experience with participation and stakeholder processes. Regarding the challenges deriving from local factors, examples can both be related to the structures of the regional systems as such (e.g. innovation or production oriented, public vs. private driven, amount of formal vs. informal exchange, entrepreneurial vs. routinized regime) and the modes of governance and coordination. Finally, we will look at those challenges having mixed causes, typically due to the integration of top-down and bottom-up processes and related complex governance mechanisms.

Based on the analyses of the challenges, the following chapters will focus on the potential (theoretical) needs of the local authorities and stakeholders. Here, possible concepts and approaches will be discussed and used as input for the next round of workshops for the specification of the pilot actions. Possible needs can for instance include enabling factors like motivation and awareness raising (for actors and individuals to engage into RRI), the development of structures to facilitate the generation and exchange of knowledge surrounding participation and stakeholder processes, a better coordination of policies vis-à-vis superior authorities or agencies or in the case of complex, risky and/or experimental research and development, the support of local and regional actors on how to facilitate new transfer models like regulatory sandboxes or living labs.

Finally, the region specific cases will look at the pre-existing activities, partners and stakeholders that could potentially be leveraged. What follows here are basically brief descriptions of structures, projects and generall approaches, a recap of the local institutional structure and particularly first ideas on how single or a group of actors can be leveraged to strengthen the institutional setup in terms of activeley and effectively implementing RRI dimensions.

2   Cantabria

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EXECUTIVE SUMMARY

This report is part of Deliverable 3.1 of the TetRRIS project, funded by the European Commission (EC) under its Horizon 2020 Research and Innovation Framework Programme (H2020), Science with and for Society (Swafs) Call 14. The core objective of TetRRIS is to support four European pilot territories in integrating Responsible Research and Innovation (RRI) practices into their local/regional innovation systems and development approaches. To do so, TetRRIS draws on concepts from the literatures on Regional Innovation Systems (RIS) and RRI.

In Deliverable 2.2 we conducted a mapping of the regional innovation ecosystem of Cantabria. In this exercise, we paid special attention to its structure, actors, policy plans, dynamics, activities and cultures to explore "de facto RRI" features in the ecosystem. In this report, we aim to validate previous results with the help of the participants in the aforementioned study.

To achieve this objective, TECNALIA, in liaison with SODERCAN, conducted a virtual workshop with several participants in the previous study to validate the mapping conducted in the territory. This exercise also helped to identify possible domains of action for developing RRI pilot actions as well as identifying challenges, needs and possible participants.

The validation of the findings of the mapping exercise and its presentation to the participants in the fieldwork through the virtual workshop has allowed to the research team to fine-tune some domains of opportunity for the development of the RRI concept in the territory. These are:

- **Bio-Health and post-Covid-19 society**
- **Blue economy and energy transitions**
- **Responsible Industry 4.0**
- **Sustainability and Responsibility**

2.1   Introduction

The aim of Project TetRRIS – Territorial Responsible Research and Innovation and Smart Specialization is to support four European pilot territories in integrating Responsible Research and Innovation (RRI) practices into their local/regional ("territorial") innovation systems and development approaches; to promote mutual learning and interaction between the pilots (and, where possible, other European projects and regions); and to develop tools, good practices and policy recommendations that can be used to integrate RRI into regional development in other European territories.

The TetRRIS project seeks to initiate pilot activities to strengthen local RRI practice in four European territories (Tampere Region in Finland, Karlsruhe Technology Region in Germany, Cantabria in Spain, and Csongrád-Csanád County in Hungary). As a first step in this process, the consortium partners prepared in Deliverable 2.2 short reports on the different territories, to map the structure of the local territorial innovation systems, and the extent and nature of any pre-existing RRI (or RRI-like) activities found within them.

This report takes a step forward and analyses Cantabria regions´-specific issues and challenges that may yield themselves to RRI related considerations. The report includes preceding activities to be built upon, taking a closer look to the potentialities, needs and challenges that the implementation of RRI can rise during the next months of TetRRIS project implementation.

To this aim, this document is structured in five chapters that provide an overview of the region. The first chapter explains the methods employed to develop this deliverable, the second is a brief recap of the current status of the implementation for the RRI agenda in the region. The third and fourth chapters focuses on the challenges and the needs that the region faces on the integration of the RRI Agenda into the local innovation and development system. The fifth chapter pays attention to the pre-existing local activities, partners and stakeholders that could potentially be leveraged for further pilot activities around RRI in the project.

2.2   Methods

In Deliverable 2.2, the research team conducted a case study that was structured around a policy documentation analysis and 12 semi-structured interviews with 16 key informants representing 19 organizations. This fieldwork helped to gather different visions, particularities and values that are part of the innovation ecosystem of the region. The aim was to understand the socio-cultural particularities of the regional innovation ecosystem as well as which kind of "de facto RRI" features are embedded in their actors. This included mapping out regional R&I&I stakeholders, communities, businesses associations, clusters and other bodies and actors affected or concerned by the issues at stake in research and innovation activities (Martin, Kroll, Stahleckler, & Hansmeier, 2020).

In order to validate the findings obtained in this previous exercise, TECNALIA team in liaison with SODERCAN organized a virtual workshop with participants in the prior

fieldwork. The virtual character of the event was mainly imposed by COVID-19 restrictions and to facilitate participants its attendance throughout a digital platform. This event was organized in the morning of the **6th of May 2021** with a duration of one hour and a half. The 19 organizations that took place in the interviews were invited to this event as well as other that did not take part. 15 Participants representing 17 organizations such as universities (UC, UNE Atlántico), research institutes (IDIVAL, IH), technological centres (CTC), clusters (CINC, Sea of Innovation) and companies (Textil Santanderina, DEGIMA, APRIA Systems, MAFLOW) assisted to the event as well as some representatives of other institutions such as the Government of Cantabria[1].

The objectives of this virtual workshop were aligned with the WP3 objectives of the Grant Agreement and are basically two:

- **To share the results of Deliverable 2.2. and validate them.**
- **To work together towards a more responsible R&D&I ecosystem in the region.**

These objectives were oriented to understand what are the main actors and institutions in the regional innovation ecosystem, which are the main networks and communities, and which are the main RRI related issues that are perceived as relevant by these actors and that can serve as a basis for the development of pilot actions at the later stages of the TetRRIS project.

The agenda of the event was organized around 2 main blocks**: the presentation of the mapping** and another slot focused in understanding **potentialities of RRI for facing the different challenges of the innovation ecosystem of the region** The event begun with an institutional welcome led by Jorge Muyo, Director of the General Directorate of Innovation, Technological Development and Industrial Entrepreneurship (DGIDTEI) and Rafael Pérez Tezanos (see figure 1) CEO chief executive of SODERCAN.

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[1] Total number of participants was 21 but participants from SODERCAN, Government of Cantabria and TECNALIA were not included in this listing.

Figure 1: Welcoming by Jorge Muyo, and Rafael Pérez Tezanos

After this introduction, the mapping exercise conducted was presented by TECNALIA and several questions and comments followed that presentation. In the second block of the agenda, there was a brief explanation of the different potentialities of RRI and a practical example of two particular regions that have been engaged on RRI dimensions and keys. This exercise was conducted for triggering the debate around the possibilities that RRI can offer for the innovation ecosystem of Cantabria.

Most of the participants agreed with the results of the study and identified the same challenges facing the region in terms of R+D+I. The majority of the participants valued the work carried out and they express that the mapping exercise has been an important first step. Many of them highlighted that the fragmentation of the regional innovation ecosystem did not allow to have "a map" of actors that can be visualized around R&D&I. A round of interventions was opened in which different contributions were made on the different sections that were discussed. Generally speaking, the participants stressed that the project is situated in a unique and historically policy context and momentum. The development of the new RIS3 strategy, Agenda 2030 and other emerging regional projects and reinforced by the recovery funds, where the development of a collaborative, open and reflective culture will be a necessary asset for facing the challenges of the region.

The new European orientation of science and technology R&D&I towards solving societal challenges resulting from top-down governance and bottom-up societal demand is also perceived as an opportunity linked to this project. The participants commonly stressed that the mapping exercise is a good starting point to encourage collaboration and join initiatives between the actors of the ecosystem. The discussion revolved around the next steps and one of the main concerns referred to how to translate the project into concrete actions and how to reach the market by strengthening sustainable and responsible competitiveness.
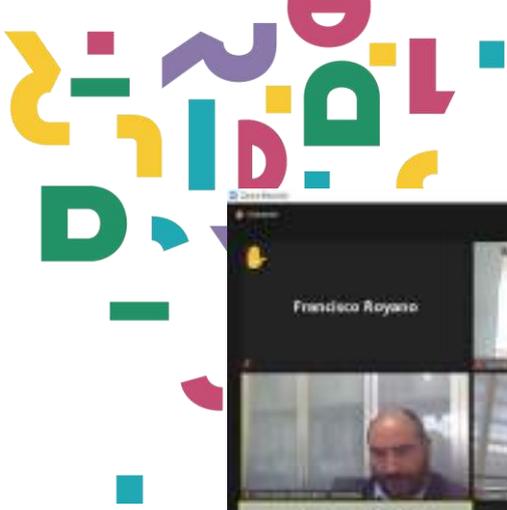
Figure 2: Closing of the virtual workshop

2.3   Brief Recap of the current Status of the Implementation for the RRI Agenda in the Territory

Having an understanding of how and to what extent different elements of RRI are practiced in the Cantabria region, is one of the objectives that are pursued by the TetRRIS project. This chapter tries to provide a general summary of the different features of the regional innovation ecosystem mapped out and how these characteristics enable or hinder the implementation of a RRI agenda in the region. The objective is to unveil some of the underlying ideas associated to these characteristics that share synergies with the RRI paradigm to analyse the existence of "de-facto RRI" features in the ecosystem (Randles, Larédo, Loconto, Walhout, & Lindner, 2016).

In this sense, we can say that **Cantabria is at early stages of the process of integrating RRI paradigm into regional policies.** The term is not used in policy documentation consulted and none of the horizontal strategies explicitly mentions the term RRI (Geoghegan-Quinn, 2012) or RI (Owen & Pansera, 2019). At a programming level there are no data available for funders' activities to promote RRI in the region. At the same time, it is worthy to mention that **social innovation has a significant presence in policy documents and strategies**. The regional innovation strategy for the period 2016-2030 establishes in its first axis the aim of achieving a sustainable innovation ecosystem and stimulating social innovation. Through the creation of a regional system that fosters social innovation, it aims to establish a critical mass of actors with a high level of commitment in the social innovation sector, for supporting the creation and implementation of new projects. Social innovation is described as

The development and implementation of new ideas (products, services, and models) to meet social needs, create new social needs, create new social relationships and deliver better outcomes. It serves as a response to social demands that affect the process of social interaction, aiming to improve human well-being.

(Gobierno de Cantabria, 2016b)

In this sense, **social innovation is understood in the region as a broad concept that in recent years it has grown in prominence, but still needs to be implemented.** In the beginning of this year, a new program has been launched for supporting social innovation projects in the territory (especially in rural areas) with a budget of 240.000€[2]. It is reasonable to expect that these actions will follow during the next years as the different challenges that industrial, economic and societal transformation processes will create in the region will demand of these lines of action. In this sense, RRI can have also a specific application domain where it can be embedded in the policy strategy of the region. We have to remind that RRI can be also considered a social innovation applied to R&D&I (Rip, 2014) and its application to regional strategies demands of a proper contextualization of the concept and its potentialities (Tabarés et al., 2020; Thapa, Iakovleva, & Foss, 2019; Uyarra, Ribeiro, & Dale-Clough, 2019).

At the same time, the research team has observed how **different keys of the RRI paradigm such as ethics and gender equality are regularly present in several of the research organizations of the regional innovation ecosystem.** Many of the research institutes showed an institutionalization of ethics and gender equality, mainly throughout ethics assessment internal procedures and gender balance official plans. We have found personal bottom-up motivations, commitments and interests of scientists and innovators towards responsibility, sustainability and ethics related approaches. In contrast, **other keys of the RRI paradigm such as public engagement, open access and science education related activities**, seem to be not widely diffused between research and innovation organizations in the region. It is true that some research institutes and educational institutions organize from time to time "open doors days", they take part in EU coordinated activities such as the "Researcher´s night", but it is not common to observe this kind of activities in the different stakeholders of the regional innovation ecosystem. In addition, there are no specific lines of funding or support for these type of activities by the regional government. That is why this domain of action could be identified as one of the major gaps that can contribute to the development of the RRI concept in the region. Public engagement, open access and science education deserve

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[2] https://dgidtei.cantabria.es/ayudas/-/asset_publisher/zGYQ2fbdARZl/content/subvenciones-innovaci-c3-b3n-social?_com_liferay_asset_publisher_web_portlet_AssetPublisherPortlet_INSTANCE_zGYQ2fbdARZl_assetEntryId=11954950&_com_liferay_asset_publisher_web_portlet_AssetPublisherPortlet_INSTANCE_zGYQ2fbdARZl_redirect=https%3A%2F%2Fdgidtei.cantabria.es%2Fayudas%3Fp_p_id%3Dcom_liferay_asset_publisher_web_portlet_AssetPublisherPortlet_INSTANCE_zGYQ2fbdARZl%26p_p_lifecycle%3D0%26p_p_state%3Dnormal%26p_p_mode%3Dview%26_com_liferay_asset_publisher_web_portlet_AssetPublisherPortlet_INSTANCE_zGYQ2fbdARZl_cur%3D0%26p_r_p_resetCur%3Dfalse%26_com_liferay_asset_publisher_web_portlet_AssetPublisherPortlet_INSTANCE_zGYQ2fbdARZl_assetEntryId%3D11954950

special attention for promoting societal engagement around R&D&I and strengthening science-society interactions in the region.

In addition to the keys, there are other meanings and conceptualizations around responsibility that are present in the regional innovation ecosystem and that can affect the development of the RRI paradigm in Cantabria. One of these concepts is **Corporate Social Responsibility (CSR) that shows a regular presence and is widely integrated in regional stakeholders**. CSR shares synergies with the RRI paradigm and also share some values and their respective discourses (Tabarés et al., 2020; van de Poel et al., 2017). In this sense, it is common to observe how different organizations have their own CSR policies or plans and several associations such as CEOE-CEPYME and the Chamber of Commerce also coordinates different initiatives related with CSR such as "Cantabria Responsable"[3]. In addition, SODERCAN also runs a CSR program with two main objectives: to develop responsible actions internally (through the implementation of community support activities, the integration of CSR in the mission, vision and values of the group's companies, the creation of human resources practices that improve the quality of life of employees) and the acquisition of environmentally friendly behaviour, among others[4].

Sustainability is also another concept that overlaps practices, meanings and values with RRI (Burget, Bardone, & Pedaste, 2017; Ladikas, Hahn, Hennen, Kulakov, & Scherz, 2019). **Sustainability is widespread among many of the stakeholders of the regional innovation ecosystem and it seems that there is a common awareness of the concept and a regular number of related initiatives in the territory. There are also pre-exiting networks in the territory such as the Cantabria Local Sustainability Network[5].** Innovation and environmental issues are been increasingly associated and re-oriented towards the green deal orientation proposed by the EC (European Commission, 2020). **The region is also making the first steps towards developing a coherent, coordinated political and social commitment of Cantabria to the 2030 Agenda. Nonetheless, there is not any plan yet.** Sustainability Development Goals (SDGs) are in general taken into account in the R&D projects developed in the region and it seems that research teams align them with their objectives in a bottom-up way. Since 2019, a first common and homogeneous set of indicators is available. An easy reading guide to the 2030 Agenda has been published which explains the SDGs in a simple way.

All in all, there are elements in the regional innovation ecosystem around RRI such as CSR, sustainability, environmental awareness and different visions of responsibility that can facilitate the onboarding of RRI. Some of the keys seem to be institutionalized in some research institutions but in general, **the region is at its infancy in adopting the RRI paradigm.**

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[3] http://camaracantabria.com/calidad/asesoramiento-responsabilidad-social-empresarial.php

[4] https://www.sodercan.es/responsabilidad-social/

[5] https://cima.cantabria.es/red-local-de-sostenibilidad

2.4 Analysis of Challenges

Promoting the development and the integration of the RRI paradigm into the regional ecosystem of Cantabria faces a significant number of challenges. **These are mainly enshrined into the already existing challenges that deter the collaboration and cooperation of different research and innovation actors in the region**. As we have previously stressed, most of the participants in the fieldwork stressed the absence of an open innovation strategy in the territory that can facilitate the establishment and development of synergies between them (Martin et al., 2021). Besides that, there are a number of challenges that are largely unamenable to local action and others that comprises different causes. During this chapter we pay attention to some of the challenges identified during the mapping of the innovation ecosystem of the region.

2.4.1 Challenges deriving from external factors or causes largely unamenable to local action

One of the biggest challenges for the development and integration of the RRI paradigm into the region will be the **COVID-19 and its associated and related changes in regional priorities**. It is probably too soon to know what consequences the coronavirus outbreak in Cantabria will have, but it seems feasible that it will create several changes in the innovation policy and industrial strategy of the region. At the time that this text is being written, there are no detailed predictions or estimations about the impact of the pandemic into the economy of the region. An estimation made last year by the Government of Cantabria number this economic impact in 540,5 million euros[6]. In this sense, it seems clear that the autonomous community should be indebted to face the economic expenses derived from the health crisis as well as promoting the economic development of the region after the pandemic.

On the positive side, **it can be argued that the COVID-19 crisis can reaffirm the bet on research in health and biotechnology**. Two of the research strengths in the region that can be benefited for this changing in the priorities. In this sense, the projects proposed for the EU recovery funds are aligned with this idea and the development of a Bio-Health Hub in the region is one of the most important projects proposed by the Government of Cantabria (Gobierno de Cantabria, 2020). In fact, significant and innovative initiatives associated to this hub such as the proton therapy unit (see figure 4) are currently underway[7]. However, the great economic losses of the pandemic can also deteriorate the wounded economy of the region. Budget reductions or cuts in R&D can be executed in following years if there is no political will or consensus around its strategic value.

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[6] https://www.europapress.es/cantabria/noticia-cantabria-cifra-5405-millones-impacto-covid19-cree-tendra-endeudarse-20200513152321.html

[7] See https://www.cantabriaeconomica.com/reportaje/valdecilla-tendra-unidad-de-protones/

Figure 3: Proton therapy Unit. Source: Cantabria Económica

Another important challenge that the development of RRI in the territory can face is associated to the fact that the **biggest factories in the region are usually part of multinational companies that have its decision centres outside the region**. Companies such as Bridgestone, Nestlé, Solvay, Sidenor or Teka which have a significant size, resources and employees that can be mobilized will not be easy to gather around envisaged initiatives.

Last, **it is still unknown which kind of participation it can be expected from the Cantabrian society** as the research team have limited knowledge and references about past initiatives in this regard. In the region there are several significant cultural associations, but the research team have not identified any kind of public engagement or scientific communication associations that can be engaged into future actions. Some examples of citizen engagement have been deployed in the capital city of the region, Santander, but with a limited impact. These initiatives have promoted the organization of physical events and the development of a dedicated crowdsourcing website for collecting ideas from citizens around sustainability (Santander City Brain[8]), and an app oriented to send warnings and report incidences of "hot spots in the city" (Pulso de la ciudad[9]). It is also true that at the time that this text is being written a new regional public law is going underway for promoting citizen participation in the territory[10]. There is also a dedicated website known as "Cantabria Participa[11]" but its reach seems to be limited.

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[8] https://www.santandercitybrain.com/

[9] https://maps.smartsantander.eu/#page3

[10] https://www.elfaradio.com/2021/03/30/la-participacion-ciudadana-se-abre-paso-en-cantabria/

[11] https://participacion.cantabria.es/web/guest/portada

2.4.2 Challenges deriving from local factors or causes potentially more amenable to local action

Several challenges for the RRI development derive from local factors. First of all, **the term RRI is not familiar for the population of the region, but also for most of the actors of the regional innovation ecosystem**. Most of them are aligned with visions of responsibility and sustainability, but they have a limited understanding of the possible transformations that RRI can facilitate. In addition, there are no clear incentives at this point that can be articulated for facilitating the embracement of RRI. However, some actors such as IDIVAL have incorporated RRI into its DNA and others show an institutionalization of some of their keys, which can help towards the dissemination of the concept into the regional innovation ecosystem. The development of the RRI paradigm into the regional innovation ecosystem is meant to be a long process that will need to be build up on the different particularities that have been observed in the prior mapping exercise (Martin et al., 2021). The enormous variety of sectors and companies that are enclosed at the region also offers different conceptions of individual and shared responsibility and sustainability. This might create different perceptions around RRI and can create obstacles for its adoption. In this sense, awareness and specific training activities should be deployed for conceptual clarifications as well as understanding intrinsic motivation for innovating responsibly.

Another important challenge to consider is **the gap between the implementation of RRI and the theory of RRI** (Tabarés et al., 2020) that sometimes can be misunderstood as too academic to be of any practical value for industry and businesses and perceived as another top-down burden assigned to scientists and innovators. At the same time**, the time lag from implementation until the generation of outputs and outcomes should also be considered**. The impact of the TetRRIS project can be hard to measure during its lifespan and it is probably that their major contributions will take place in the midterm (3-5 years after its ending).

2.4.3 Challenges with mixed causes

Another set of challenges that have mixed causes can be enounced in the territory. Of this, **the most important seems to be the modest innovation culture that participants in the fieldwork have commonly stressed in their statements**. This modest innovation culture also contrasts with the common agreement of participants around the possibilities that innovation can offer for facing the different societal challenges that the region will face in coming years. Several incipient initiatives have been recently deployed for promoting information exchange, knowledge brokering and knowledge sharing but these are still in their infancy. It seems clear that generating a generous social capital that can cultivate trust, cooperation and collaboration is the very first mandatory step towards the establishment of a shared vision between actors. To build future opportunities, the region will need to set goals for the challenges that want to tackle and act together to achieve them. This innovative future will require a shared vision for stressing the necessity of making all the actors, but specifically the SMEs, working together with other organizations in innovation projects. The challenge is that the region only counts with a limited extent of R&D&I networks.

Major challenges detected in the regional innovation ecosystem that can also affect the development of RRI practices are also intimately associated with the lack of an official open innovation strategy. his absence hinders its roots into the **lack of trust and cooperation between companies, and between research organizations and companies that creates difficulties for innovation.** One of the measures to meet this gap is the setting up of a Research and Transfer Agency and the promotion of these kind of activities in the region in several policy plans (Gobierno de Cantabria, 2016b). These measures can help to strength cooperation between different actors but reverting this situation can take several years. Social capital and trust are very valuable assets in innovation ecosystems and for sure, this will be a significant challenge to face. **This lack of cooperation and trust between agents in the territory have a considerable influence in the low level of innovation culture and practices of co-creation that have been detected in the mapping exercise**. This for sure will be one of the greatest challenges that will be face but the development and integration of RRI into the territory.

Last, **Cantabria faces significant challenges for retaining and attracting talent, and the region has a deficit in the training and skills development of R&D&I professionals**. This gap in capacities and skills not only can put at risk equal opportunities for offering qualified employment but also harms professional development and productivity decreasing prospects for augmenting high-quality employment and reducing unemployment. The high decrease of researchers experienced during the period 2009-2018 can be exacerbated if no adequate measures are exerted (Martin et al., 2021). In addition, the region can face pressing needs for recruiting and retain talent for rejuvenating research institutions located in the region. A challenge, that other transborder regions are facing and where it seems that they are better positioned. Retaining and attracting talent is a very important aspect for building and extending RRI capabilities into the region.

2.5   Analysis of Needs

Cantabria have significant needs for the development of the RRI paradigm into its territory. As we have reported in previous chapters, the current challenges that face the regional innovation ecosystem creates several needs to be addressed by a comprehensive policy strategy.

First, **it seems reasonable that the development of informal innovation forums and "knowledge brokering platforms" in the regional innovation ecosystem is of outmost importance.** As many of the participants agreed, the lack of instruments, events or programs for promoting information exchange and sharing best practices around innovation is at the heart of the modest innovation culture of the territory. This is also in line with the findings provided by the literature review conducted in the mapping exercise (Martin et al., 2021). The development of generous social capital and trust in the territory can facilitate the establishment of coalitions of actors, promoting new alliances and new forms of participation that are currently not in place. This last element can facilitate the development of the RRI paradigm in the territory and specifically, some of the RRI keys such as public engagement.

Second, **skills development and training activities oriented to facilitate innovation diffusion, facilitation and dynamization of regional R&D&I actors seem to be another of the specific needs to pay attention to**. Skills development is also identified into regional policy plans at place such as the smart specialization strategy and innovation strategy of the region (Gobierno de Cantabria, 2013, 2016b). There are specific needs around skills development for enabling cooperation between agents, promoting innovation culture and strengthening sustainable competitiveness, among others. It is important to stress that Cantabria is a region with a limited research tradition but the public university, as well as some of research institutes, show a significant performance in research. That is why some efforts are needed for upgrading and extending skills into the whole regional ecosystem for promoting spill-over effects and facilitating the adoption of RRI.

Third, and as an aggregation of previous needs, **it also seems clear that the lack of an open innovation strategy into the territory is also a pressing need.** Promoting informal networks, coordinating innovation activities between actors and supporting its concertation around different topics of interest can be a game changer for the innovation mindset in the region. Moreover, **we also identify this need as an opportunity for highlighting the synergies between OI and RRI** (Long & Blok, 2018)**, putting an emphasis in public engagement as a way to strengthening OI with RRI characteristics**. Something that can legitimate the public expenditure in R&D&I activities in the territory as well as strengthening science-society relationships. In this sense, there are several research areas in the region such as bio-health and renewable and maritime energies that are in a very adequate positioning for promoting these kinds of encounters with citizens. These two particular ones will demand from a public legitimization for developing their R&D&I activities as they will need public acceptance for their interventions in sea, land and life itself.

Last, **the extension of impact assessment strategies, instruments and activities into R&D&I programs offered in the region is another horizontal need that emerges from the mapping exercise**. Some actors that are active in EU and international research programs are familiarized with socio-ethical aspects of innovation such as impact assessment, gender equality, SDGs, societal challenges and others. In this sense, this awareness must be diffused and equally shared between all actors that compose the regional innovation ecosystem for facilitating a transformation of this ecosystem as well as favouring the adoption of the RRI paradigm. This will also facilitate the involvement of citizens into regional R&D&I for overcoming the major challenges that the territory will face in coming years.

2.6 Pre-existing local activities, partners and stakeholders that could potentially be leveraged

The regional innovation ecosystem of Cantabria is coordinated by DGIDTEI. This public board was setup in September 2015 by the Regional Ministry of Innovation, Industry, Tourism and Trade of Cantabria Government due to the increasing importance that is conferred to innovation in the economic policies of the region and the objective of ensuring that R&D activities are at the core of industrial development into the region.

DGIDTEI is the main responsible of several innovation programs such as INNOVA or INNOVA PLUS. SODERCAN also complements these programs with three main lines of funding oriented to company creation, internationalization services and R&D. In this last area, there are several programs oriented to facilitate technology transfer (INVESNOVA), cluster development and specific programs focused in ICT, circular economy and in the automotive sector.

Figure 4: Regional innovation ecosystem actors

The regional innovation ecosystem is composed by several agents that can be divided into universities, research institutes and organizations, clusters, business associations, companies and social agents. All of these actors are explained with further detail in Deliverable 2.2, but the ambition here is to pivot around the ones that have been identified as possible participants in the pilot activities. In this sense, we will speak about **"domains of opportunity"** and not sectors or specific technologies or innovation roadmaps. This is due to the lack of prominent or dominant sectors in the economic structure of Cantabria. The region has several strengths, but it is not characterized by predominant sectors which can create technological or sectorial roadmaps. Instead, **we propose bigger areas of interest that gathers research, innovation, industry and society around societal challenges and socio-economic transformations**. These are "domains of opportunity" where a different set of stakeholders can be potentially leveraged towards collective and participatory initiatives involving science, technology and society.
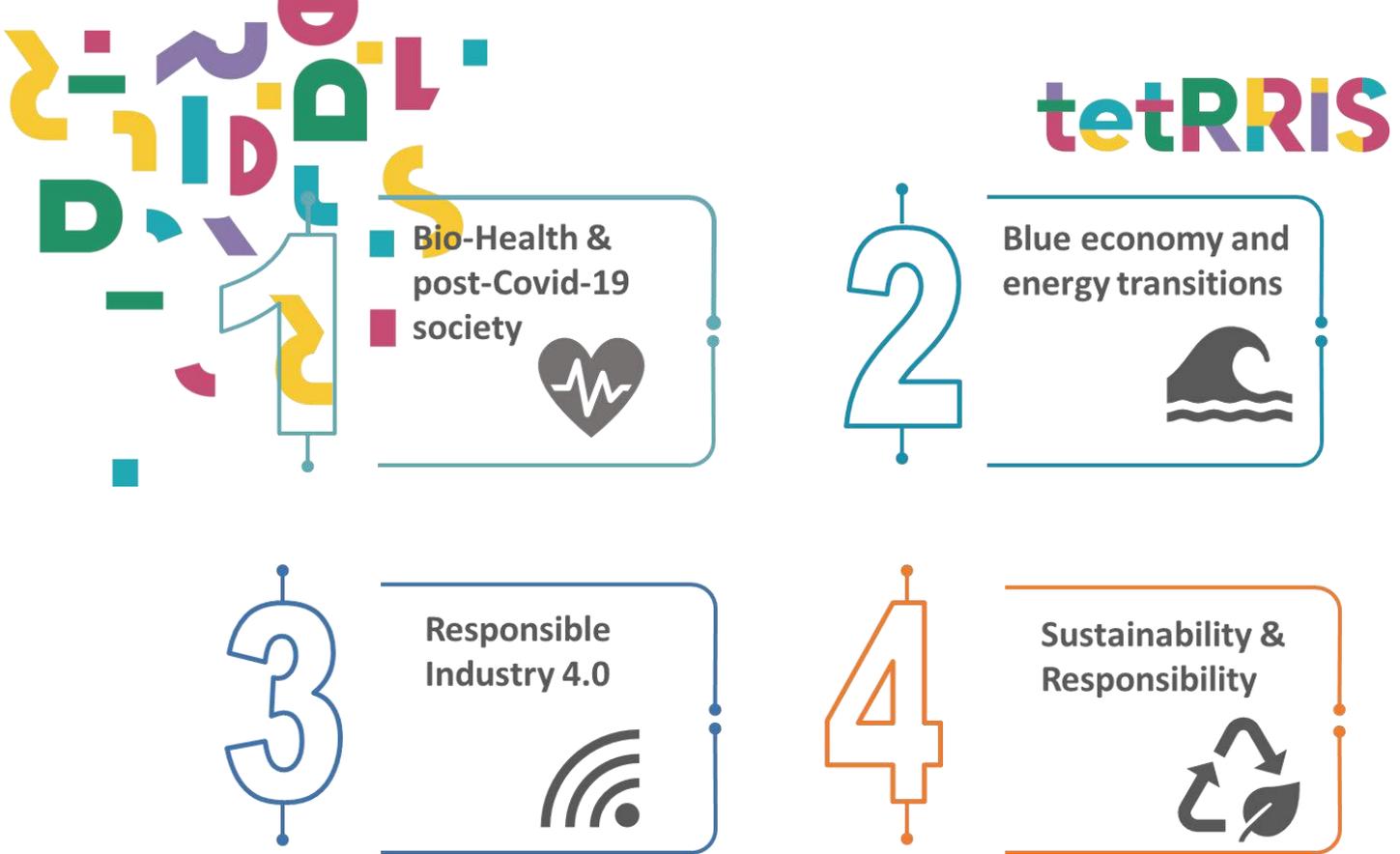
Figure 5: Regional domains of opportunity around RRI

To this extent and after the virtual workshop took place, TECNALIA team with the help of SODERCAN and the participants in the fieldwork has identified several domains of opportunity that are listed below. These domains are also aligned with the EU Next Generation Funds and the specific axis that the regional government has sketched for developing further projects during the next years (Gobierno de Cantabria, 2020). These domains are:

> **Bio-Health and post-Covid-19 society:** Biotechnologies and the health sector are one of the major strengths of the region. These two research areas also offer significant possibilities for business development in the region as well as they include significant elements of interest for the RRI development in the region. In addition, research in biotechnologies also offer to the agri-food industry possibilities for business development as different bio-innovations can have several potentialities in different sectors related with the agri-food sector. In this sense, we envision a significant number of actors of R&D that can be leveraged around this domain. One of the main strengths of this domain of opportunity is that IDIVAL has institutionalized RRI and they have incorporated several elements of RRI into their DNA. This can be observed also in breakthrough projects such as "Cohorte", an ambitious initiative promoted by IDIVAL to attract 50.000 residents in the region to take part in a pioneering initiative for promoting a better understanding of health and sickness relationships in Cantabria. The project aims to "follow the participants during its lifetime" for a period of 30 years (participants from 40 to 70 years)[12]. IBBTEC, another of the most important research institutes of the region also has several institutionalized keys. This will definitively help towards the diffusion of RRI into the regional ecosystem and

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[12] Further information at https://cohortecantabria.com/

favouring collective action. Other interesting actors that can contribute to the development of this domain of opportunity are UC, UNE-Atlántico and CITICAN. Last, agri-food companies and associations, can be also engaged in this effort, looking also for synergies in the rural environment where some of these companies are located and triggering social innovation effects.

- **Blue economy and energy transitions:** Renewable energies and R&D associated to marine engineering is another of the strengths that can be found in Cantabria. The region also faces significant challenges regarding energy transitions and the development of renewable energies in the region as an emergent industry. In this sense, there are different opportunities to engage society into this domain as further developments will demand significant interventions into the land and sea of the territory. For instance, one of the breakthrough projects proposed to the Recovery EU funds (Bahía H2 Offshore[13]), aims to develop an innovative and clean energy system to produce green hydrogen through electrolysis processes, powered by solar and wind energy in maritime conditions (in the facilities of the Port of Santander). The intervention over land and sea will require the involvement of society to facilitate and legitimate these "energy transitions". This is a nice opportunity due to the research strengths of the region and the significant number of research organizations (IH, UC) clusters (MARCA, Sea of Innovation) and companies specialized into this field. Plans for the setting up of wind turbine industrial districts in the region have been controversial and have received a significant backlash from the Cantabrian society, due to their environmental impacts[14]. We can expect that the modification of bay areas can also provoke these kinds of reactions and controversies and the role of RRI can contribute to actively involving society into R&D and favouring participatory and democratic approaches.

- **Responsible Industry 4.0:** Another interesting domain that can be fruitful for developing RRI initiatives is the ongoing and increasing processes of digitalization that many organizations and institutions of the region are facing nowadays. With special attention to initiatives such as the Plan "Factorías del Futuro" (Gobierno de Cantabria, 2016a), a strong emphasis is put into industry from the policy perspective for facilitating the digitalization, modernization and automation of the factories of the region (Gobierno de Cantabria, 2020). This domain can also offer several opportunities to promote collaboration and knowledge transfer between different stakeholders. Industry 4.0 creates significant needs of collaboration between actors of different big sectors such as ICT and manufacturing, but also across the entire established value chains, redefining and blurring the limits and scope of physical factories. Variety and diversity of needs into factories will demand cooperation between stakeholders but also will involve active participation from social agents as the introduction of

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[13] https://www.elespanol.com/invertia/disruptores-innovadores/autonomias/cantabria/20210118/bahia-h2-proyecto-producir-hidrogeno-energia-solar/552195277_0.html

[14] See https://www.eldiariomontanes.es/region/valles-pasiegos/plataforma-pasiega-eolicos-20210504195347-nt.html
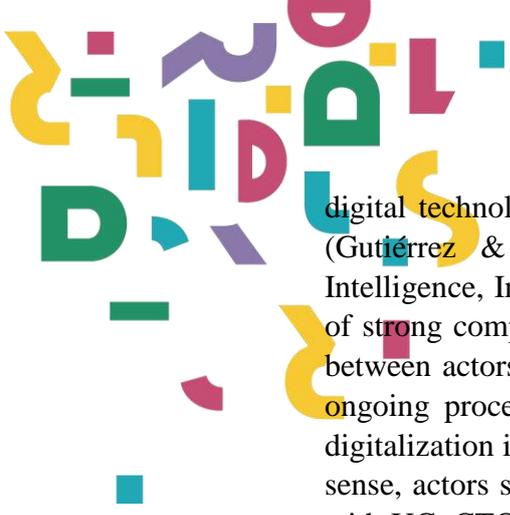
digital technologies usually redefine labour organization, conditions and rights (Gutiérrez & Ezponda, 2019). Emergent technologies such as Artificial Intelligence, Internet of Things, 3D Printing, Robotics or Cybersecurity provide of strong competitive advantages, but they also require of closer collaborations between actors. We can see this as an opportunity for aligning RRI values into ongoing processes of Industry 4.0 in the region and significant initiatives of digitalization in related industrial settings such as the Port of Santander[15]. In this sense, actors such as the TERA cluster or the ASCENTIC association, together with UC, CTC and others business associations and companies can cooperate in the development of RRI related initiatives in this domain.

➢ **Sustainability and responsibility:** One of the conclusions of the mapping is the common awareness, knowledge and existence of related initiatives with sustainability and CSR in different agents of the regional innovation ecosystem. There is also a singular number of initiatives related with circular economy in the territory and a common emphasis in policy plans (Gobierno de Cantabria, 2016b, 2020). As it is commonly argued in the literature (Burget et al., 2017; Dreyer et al., 2017; Ladikas et al., 2019; van de Poel et al., 2017), we affirm that these elements can be used for building initiatives on them or congregating several agents around them. In this sense, agents not directly involved in R&D such as the Chamber of Commerce of Cantabria or CEOE-CEPYME can actively contribute towards the development of RRI related initiatives in the regional innovation ecosystem of Cantabria. Both of them have different initiatives underway and they have the capability to congregate different set of actors (business, academia, industry, CSOs). Together with SODERCAN and DGIDTEI these stakeholders can exert a great pivoting effect that can favour concertation processes. Last, they seem to have more visibility towards citizens than other R&D actors which it can be highly beneficial in terms of diffusion and impact.

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[15] See https://cantabrialiberal.com/santander/el-puerto-de-santander-entre-las-sedes-del-fondo-40-para-fomentar-el-uso-de-las-tecnologias-digitales,554575.html

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3   Tampere

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LEGAL DISCLAIMER

3.1 Abstract

Tampere region's Research, Development and Innovation (RDI) system's characteristics are based on the region's historical background as an industrial hotspot. The strong industrial base of the region is today complemented by diverse research and innovation infrastructures and educational institutions. Additionally, one key factor uniting the actors in the region of Tampere is long traditions in joint-actions and vivid co-creation culture. The weight of the industrial profile still lies with technology, manufacturing industry and ICT.

Due to the historical background, and thus consequent specialization of the area, manufacturing industry has a fundamental role in the RDI of the region. At the moment, the whole industrial and manufacturing sector seems to be in the midst of a transformation where digitalization and sustainable development are driving forces of change.

The region of Tampere has act proactively and progressively achieving more sustainable and responsible regional society. Co-operation culture between different actors in the region create a fertile base for co-actions tackling sustainability challenges and foster sustainable development. Additionally, the region of Tampere and its various actors have determinedly stated the importance of sustainable development and their willingness to be part of the change.

Therefore, influential segments driving the change are regional development itself and industrial sector as a specialization area of the region. Thus, **the main goal** of Tampere region pilot is integrating RRI themes and promoting sustainability in the region's RDI system through regional development and industrial RDI networks. **One sub-target** relates to the regional development – spearhead of the pilot and the sub-target is to integrate RRI into regional development processes and promote sustainability through regional development work in the region of Tampere. **Another sub-target** relates to the Industrial RDI networks – spearhead of the pilot and the sub-target is to promote sustainability through industrial RDI ecosystems for related actors and integrate RRI into industrial RDI practices. Additionally, the aim is to constantly identify synergies between these two spearheads and create dialogue and co-development opportunities.

3.2 The current Status of the Implementation of the RRI Agenda

In the region of Tampere, most RRI themes are somehow acknowledged by RDI practitioners, although RRI-terminology is hardly used. The strengths of the region of Tampere lies in its strong co-operation culture between various actors. There are for example various co-creation platforms and effective co-operation between educational institutions and individual companies. Besides, co-creation culture is concretized by including public engagement and stakeholder inclusion activities in various public initiatives, e.g. urban development projects.

Thus, the elements of RRI are by no means unidentifiable or new issues in RDI activities in the region. Besides, Tampere region has been associated in quite a few de-facto RRI

projects.[16] Additionally, there has been other projects and initiatives which are indirectly addressing the elements of RRI.[17] However, some of the RRI themes are broader emphasized and addressed than others. More systematic interventions could be made to further improve and expand all dimensions of RRI.

The region of Tampere has taken proactive and progressive steps towards more sustainable and responsible regional society. To an increasing extent sustainability and responsibility have been taken into the account in regional development operations, policymaking and strategies. The concept of mission-oriented innovation policy has already been acknowledged regionally, offering a potential basis to set sustainability at the core of the mission-orientation approach.

Generally, the shared aim in the region of Tampere is to create the ground for research, development and innovation in which responsibility and sustainability are built-in elements. It can be seen that favourable atmosphere and momentum for this is constantly evolving. However, practical know-how and implementation of strategies to a practical level are needed among public sector actors.

Sustainability has been recognized in the Finnish manufacturing industry as an important future factor, too. Currently, there are a few initiatives addressing sustainable development in the industrial sector, and also individual companies have acknowledged the importance and growing need to address sustainability issues. Nonetheless, there are differences among companies, depending on the individual differences, but also company's size, maturity and industry. For example, larger companies may be way forward with their strategy work whereas SME companies, especially in the manufacturing industry, are facing challenges to tackle both, demand towards sustainability but also increasing digitalization.

Also, most companies, regardless of the size, still need support in implementing sustainability into practice and transforming it into competitiveness and future opportunities. Industry is also lacking the support from strategic level and funding. There has not been clear signal from national strategies or funding criterions promoting the importance of sustainability.

Ecosystems, co-operative actions and co-development are seen as an important factor for the development from the perspective of both, sustainability and digitalization. Along the way there have been launched multiple individual initiatives as well as co-operation platforms which are promoting openness and co-creation between sectors and different actors. Among industry actors' openness and co-creation are an established mindset for approaching and tackling opportunities and challenges. However, the new challenges related to sustainability and digitalization may need re-thinking the old ways and means to approach them. In order to achieve re-thinking, both regional development and industrial RDI actors may need a little push.

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16 In addition to TetRRIS, there are e.g. MARIE, Co-Change, New HoRRIzon and MULTI-ACT initiatives.

17 To name a few e.g. NordWit initiative advancing gender equality between researchers and regional agencies. Also, there are multiple co-operation platforms promoting openness and open innovation, such as Demola, InnoHEIs and Platform6. Furthermore, e.g. stakeholder inclusion and public engagement has been in the core of multiple urban development projects in the City of Tampere, examples including Hiedanranta project and Kolmenkulma Eco-industrial Park.

3.3 Analysis of Challenges

3.3.1 Challenges deriving from external factors or causes largely unamenable to local action

Tampere Region is the second largest region in Finland. However, relative to the big picture and policymaking as a region its leverage to affect is to some extent limited. Nonetheless, under its own sphere of influence, coordinating development and creating common ground for co-actions may be easier than in more fragmented regions. This is referring to the matter that the region is centralized to the City of Tampere and City's region, and this hotspot has influential role and power over smaller municipalities of the region. After all, the Tampere Region is depended on the signals from upper-level coordination bodies.

There has been a message from both regional development and industry that higher-level strategies and persistency have been lacking in local and national coordination. Short-sightedness and impatience in public funding and policymaking have made it difficult for other actors to commit to sustainable change and invest in development. Recently, for example, as the EU aligns itself with the importance of fair digitalization and green development, these themes have also begun to be reflected in Finland's national and local strategies. This development has given reassurance to local actors, public and private.

Regarding the fact that Tampere region's influence is somewhat limited, the role of regional funding instruments as an incentive is relatively small. Thus, national and international support is needed to enable and fund responsibly driven sustainable development. National strategies that guide funding would be needed in this matter.

To promote sustainability, requirements towards sustainability impacts and responsibility of RDI activities and outcomes should be reflected in national funding criteria by public institutions. This is not currently the case. For instance, Business Finland emphasizes export coefficient as a main funding criterion which sets aside importance of broad sustainability, responsibility and impacts. Currently, there may be some supporting programs for sustainable development, but their impact on creating the radical sustainability impacts is nominal. The funding criteria should be more concrete and play a greater role. Besides, sustainability implementation in different projects should be thoroughly measured and tracked. However, this kind of verification and monitoring requires a lot more resources.

Additionally, the users of various funding instruments are to some extent established. For example, different business subsidies are often used only by the same companies. Certain actors are aware of the funding instruments and know how to take advantage of them, but then there are many actors for whom different public funding instruments are unknown and difficult to approach, including national but also EU funding.

Thrusting sustainable development demands collaboration between various actors. However, this matter has not developed in a favourable direction. Recently, for example, co-operation between business and research have decreased overall in Finland. Similar development has taken place also in the region of Tampere which has a long tradition for co-operation between industry and universities especially in the field of technology. There may be many reasons for this, but the public funding for collaborative industrial RDI activities has been rather weak lately, and also companies have been less interested

in funding co-operative RDI with universities[18]. Additionally, the strategy of the new emerged university and the Tampere Universities' community sends a remarkable signal – university's strategical focus lies in academic research and research quality,[19] which are often the opposite of business collaboration and "commercial" research.

3.3.2 Challenges deriving from local factors or causes potentially more amenable to local action

The identified key issue in the Tampere Region pilot is increasing a broad and multidimensional understanding of sustainability in different contexts and levels. Sustainability and responsibility are seen as important topics and most actors have a consensus contributing to sustainable development. However, many practitioners are lacking the knowledge and experience what it should mean in visions and practice. In addition, understanding the importance of responsible RDI activities is also incomplete.

Therefore, significance and benefits of broad sustainability and RRI are not yet valued. Different actors may be insufficiently motivated to commit and allocate resources for addressing sustainability and responsibility issues due to the fact that the benefits are not known. One reason for this may be that in the region of Tampere, RDI have traditionally focused on "hard" technical competence and knowledge. Thus, "softer" dimensions and fields of expertise, e.g. Social Sciences and Humanities has remained in its own silo and undervalued, even when it is needed to diversify and deepen the knowledge and perspectives, and thus, create regeneration and value through cooperation and ecosystems. Eco-social sustainability, ethics and responsibility are often seen as these "softer" issues.

Whereas the region of Tampere is relatively small and settled environment, homogenous and fixed perspectives, knowledge and visions may prevail. Among region's actors, there may be relatively little competing ideas and regenerative movement compared to larger urban centres, domestically and internationally. The region of Tampere has an established co-operation culture and well-institutionalized systems, public-private platforms and practices for joint-actions. Strong institutions are certainly a strength of the region. However, it should be assessed whether there are situations when strong institutions and actors dominate the RDI field too much, and where re-thinking and regeneration would be needed. It would be useful to assess in more detail how smaller or invisible actors are perceived and included. Besides, how their voices are, or could be, heard.

Pre-established groups of actors and people who are familiar with interacting with each other may limit the access of new actors, and thus generation of new perspectives and ideas. When a same group of actors is involved in RDI activities, new unrecognized actors may not be discovered and emerging opportunities for open access may not identified. Also, pre-established and settled group of actors leads to the saturation of the know-how and perspectives as well as to an emphasis on current prejudices and biases of the actors. Thus, down the line settled group of actors limits the creation of new ideas and solutions.

This issue of closed circle is likely to be essential especially for industrial actors in the region who need renewal to keep up with development. For instance, Tampere region's industry clusters, which have been traditionally a key part of industrial RDI activities,

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[18] Source and further information: vaikuttavuussaatio_selvitys.pdf

[19] Further information: https://www.tuni.fi/sites/default/files/2020-04/tampere-university-strategy-2030.pdf

should be developed towards more eco-systemic network approach and cross-sectoral co-operation to create new solutions.

Regarding regional development, it may also be beneficial to assess whether new groups of actors or organizations could be included or whether new ways to interact and engage could be generated. All interested or important stakeholders may not find a way to influence regional development and its sustainability.

The Tampere region has traditionally had strong cluster policies in innovation development. Whilst this has worked to the region's advantage in the past, it has also perhaps slowed down the development towards a complex innovation system-network: an innovation network that consists of techno-socio-economic-aspects and creates diverse partnerships and collaboration opportunities. Additionally, it should also be analysed whether completely new actors, perspectives and know-how could be brought into this development alongside traditional and self-evident actors.

The opportunities and potential related to different ecosystems have been acknowledged by different actors, but support and favourable shift in various levels are needed to accelerate the creation of more eco-systemic way of work and culture. Instead of trying to create the change artificially, public institutions and RDI practitioners should act as an enabler and leave the stage for other actors to bring their needs and challenges at the center of the ecosystem.

RDI practitioners developing and orchestrating ecosystems should also pay more attention to and clearly communicate the practical level, implementation and long-term vision of the ecosystem in order to make the purpose of the ecosystem tangible for other actors, e.g. companies. On the other hand, there should also be greater reliance on the importance and multiplier effects of indirect influence, which may create impacts later on in the future and in other contexts.

3.3.3 Challenges with mixed causes

As mentioned before, there has not been national strategies addressing sustainability and also funding, initiatives and projects are not coordinated either on national or local levels. The lack of shared vision has been a norm for long and this is still affecting various levels. There is a great need to coordinate all the numerous projects and initiatives.

Currently, different projects and initiatives are largely project-driven rather than mission-driven. This leads to a situation where a relatively small country, Finland, has a large number of overlapping projects, which is a huge waste of time, resources and potential. Nationally, or even locally, funds are allocated to overlapping projects addressing same issues whereas those projects may not be even aware of each other. Additionally, especially companies are facing challenges to identify and participate in projects that are significant and noteworthy. However, this is slowly changing. For instance, the new Regional Strategy is designed to have a mission-driven approach and thus, as a strategic instrument it is leading by example.

In addition to the weak signals from public funding, decision-making and strategy, path dependency is also a major hindrance for the systemic change. Due to path dependencies, it is difficult for actors to change the direction. Thus, actors should be supported in breaking down disadvantageous path dependencies and the emergence of new path dependencies should be proactively prevented.

It needs to be taken into account that from the point of view of industrial sector, there are large differences between actors. Many larger companies are located in the Tampere city region whereas multiple SMEs are scattered around the whole Tampere region area. The industrial companies are by no means a homogeneous group of actors and there are significant differences between companies. This requires effective consultation of industry representatives to understand the variety of their needs and challenges related to sustainable development.

3.4   Analysis of Needs

To begin with**, there is a need to coordinate the fragile field of multiple overlapping projects and initiatives.** In the region but also at the national level, greater coordination is required to ensure that projects do not overlap, and that project actions and objects are effectively harnessed to contribute to sustainable development. The current fragmented field of projects and initiatives produces casting defects and inefficiencies. Thus, the shared goals and objectives are required to coordinate the field of different projects, steer funding and allocate resources on projects which pursue jointly defined goals and objectives.

Besides, **a common key issue for all regional RDI practitioners and related actors is that understanding sustainability more broadly and multidimensionally in different contexts and levels is needed.** Firstly, there is a lack of understanding sustainability as an equalization of ecological, social and economic sustainability. Sustainability is often understood one-sidedly and superficially. Ethical reflection of socio-ecological sustainability and soft values are seen relatively secondary.

Additionally, most actors are lacking practical know-how and tools to implement sustainability into processes and actions. Furthermore, due to the inadequate understanding, sustainability is still approached as a word to gloss-over old ways and means without regenerative changes. Generally, among region's actors, sustainability and responsibility issues often stay at the metalevel and are vaguely represented in strategies and policy plans without practical implementation. It is not realized as sufficiently large changes in customary practices. Progress in this matter needs much support, such as tools and initiatives and favourable systemic structural and cultural shift.

Whereas the region of Tampere is very technologically oriented due to its industrial history, profile and educational institutions, the perspectives and understanding of the impacts is often very technical, direct and tangible. The impacts, risks and benefits are mainly understood technically and economically. This emphasizes the need to increase systematic and multidimensional understanding of sustainability. The diversity of perspectives should be maximized in order to detect unrecognized risks and impacts.

Derived from this, **one key factor to take under investigation is diversity issues.** The Region of Tampere has favourable pre-conditions to further develop open innovation and open science approaches among actors. However, co-creation culture and open innovation can easily drift into a pitfall due to developers' and users' own biases and limited perspectives, know-how and imagination. The nature of the strong industry sectors and the history of the region leads on the challenges in diversity, especially in the field of manufacturing industry and industrial RDI.

Industrial sector as well as RDI field are traditionally dominated by senior professionals, men and older generations. The history of the region has left behind an established group

of top professionals who continue to have a strong influence in the fields of industry, technology and RDI. The challenge is not only in history but also in the fact that young people and women are not so interested in the fields of industry, technology and RDI.[20] However, paying attention to power structures regarding diversity and e.g. the valuing the variety of disciplines, such as social sciences as well as intangible and indirect impacts should be promoted.

At the same time, the industrial sector in particular, is struggling with the growing need for industrial experts and professional which has become one of the most significant challenge for future success of industrial actors. Examining and promoting diversity may be one answer to the need for expertise in industrial sector. Promoting diversity in industry and RDI could also make the sector more attractive and identifiable for young generations and women. Especially for young professionals of the future, a new kind of sustainability thinking and the meaningfulness as well as a positive handprint of work, are important criteria.

Even though diverse groups of people in RDI activities would produce better quality RDI processes and more positive impacts as an outcome, and diversity issues are also acknowledged to be very important among practitioners, there is a lack of systematic interventions to assess, identify or assure diversity issues. Systematic initiatives are needed to address diversity issues in the industrial RDI. Diversity issues related to e.g. age, gender, or ethnic background, are structural challenges and deeply embedded in the culture, making their identification challenging without systematic assessment.

Diversity is needed in the individual level among practitioners, but diversity should also be assessed in the level of groups and organizations, both in industrial RDI networks and in regional development. Co-creation culture has a long history in the region and region's strong co-operation culture is taking steps towards diversity and ecosystem thinking. However, **further promoting ecosystems, co-creation and inclusiveness is needed fostering sustainable development in the region and supporting companies to gain sustainable competitive advantage**. Therefore, there is still a clear need for developing local support structures to better facilitate co-creation platforms, dialogue and networking nationally and internationally.

Companies need co-operative actions to tackle sustainability issues and different ecosystems are seen important in this matter. Additionally, Finnish manufacturing industry is facing challenges in digital transition and especially SMEs need public and peer-support to step into the next phase in their path towards digitalization and sustainability. Larger companies need facilitation to extend their business-as-usual boundaries and relations, and to generate new solutions and drive change. Supporting structures are needed for information and good-practice exchange among actors.

In the region, openness, trust and co-creation are part of the established mindset for approaching opportunities and challenges. However, there is room for improvement and pitfalls to tackle. For example, long historical roots and pre-established groups and institutions for co-operation do not have only positive aspects and upsides when it comes to openness. Region's and its industrial actors' co-creation potential should be harnessed for sustainable development and openness is one essential key fostering diverse sustainability.

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[20] Further information (in Finnish): Alle viidennes opiskelijoista opinnoissa joissa tasaisesti naisia ja miehiä – koulutus-alojen eriytyminen jatkuu | Tieto&trendit (stat.fi)

Also, **in the regional development openness could be addressed by re-thinking stakeholder inclusion and public engagement practices.** Firstly, broad and transparent communication is essential to raise awareness and provide an opportunity for different stakeholders to participate. Regional development activities are often more directly linked to different levels of society and individuals and transparency and communication would increase organizations and citizens' awareness and understanding of different projects, initiatives, and strategies which are or could be affecting them.

In the region, stakeholder inclusion and public engagement are a frequently addressed aspects and it is an integral part of co-creation culture in regional development. However, engagement patterns and stakeholders are somewhat established. Thus, the range of stakeholders and inclusion practices could be further expanded. Additionally**, there is unused potential for exploiting regional development processes and events effectively as platforms for increasing and promoting dialogue between different actors.** This could serve both as a means to bring different actors together and offering supporting structures for networking and dialogue, but also to increase the inclusiveness of regional development. For example, regional development activities could be used more effectively as opportunities to bring different parties together to consider the needs and challenges related to sustainable development.

Additionally, it would be valuable to assess how different perspectives gained through the dialogue are taken into account in the regional development processes and projects. **For the co-creation culture to move to the next level in the region, the regional development processes should have sufficient flexibility and responsiveness to modify the processes according to results of inclusions and engagement**, e.g. the gained new insight and understanding. When new and diverse perspectives are observed, systemic tools are developed to address them in regional development processes. Especially in regional development, the risk of pseudo-participation of different stakeholders (e.g., companies, NGOs, citizens) always exists and processes ensuring values and acceptance of the actions should be constantly developed and critically examined.

3.5 Pre-existing local activities, partners and stakeholders that could potentially be leveraged

The main goal of Tampere region pilot (see figure 1 below) is integrating RRI themes and promoting sustainability in the region's RDI system through regional development and industrial RDI networks. One sub-target relates to the regional development – spearhead of the pilot and the sub-target is to integrate RRI into regional development processes and promote sustainability through regional development work in the region of Tampere. Another sub-target relates to the Industrial RDI networks – spearhead of the pilot and the sub-target is to promote sustainability through industrial RDI ecosystems for related actors and integrate RRI into industrial RDI practices. As combining factor, we are aiming to constantly identify synergies between these two spearheads. We have identified four main initiatives which can be leveraged to promote goals and targets of the regional pilot.

Figure 1. Initial plan for TetRRIS Tampere Region Pilot
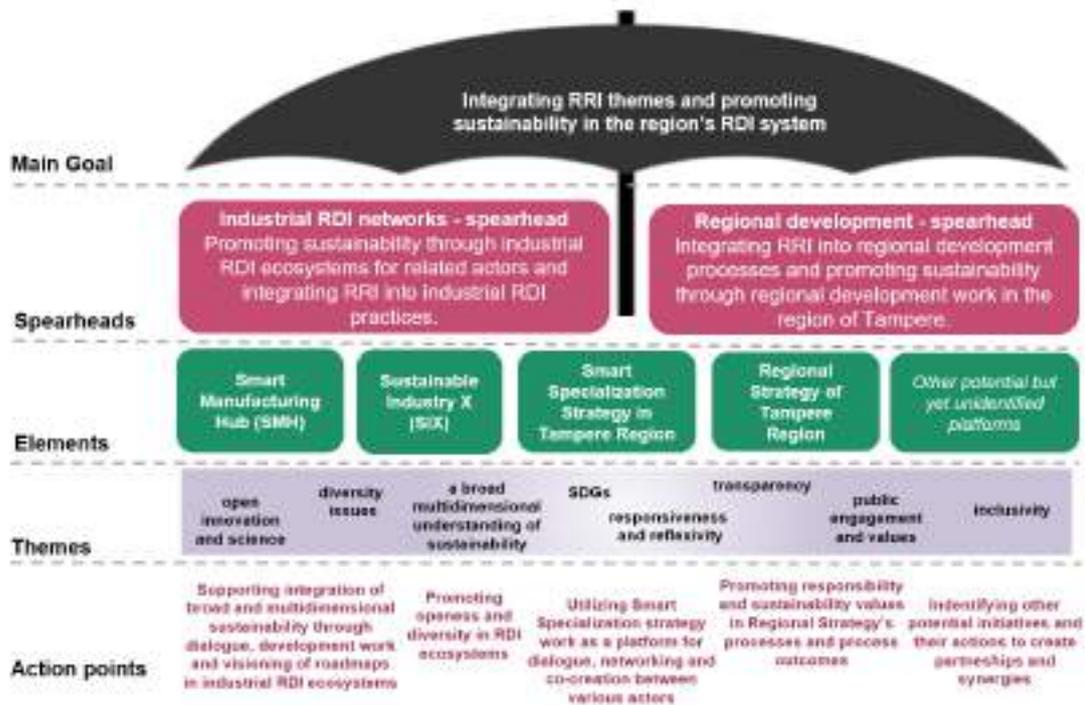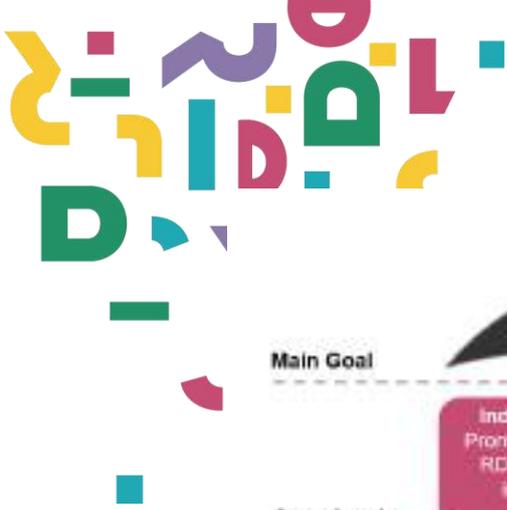
Under regional development spearhead the key action points are new Regional Strategy and Smart Specialization Strategy which are in preparation and will be published by the end of 2021. Firstly, **we are aiming to promote responsibility and sustainability values in Regional Strategy's processes and outcomes which would foster sustainability in the region and send important signal to regional actors.**

Regional Strategy it is a steering instrument for regional development and the allocation of resources. The program defines the common developmental objectives, identifies opportunities and areas of joint action, recognizes challenges and outlines the actions needed to succeed in the future. The program emphasizes foresight and common vision. Thus, the program impacts the regional innovations system and policy making as well. Stakeholder inclusion and engagement are important aspects in the program's development process. It is an end-result of a cooperative process with a wide stakeholder group that aims to present the whole region from municipalities to public organizations and industry. The current Regional Strategy consists of four strategic spearheads: Bright, Sustainable, Integrated and Accessible.

Secondly, **we are aiming to utilize Smart Specialization strategy work as a platform for dialogue, networking and co-creation between various actors.** This would promote inclusiveness and engagement. It may also function as a forum bringing different parties together to consider the needs and challenges related to sustainable development. **Smart Specialization in Tampere Region** is drafted in accordance with the Regional Strategy. The two steering instruments concentrate on slightly different thematic areas of regional development. The smart specialization strategy prioritizes innovation and building competitive advantage by developing and matching research and innovation strengths to business needs in order to address emerging opportunities and market developments in a comprehensible manner. It contains and identifies the specific regional spearheads to develop the region's competitive advantage.

Like the regional program, the smart specialization strategy process is equally inclusive process done in cooperation with a wide variety of stakeholders from businesses, public

organizations and representatives of the science sector. The Strategy is developed in cooperation and ideally brings together the whole RDI system to develop a long-term growth strategy that is supported by EU-funds. Even though these strategic level development processes are inclusive and open by nature, they have never involved strictly private sector actors. Institutions that represent these actors are always involved in these processes (Business Tampere, Chamber of Commerce), but corporations, SMEs and other private sector actors have been left out. Thus, it would be especially attractive to involve these actors to these processes, especially the S3 drafting process. We are currently aiming to provide a platform for these actors to voice their opinions of these developmental processes as well. This would enhance the public engagement and open access dimensions of these processes.

Under industrial RDI networks - spearhead the key action points are linked with Sustainable Industry X (SIX) and SIX Manufacturing Hub (SMH) initiatives which are aiming to increase competitiveness and sustainability in Finnish manufacturing industry. Additionally, these initiatives are aiming to bring different actors together, foster eco-systemic thinking and networking, and building shared vision for the industrial sector. The initiatives have strong linkages to the Tampere Region due to the great importance of the region for the industrial sector and manufacturing industry. Firstly, **our aim is to support integration of broad and multidimensional sustainability through dialogue, development work and visioning of roadmaps in industrial RDI networks.** SIX and SMH initiatives may provide ready-made platforms and groups of actors to foster ethics, responsibility and sustainability to be integrated into the future Finnish industry. Secondly, **our aim is to promote openness and diversity in RDI ecosystems and thus improving quality and responsibility of industrial RDI.**

As mentioned, there has been a lack of a national long-term industrial strategy in Finland. As an industry-led initiative **Sustainable Industry X (SIX)** is aiming to compensate the lack of a long-term vision. The national longer-term industrial strategy is needed for industry actors to create stable foundations for investments and provide commonly agreed vision of the industrial sector's future. By now, development work under SIX initiative have recognized seeking competitive advantage from ecosystems and sustainability as key factors for Finnish industrial sector.

Additionally, **Six Manufacturing Hub (SMH)** aims to boost co-development and make the Tampere Region as a smart and sustainable centre for RDI and make it as one of the EU's most attractive and leading RDI centres in smart and sustainable manufacturing. This initiative will form a common vision of industry, research institutes, top partnerships and operating models. It aims to foster co-development, co-learning and RDI platforms and bring together different actors as well as large companies and SMEs.

Additionally, one indicated need is coordinating fragile field of multiple overlapping projects and initiatives. Therefore, as another combining factor **we aim to identify other projects in region targeting sustainable development and responsible RDI and exploring opportunities to combine interests, objects, actors and resources of these projects**. For example, recently, the Council of Tampere Region, VTT and Tampere University established **Ecological Transition project** aiming to bring different actors together to co-create and boost socio-ecological change. The project implements three interconnected co-development processes that strengthen the co-operation between the region's sustainability work and RDI activities and expand the range of actors in the regional innovation ecosystem. One identified action point is to co-organize Tampere region's **second Ekothon event** together with the Ecological Transition project and use

it as a platform to bring actors together. Potentially other several opportunities to combine interests and resources of Ecological Transition project and Tampere region TetRRIS pilot may occur.

4 Karlsruhe

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4.1   Abstract

This deliverable provides an overview of the state of play of RRI-related activities in the Karlsruhe Technology Region, identifying challenges which have so far prevented the integration of (more) RRI-oriented practices in the regional innovation system as well as, derived from those, concrete stakeholder needs to which subsequent work in the TetRRIS project could connect and relate.

In principle, challenges of three different types could be identified: structural and external challenges the roots of which may be difficult to address in the short run and challenges that seem more amenable to changes triggered by short- to mid-term activities in a framework like the TetRRIS project. These latter challenges, about to become key foci of this project's overall ambition, can in turn be subdivided into two main categories. First, challenges deriving from local factors, related to e.g. actor constellations, practices or conventions, that are in principle amenable to change by (both individual and collective) decision. Second, complex challenges associated with regulation that may impede or enable experimentation. Different from those in the first category, such challenges cannot easily be addressed by local decisions alone but require more wide-ranging, if not necessarily fundamental, changes e.g. in the legal domain.

Overall, the report identifies the following stakeholder needs that could be addressed in subsequent stages of the project. First, it seems that there is the need to develop structures to facilitate the codification, exchange and build-up of knowledge surrounding public participation, including the development of formal guidelines based on successful, past practices as well as the development - and sustainable establishment - of additional formats of knowledge exchange and related educational formats. Second, it could be useful to develop governance/coordination structures to facilitate more systematic public input into the regional innovation projects and agendas, guided and informed by insights of public stakeholders not only on the level of an individual project, but also on the overarching level of coordinating and liaising policies and initiatives. Third, there is the need to better develop local support structures to enable and facilitate experimentation, with the aim to develop a common understanding on the local relevance and potential of living labs, a facilitation of activities to increase the public acceptance of test areas in the public domain and activities aimed at identifying new ways of leveraging regional level legislative authority to enable, facilitate and add momentum to orchestrated experimentation activities in living labs.

4.2   Introduction

Following the "mapping" of the research and innovation system in the Karlsruhe Technology Region that was conducted in Work Package 2, the study team undertook a number of discussions with key stakeholders from the Technology Region Karlsruhe GmbH (the key intermediary organisation of the local innovation system) and outside academic experts. The purpose of these discussions was to validate the findings of the foregoing mapping and, especially, to identify potential needs and challenges with a relationship to Responsible Research and Innovation (RRI), that could form areas for joint
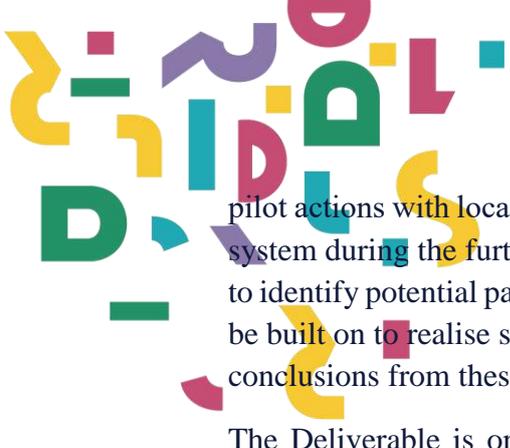
pilot actions with local actors and stakeholders from the Technology Region's innovation system during the further course of the TetRRIS project. In particular, it was also sought to identify potential partnerships and ongoing activities in the region that could potentially be built on to realise such pilot actions. This Deliverable briefly summarises some of the conclusions from these discussions.

The Deliverable is organised as follows. Section 2 gives a summary overview of the extent and the ways to and in which the idea of RRI is already being realised in the Karlsruhe Technology Region. Sections 3 and 4 then discuss the challenges and potential needs facing stakeholders in the local innovation system that bear upon core concerns of RRI. Section 5 describes some of the important pre-existing activities, initiatives, stakeholders and potential partners that could potentially be leveraged to further develop the planned pilot activities in the further stages of the TetRRIS project.

4.3 Summary Remarks on the Status of Responsible Research and Innovation in the Karlsruhe Technology Region

A key conclusion from the mapping work, which was supported by the subsequent validation discussions, was that the Karlsruhe Technology Region, as an established and dynamic regional innovation system in a country (Germany) characterised by participative, multi-level governance, already enjoys a relatively high level of RRI practice on the part of local innovation actors. For example, the region's firms and research institutes display a number of relevant competences that give rise to potentially transformative innovations on a regular basis, and quite frequently seek to pilot these innovations in the socioeconomic environment of the region – its traffic systems, its urban quarters or its higher education sector – and in this context undertake various types of public consultation and participatory processes.

Like many regions in Germany, the Karlsruhe Technology Region features a number of network and cluster organisations, associations and other intermediaries that support and maintain a vibrant exchange at different levels. Overall, there is a rather cooperative and inclusive culture of innovation that connects at least firms and research organisations rather well. Traditionally, however, overlaps between networks in the domain of civil society and those of the business or research sector have been less developed. While these connections and interfaces have intensified – and while Germany's economic system includes a strong element of consultation to start with – some would still argue that civil society and the business sector remain rather separate spheres in their everyday activities and perspectives.

However, while elements of RRI are thus practiced with growing frequency and routine in the Karlsruhe Technology Region, this practice is almost entirely of the "de facto" RRI variety: that is, actions and practices that embody the basic concerns and "spirit" of RRI, but are not framed in terms of the technical academic and policy language of RRI or

performed with reference to the various academic and policy texts on RRI. Individual RRI keys – like ethics – may occasionally be referred to, but in most cases the discussion is framed in the pragmatic, established language of business or municipal politics. Indeed, outside of several local research institutes that have played important roles in the development of the European discourse on RRI,[21] local actors seem to be almost entirely unaware of the terms "RRI" or "Responsible Research and Innovation".

As discussed in Deliverable 2.1 of the TetRRIS project, it can be helpful to distinguish between substantive and more processually-oriented dimensions of RRI. As regards substantive concerns, the de facto RRI activities and practices in the Technology Region seem to be concentrated in particular in the area of environmental sustainability. An important focus area here is the development of new, more climate- and environmentally-friendly mobility and logistics solutions, though there are also various activities in the field of new energy technologies.

On the more processual side, a major strand of Karlsruhe de facto RRI practices and activities lies in the field of public engagement/inclusion, mainly in the context of projects seeking to innovate new technologies or develop new physical and social infrastructures and associated social practices (e.g. large-scale new mobility and logistics systems). These activities often naturally also relate to the RRI dimensions of (public) science education and gender/diversity, respectively. Public engagement and inclusion is viewed as important by stakeholders from both policy and business, and is the area of (de facto) RRI where activities, when not present, are most actively deplored as absent by local stakeholders.

One reason for this stakeholder interest in public engagement is, quite practically, that local legitimacy has been found to be important for making projects viable and to pursue them constructively. Actions "enforced" from higher echelons of government, like the federal or the Länder level, have proven more controversial and less effective, if the representative of the local population, municipalities and counties, were insufficiently consulted and provided with insufficient time to set up relevant and inclusive consultation processes meaningful to the local population. Local authorities and other actors in the innovation system (researchers, private-sector technologists and businesses) have begun to recognise this challenge, and in several cases have set up well-organised processes of communication around research/innovation projects with public impact. Relevant thematic areas of application are mobility, digitalisation and energy.

One concrete example of research or innovation projects "with public impact" is the operation of "living labs" (Reallabore) or testbeds in public spaces, ranging from municipal test areas for autonomous driving to pilot lines for e-lorries powered by contact wires, to considerations whether regional test areas could be established for unmanned aerial transport vehicles. All have tended to meet with both regulatory hurdles and

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[21] These are the Fraunhofer Institute for Systems and Innovation Research ISI and the Institute for Technology Assessment and Systems Analyse ITAS at the Karlsruhe Institute of Technology (KIT).
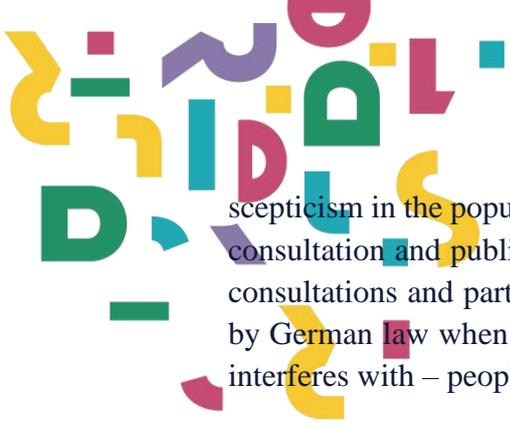
scepticism in the population and all have to be legitimised and publicly defended through consultation and public engagement. Beyond purely instrumental considerations, public consultations and participatory processes are in many cases also, quite simply, required by German law when testing and piloting new technology that affects – and potentially interferes with – people's daily life.

Public engagement activities tend naturally to involve some measure of attention to questions of gender or diversity (in order to ensure that representatives of at least the main affected parties are heard). They also tend to require that at least some basic efforts are made to educate the affected public about a given project's technical and scientific background, and in this sense can be understood to relate to the "science education"-key of RRI.

That said, concrete evidence of proper citizen science or processes of open innovation that substantively include laypeople in collecting or evaluating bodies of knowledge are more or less absent. Beyond the occasional initiative that collects information about vegetation through crowdsourcing or some university-based makerspaces, few concrete activities could be identified. Even managers of network organisations tend to argue that some degree of subject-matter expertise is usually required to meaningfully contribute to innovation processes, even if open. As a result, citizens tend more to be consulted for their opinion (in public consultation) than for their knowledge.

Beyond the need for public engagement/inclusion (and related RRI keys), "living labs" involve further complex governance challenges that relate closely to the core ideas and motivating spirit of RRI. These include in particular the problem of anticipation and assessment of possible risks and "side effects" of the technology, as well as potential regulatory challenges (in as far as, in the case of very novel technologies, often no regulatory structure and permitting processes may yet exist). They also include the problem of responsiveness and flexibility – the ability to alter the project or even the technology under development in response to new and unanticipated feedback and reactions from the external environment.

One conclusion from the mapping and subsequent discussions was that, while fairly extensive de facto RRI activity is regularly occurring in the Karlsruhe Technology Region, it appears that these activities are often not very coordinated or linked to each other. There seems to be limited exchange and mutual learning among innovation-system actors about the successful RRI practices being pioneered in the region. Rather, it appears that the (de facto) RRI activities occurring are mostly somewhat disparate actions of individual organisations or even individual project managers acting on their own initiative. In other cases, when technology or development initiatives have become very politicised and conflictual, RRI-like actions may be taken, but with a view to dampening the conflict and allowing the project to proceed – rather than being conducted in advance, to strategically identify and address potential sources of conflict in advance. At that point, when it is too late to convey the impression of sincere prior consultation, the negotiation of interests and opinions will inevitably take centre stage.

At the same time, this apparent lack of exchange and learning about RRI practices means that even when innovation system actors are aware of and interested in conducting certain (de facto) RRI activities, they are sometimes left unsure how best to do so. Despite valuable experiences and the gradual accumulation of a knowledge base about how best to "do" RRI in the region, its full potential to serve as a vehicle to prepare societally viable, inclusive and constructive innovation activities in cooperation, rather than in pure negotiation, with the population is not yet realised.

4.4 Challenges for the further integration of RRI into the local innovation and development system

A number of challenges to the further integration and deepening of RRI practices in the regional innovation system could be identified. Importantly, not all of these challenges are easily amenable to intervention by local actors. Rather, a number of challenges are either structural or derive from the decisions and preferences of higher-level or external political, administrative and research-funding bodies. Conversely, other challenges have roots that are more directly located in the region itself, and can therefore be more readily addressed by local action. Other challenges, finally, derive from a complex mix of external and local factors.

4.4.1 Structural and Externally-rooted challenges

At least three sets of largely structural and/or externally-rooted challenges to a more thorough-going integration of RRI into innovation activities in the Technology Region could be identified: the distribution of power in the multi-level political and administrative structures, the requirements and expectations of funding bodies, and limits to the capacity and willingness of citizens and stakeholders to engage in participatory processes.

Distributed Competencies and Remit in Multi-Level Governance

While in the German federal system comparatively large amounts of power and competency are devolved away from the central government, a large portion of these powers and competencies accrues to the State (*Länder*) level and their local representatives, the regional councillors (*Regierungspräsident*). As in other countries, therefore regional-level executive decisions may stand in contrast to or at least partially deviate from the opinions of elected local authorities (city mayors, etc.) which, in Germany, have substantial powers as well - albeit less so in the domain of science, research and innovation.

One important consequence of this is that responsibilities for science, research, and innovation will often fall under the remit of the state, if not the federal level, while responsibilities for local framework conditions as well as knowledge about local societal and political opinion rest with local decision makers. To a degree, all projects in the area of science, research and innovation are thus confronted with the challenge that, unless
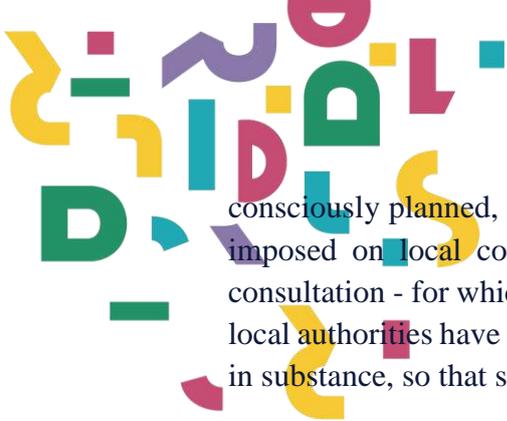
consciously planned, they may be perceived as something external to the locality that is imposed on local communities from higher echelons of government without proper consultation - for which only local authorities have relevant capacities. At the same time, local authorities have neither competences nor remit to start and govern such STI projects in substance, so that some form of coordination is inevitable.

While underexploited, both conceptual options as well as positive presence for such fruitful cooperation exists. While technology and innovation projects of strategic importance for the state or the country will inevitably be conceived, initiated, and financed by higher-level institutions the implementation of a "genuinely" RRI-minded approach to innovation (with a view to inclusiveness and participation) will crucially depend on the capacities and experiences of local authorities who have acquired knowledge on how to run such processes in other, no STI, domains. This concerns in particular participatory processes – through which a genuine involvement of the affected citizens and stakeholders in the locality may prompt productive changes to the project – but is true also for other aspects of RRI such as including reflexive processes aimed at re-evaluating and if necessary altering projects in mid-stream.

Against this background, two main tasks remain to be fulfilled: On the one hand, state and federal-level authorities must be open towards the incorporation of relevant information and feedback "from the ground" rather than merely considering stakeholder consultation a necessarily, if inevitable duty to the citizen. On the other hand, local authorities, too, have to open themselves to constructive collaboration with higher-level, domain-specific actors (i.e. ministries of research and education) rather than to withdraw into a defensive, unconstructive approach. Effectively, both sides - and more so the project as such - have to gain through constructive collaboration.

Naturally, local actors within the Technology Region have no scope to change the larger state administrative structure they are part of, and can only exercise a degree of practical and normative suasion vis-à-vis higher-level actors.

Requirements and expectations of funding bodies

RRI understands the innovation process as – ideally – an iterative, open and reflexive process, wherein the goals, object (technology/social practice) and method of innovation – what is to be innovated, how, and to what end – is opened up to deliberation by outside stakeholders (citizens, interested/affected parties), who should enjoy meaningful input into these questions, even while the innovation actors (researchers, technologists) themselves reflect critically on these questions. This deliberation and reflexion, moreover, may occur both at the scoping and initiation stages of a project, and during the run-time of the project (e.g. in the form of a sequential stage-gating process).

By definition, however, such a practice of RRI introduces considerable uncertainty into the eventual outcome and even basic shape of an innovation project. This clashes with the expectations of funding agencies, which tend to require detailed, multi-year work plans with clearly defined outcomes, to be implemented according to fairly tight schedules. Substantial deviations from submitted (and funded) work plans are rarely met
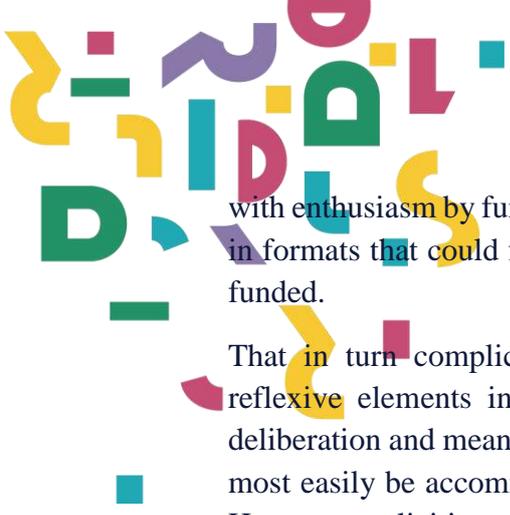
with enthusiasm by funders, and proposals that include this as a possibility – or even build in formats that could facilitate it, like deliberations in mid-stream – are liable to not get funded.

That in turn complicates the introduction of strongly deliberative/participatory and reflexive elements into innovation projects. Under most funding formats, reflexion, deliberation and meaningful shaping of a project by outside stakeholders and citizens can most easily be accommodated during the proposal stage of a project (i.e., pre-funding). However, soliciting citizen feedback or participation in proposal-formation is rarely possible for innovators and researchers, unless appropriate structures and institutions exist to organise such input in a manner that is time- and cost-effective, and can safeguard innovation actors' legitimate expectation that secrecy/intellectual property be safeguarded.

Again, local actors have little power to unilaterally alter the requirements of funding bodies. An open question, however, is to what extent it may be possible to create new structures that can help facilitate early-stage public inputs and participation.

Limited Interest and Qualification among Citizens and Stakeholders

The feasibility of engaging and including citizens and other stakeholders (e.g. business interests, NGOs) in innovation projects ultimately depends on the willingness and capacity of these citizens and stakeholders to be included. After all, participation – necessarily almost always unpaid - although daily allowances are gradually becoming more common, especially when participation is supposed to involve a high level of engagement – takes time, and to meaningfully participate some level of background knowledge is almost always necessary. However, as became clear during the mapping and subsequent validation discussions, both can be in limited supply. While innovative formats and communication strategies to emphasise the relevance of projects to citizens' and stakeholders' daily lives and/or material and ethical interests can help spark interest and participation, this cannot be guaranteed. Whether or not the offer to participate is taken up, is ultimately out of the hands of the innovation actors themselves.

Likewise, while it can be possible to provide key background information in easily "digestible" quantities, ultimately, the more technical questions become the more limited scope for real participation can be. While everyone can opine, far fewer can provide an informed, qualified and thus potentially productive contribution to the discourse. Technical questions that require an engineering degree to answer can rarely be sensibly discussed without this background. One approach to deal with this can be to identify precisely what issue areas, in a project, lay people really can provide meaningful input to, and then involve them in a targeted way on these. However, this bears the inherent danger to reduce discussions to the level of collecting personal impressions and see them veer into an emotional debate around personal grievances. Another approach is to provide lay citizens with "expert assistants" whose task is to help them understand the key technical-scientific issues (though again this can become very resource-intensive, as the experts need to devote their own time and may have legitimate expectations of financial

compensation.) In line with that, discussions can be prepared to address precisely those "user experiences" that a project was designed to improve and by means of concrete question identify if and how this ambition has indeed been met, and where it has failed.

4.4.2   Challenges deriving from local factors or causes potentially more amenable to local action

Apart from the more externally-rooted challenges to the further integration and deepening of RRI practices in the regional innovation system outlined above, there are other challenges largely independent from external factors. These more or less all revolve around the knowledge base within the innovation system regarding the "how to" questions: How to include or engage citizens or public stakeholders in a research, development or innovation (R, D & I) project? How to ascertain that, beyond voicing personal options, they can make relevant, productive contributions that help to improve projects in substance? How to anticipate, manage and respond to public opposition or conflict between stakeholders, especially when – as may increasingly become the case – these conflicts migrate into the digital sphere and are thus potential affected by dynamics particular to social media (e.g. "shit storms", "trolls", fake news/information, etc.)? How to consider gender and diversity aspects in public engagement activities, and how to think about representativeness? How to set up an education campaign that avoids well-known pitfalls? In other words, how to design and conduct concrete activities of engaging and including citizens and other stakeholders within an R, D & I project, even in the case where the best possible framework conditions are already given?

Without a doubt, much valuable knowledge needed to answer those "how to" questions is already available within the Karlsruhe Technology Region. Many actors have conducted public engagement processes in the past, with considerable success. Internally, they have built up valuable knowledge on Dos and Don'ts, good practices and pitfalls, yet not often shared them with others. Moreover, it seems that this knowledge is too often tacit, not written down or systematized, but available only in the (fading) memory of individuals based on their personal experiences. If it has been made explicit, that happened mostly in the form of internal notes, not meant to be used by - and hence hardly known to - external parties. As a result, innovation actors new to the field or facing the challenge of designing public engagement activities for the first time cannot readily access this knowledge and has to start from scratch. Accordingly, even capable actors face difficulties in entering new fields of activities (e.g., in terms of participation methods, or in a more thematic sense) or confronting new problems (e.g., digital and social-media dynamics) - as they lack relevant reference and cannot find access to prior experiences with similar processes. In short, knowledge management with a view to the technical aspects of implementing participation in practice is poorly developed.

Regarding this challenge, it could be helpful if actors of the innovation system could build upon certain *structures to facilitate the exchange* of the substantial amounts of tacit or individually-held knowledge surrounding RRI activities (such as public engagement) that already exist. Also, it could be beneficial if greater exchange between actors in the

Technology Region, and experts and practitioners elsewhere in Germany or even Europe could be facilitated. Likewise, it may be helpful if greater shares of extant tacit knowledge were *codified in some manner*, such as guidelines, a practical handbook, or a code of recommended practices and examples. On a meta-level, this would include some conceptual guidance on how to code such knowledge-from-experience in a suitable manner from which others can actually profit. On a more technical level, it would be helpful if innovation actors could use some *open access structures to facilitate a more systematic public input* into their R, D & I activities (e.g. public survey, information or engagement infrastructure).

The framework of the TetRRIS project offers the possibility of beginning to address some of these locally-rooted challenges. which have not been addressed within the Karlsruhe Technology Region to date. At the same time, however, they point to a need of local innovation stakeholders the TetRRIS project could potentially address.

4.4.3   Complex challenges associated with experimentation and regulation

Promoting innovation and innovative activities not only through rather classic funding programmes, but also by creating concrete infrastructures that provide space for transdisciplinary research activities, has recently attracted increasing attention in Germany. In this context, the concept of living labs *(Reallabore)* is of central importance, since they aim to test specific practices or new technologies 'in real life'. *Reallabore* are located at the interface between theoretical and practice-oriented scientific knowledge generation. The core of living labs or *Reallabore* are experiments in which social or technical inventions are tested under controlled conditions. The infrastructures are mostly laboratory structures in the form of homes, offices or production buildings. However, these can also extend to several locations within small-scale areas (e.g. city quarters or test centres). The laboratory character also results from the fact that personnel and material infrastructures, a specific knowledge base and actors with various (educational) backgrounds support the experiments. In this way, *Reallabore* address de facto RRI practices in that potential risks and unforeseen "side effects" of the technology use and implementation can be anticipated and assessed in detail. Beyond that, these infrastructures allow for technological adjustments and targeted problem solution, putting the responsiveness to unexpected challenges centre stage.

In the Technology Region Karlsruhe, for example there has been a living lab since 2015 in which topics in the context of urban planning such as sustainable modes of energy production and consumption, innovative mobility solutions, social issues and sustainable use of space are researched. Moreover, *Reallabore* have been and continue to be promoted in a variety of ways and different places resulting in a wide range of different approaches. In this vein, the Federal Ministry for Economic Affairs and Energy (BMWi) is pursuing a strategy under the same name, which focuses on local and time-limited deregulation to promote technological innovation, thus slightly deviating from the original concept. These regulatory instruments are also being used more frequently in the Technology Region, including, for example, test areas for autonomous driving vehicles or routes for

trolly trucks, where the latter are expected to make a significant contribution to climate protection goals.

Building on the above, a variety of challenges arises which are at least implicitly related to various RRI dimensions. Firstly, due to the unclear demarcation and the definitional diversity of the *Reallabore* concept, it is difficult to arrive at a uniform understanding of the concept. This can lead to different objectives and expectations on the part of various actors, including civil society, which can make the implementation of experimental spaces and *Reallabore* difficult. .Secondly, and with regard to RRI-relevant governance challenges, no regulatory structure yet exists to deal with novel technologies' potential risks. Thus, the anticipation of future hazards and constraints is limited. Additionally, both during the implementation of the test beds and a potential market launch, there is a risk that the approval authorities may have difficulties in weighing up benefits and costs. Resonating with the fact that the objective of *Reallabore* is to test new products under real world conditions, there is, thirdly, the challenge of obtaining legal approvals or even using / creating exceptions in existing laws. These must be obtained at an early stage, which presupposes knowledge of the processes among the various actors. This includes, on the one hand, the developers of the technology and, on the other hand, the actors at the various administrative levels –see multi-level governance in section 0- responsible for approving the projects. The experiences of the interviewees in the Karlsruhe Technology Region in this regard are mixed. While some project actors report difficult processes, others face no problems, which is also due to diverse experiences made in the past. It can be noted that this seems to be essentially case-specific and depends on the technology being tested. The degree of novelty of the technology, the potential risk and the associated reservations of the population, as well as the extent of the relevant legal regulations, are to be mentioned here as major challenges in the implementation of *Reallabore* in the Technology Region Karlsruhe.

4.5   Potential needs of local Innovation System Stakeholders

Given the challenges to the further integration and deepening of RRI practices in the regional innovation system outlined above, three key needs can be derived that could possibly be addressed by the TetRRIS project. They all indicate a need to develop (hitherto lacking) structures within the innovation system and stimulate new communication exchanges. Developing or strengthening specific structures considered to be important for the innovation system, can be seen as one of the central tasks of the Karlsruhe Technology Region GmbH (TRK GmbH), the key intermediary undergirding the local innovation system (and regional partner within the TetRRIS consortium). Organisationally a private company, the TRK GmbH is owned by many of the key actors in the local innovation system from public administration, the private and the university/research sectors, and serves as a platform, network and broker/intermediary, enabling actors to develop and orchestrate strategic development and innovation activities for the region. Focusing on the following three needs could allow for pilot activities within the context of TetRRIS that have the highest possible, and therefore realistic, chance to create impact and value for the innovation system and its actors.

First, it seems that there is the need to develop *structures to facilitate the codification, exchange and build-up of knowledge surrounding public participation*. There are several options to address this need:

- *Developing guidelines based on successful, past practices*. As mentioned above, there are many actors in the innovation system of the Karlsruhe Technology Region with long-standing experiences and much expertise with regard to public participation. This often tacit knowledge could be carried together, systematized and could build the basis for some guidelines for a good participation practice. Since only general literature about the facilitation of public participation exists, such guidelines could be especially valuable when focussing on the local peculiarities of the Karlsruhe region, thus considering, for instance, technology-specific attitudes of local citizenship, local success factors to gain and motivate participants, any infrastructure that can be used (provided by TRK GmbH or other intermediaries), any other actors or regulatory bodies that should be involved, or the like. Such guidelines could be made publicly available and thereby publicize the actors (institutions, companies, etc.) that contributed with their knowledge and experiences – a benefit that might be necessary to motivate stakeholders to openly share their good practices.

- *Developing and establishing additional formats of knowledge exchange*. Many actors (or individual persons) have made own experiences in public participation and, assumingly, identified lessons learnt, but up to date, hardly shared them broadly. Learning about those experiences and lessons learnt other stakeholders may have gained during their activities might be very valuable for all actors interested in that topic even if each of them relates to a specific context and time. In practice, such an informal and interactive exchange on implicit knowledge will complement the abovementioned guidelines by not only providing new insights of practical relevance, but an opportunity to scrutinize the validity and generalisability of one's own experiences. Possible formats to facilitate such an exchange of "stories", lessons learnt, failures or good practices could be, for instance, a series of (public or invitation-only) workshops, "fireside chats" or other social event formats allowing for repeated exchange. Such exchanges could also involve outside experts and/or be opened to innovation actors from other areas in Germany or Europe.

- *Developing and establishing educational formats*. Beyond the knowledge exchange described before, it is also important to build-up new expertise which is not (yet) available within the innovation system, but seems to gain in significance. As noted above, new challenges for the conduct of public engagement may arise with regard to the increasingly digitalized context, such as social media driven polemics, "shit storms", fake news or rumour. Another example concerns the increasingly more complex consideration of diversity dimensions (beyond just gender, being it educational, socio-economic or migratory background) and the related question of representativeness. Here, it might be helpful to consult and

invite external experts, and to organize seminars, lectures or other educational formats.

Second, it could be useful to develop *structures to facilitate more systematic public input into the regional innovation projects and agendas,* guided and informed by the above insights on the "how to". This appears particularly relevant in the mobility field, given the variety of R, D & I projects and activities in this field in the Karlsruhe Technology Region, and its strategic significance for the region. Hence, it seems wise to foster the more systematic inclusion of public stakeholders not only on the level of an individual project, but also on the overarching level of coordinating and liaising policies and initiatives. This could help to strengthen and further integrate public engagement activities in all mobility innovation activities and on all levels.

Third, there is the need to develop local support structures to better facilitate experimentation and regulative approaches

- *Development of a common Reallabore understanding:* Since the concept of Reallabore is rather fuzzy and not clearly delineated, it is important to gain a common understanding about potential goals among the actors and stakeholders in the region. For this reason, it might be useful to bring actors from science, politics and administration, business as well as interested parties from civil society together, to clarify ideas, findings and possible ambiguities. Precisely because of the novelty of the approach, a common understanding is essential for the implementation and success of developing technologies beyond the usual innovation funding. This goes along with new ways of thinking and acting that might help to adequately address grand societal challenges.

- *Facilitate support structures and increase acceptance:* Since living labs encompass all innovation phases - from research and development to prototype development and the field phase - user acceptance can be improved at an early stage and thus the implementation of the developed products can be accelerated. Furthermore, the openness increases creativity and innovation intensity on the one hand, and actively creates networking opportunities and support structures on the other. A rather open-ended discussion about potential risk and benefits might help to increase the overall innovation performance of the Technology region. This also requires a partly departure from classical planning processes, in which the results are usually already set out in detail, towards a culture of trial and error.

- *New ways of leveraging legislative power at the regional level:* In many areas of technology development, the Länder have legislative competences, for example in environmental and climate protection. In addition, there is the possibility of derogating remit from the federal level for a limited period of time and space by means of exceptions. In many cases, however, the exploitation of legal framework conditions has not yet been considered in connection with the development and introduction of innovations. Realabore can be seen as a useful first step in this direction. The experience gained in the past should encourage the further

development of legislative competences in the sense of sustainable technology development geared to the well-being of the population. To this end, the actors at the regional, federal and national level must be involved and networked with each other in order to adapt administrative acts in particular to new requirements of technological development. This may also include learning from other regions elsewhere in the country in terms of best practices.

4.6 Pre-existing local activities, partners and stakeholders that could potentially be leveraged

As has been described in more detail in Deliverable 2.2, the Karlsruhe Technology Region can be seen as a prosperous innovation system as it not only consists of a broad variety of stakeholders from business, science, politics and society, but also of strong cooperative relationships and linkages between them. The "Regional Development Strategy Karlsruhe Technology Region 2030", which aims to strengthen the economic, scientific, innovation and technology activities of the region by intensifying cooperation among the stakeholders and their partners, defines "energy", "mobility" and "digitalisation" as focus topics. The Karlsruhe Technology Region GmbH (TRK GmbH), already introduced above, can be seen as a key intermediary within this regional innovation system. In general, innovation systems benefit in particular from intermediaries such as the TRK GmbH, as they usually act at the interface between politics, business and science and thus actively contribute to the formation of networks between the different actors and the exchange of knowledge.

The backbone of the TRK GmbH as an organization is a strategic network of partners from business, science and the public sector, which enables projects to be initiated on a living-lab (*Reallabor*) scale. Thus, R&D and innovation projects implemented are typically of an applied nature and focus on very specific areas and "grand challenges" to improve the living conditions of Karlsruhe Technology Region's inhabitants. A regional mobility cluster is currently emerging under the management umbrella of TRK GmbH, in which all regionally-based mobility partners and networks from basic science, applied research, industry, politics, administration and society will cooperate strategically and on a long-term basis. The coordinated and cohesive external appearance is already making a significant contribution to the fact that the Karlsruhe Technology Region is recognised nationally, Europe-wide and even worldwide as the mobility region of the future. With regard to sustainable mobility, three different project types can be distinguished (cf. Del. 2.2).

First, *R&D and technology oriented projects*. Examples include "efeuCampus[22]" (aiming at setting up a regional innovation centre in the field of emissions-free, i.e. sustainable

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[22] Cf. https://efeucampus-bruchsal.de/

urban freight mobility); "EVA-Shuttle[23]" (developing networked and autonomously driving mini-buses for the last mile from the bus stop to the front door); "Volocopter[24]" (aiming at building the world's first sustainable and scalable urban air mobility business to establish affordable air taxi services); and "eWayBW[25]" (investigating electrically powered hybrid overhead line trucks in a living-lab pilot).

Second, *innovation and socio-technical projects with a local application*. Examples include the Karlsruhe Technology Region Mobility Portal[26] ("TRK-Mobilitätsportal"; bundling all available information on mobility services in the Karlsruhe Technology Region under one surface) and the cluster called "regioKArgo" (aiming at relieving the logistics system by, among others, shifting the delivery of goods to local trams and by making the last mile emission-free).

Third, *infrastructure related projects*. Examples include the project "Autonomous Driving Test Area Baden-Württemberg" (aiming at promoting autonomous driving, especially in complicated urban traffic); the project "regiomove[27]" (aiming at bundling various mobility offers, such as trams, bike- and car-sharing, private cars and bikes, at hubs); and also the above mentioned "eWayBW" pilot project (since the operation of electrically powered hybrid overhead line trucks presupposes the appropriate infrastructure).

Furthermore, the current regional development concept of the TRK GmbH (its implementation will be funded by financial resources of the regional competition RegioWIN 2030) plans for the years to come three so-called lighthouse projects. These serve to develop, test and demonstrate innovative, forward-looking and competitive mobility, digitalisation and energy concepts and contribute to the sustainable, intelligent and inclusive development of the region. The project "regioKArgoTramTrain" aims at the development and evaluation of intelligent, climate-friendly and energy-efficient mobility solutions for the movement of goods, information and people by creating an alternative, rail-based logistics transport. The project "RegioMORE" aims at the establishment of an innovation and competence centre in the south of the Karlsruhe Technology Region and thus at the creation of a tangible place for innovation and networking. Finally, the project "LastMileCityLab" aims at the establishment of a living-lab (*Reallabor*) for the development, evaluation and demonstration of new delivery technologies and for the fine distribution of goods in urban areas on the "last" and "penultimate" mile.

The challenges to the further integration and deepening of RRI practices as well as the resulting needs of the innovation actors, both outlined in the previous sections, apply to

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[23] Cf. www.eva-shuttle.de

[24] Cf. https://www.volocopter.com/en/

[25] Cf. https://ewaybw.de/

[26] Cf. https://mobil.trk.de/

[27] Cf. www.regiomove.de
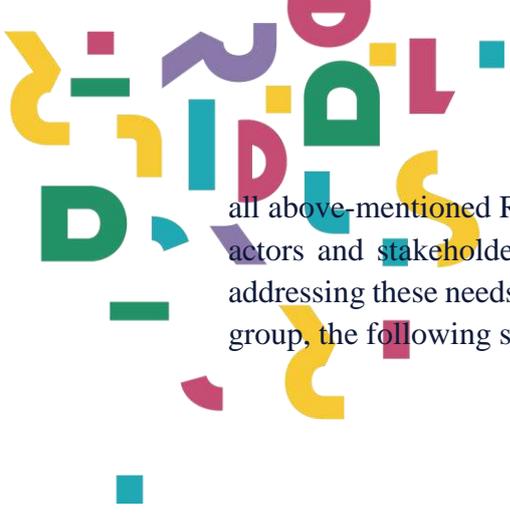
all above-mentioned R, D & I projects that are still running or just at their start. Thus, all actors and stakeholders involved could potentially benefit of TetRRIS pilot activities addressing these needs. In order to concretize these pilot activities together with the target group, the following scoping activities are planned.

5 Szeged

Work package/Deliverable: D3.1 : Region-specific challenges and identified areas for joint action in the Szeged region

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LEGAL DISCLAIMER

5.1 Brief Recap of the current Status of the Implementation to the RRI Agenda in the Territory

The low number of surveys and practical actions on RRI in the Szeged region is particularly notable, and what RRI-related activity exists is based on the actions of a very small number of people. The aspects of RRI are not directly visible and don't play a significant role in the region. These issues are in some cases quite "vague" for the regional actors, and play little or no role in the policy discourse or in actual practice. The underlying reasons for why they play little role might be that the focus is rather on economic growth and other material issues as the region is still lagging behind Western Europe (GDP per capita is about 40% of the EU average). Furthermore, the socio-cultural environment (trust, cooperation, etc.) is not so favourable to RRI, and the familiarity with and exposure to RRI is low. The most important factors influencing the current status of the implementation to the RRI Agenda in Hungary are:

1. the "lagging behind" status of the region in terms of GDP per capita

2. the post-socialist heritage (and the socio-cultural environment)

More specifically:

1. Looking at the GDP per capita, we can state that the GDP per capita is less than 50% of the EU average in the Szeged regions, so this area can be characterized as an underdeveloped region. Innovation facilities (such as science parks, technology transfer institutions, etc.) help implement innovation strategies, but in Hungary these facilities were established only in the previous 15 years, but their regional distribution is still uneven: these facilities are concentrated around capital and larger cities. Furthermore, in most of the less favoured areas such facilities and institutions – like adequate strategic concepts – are still missing. It should be underlined that Gross Domestic Expenditure on R&D (GERD) is generally lower (about 0,19 % of the GDP) in comparison with the EU average (about 0,25 percent of the GDP).

2. The so called post-socialist countries are very special in terms of innovation: many researchers implicitly assume that post-socialist countries suffer from some shortcomings in their innovation cultures (e.g. low technological capabilities of companies, absence of industrial R&D, low business demand for innovation and inappropriate science-push innovation policies) which is due to the socio-cultural values and norm that were inherited from the socialist period and which appear immune to innovation and resistant to adjust. These specificities also affect the understanding the importance of Responsible Research and Innovation in the region.

The main reason for this derives from (i) the lack of trust in people they do not know (experienced in the post-socialist countries), (ii) the fact that in business life profit is the main driving force, and (iii) they do not really appreciate activities that are not productive.

On the whole, we can say that the companies in the region currently have a weak RRI sensitivity, and it was confirmed that there is a low level of willingness to cooperate. Due to the lack of trust they show to be reluctant to provide information about their work to people they do not know.

5.2 Analysis of Challenges

5.2.1 Challenges deriving from external factors or causes largely unamenable to local action

The most important external heritage is the post-socialist heritage itself, with its socio-cultural factors:

1. **Lack of trust**: In one of the interviews conducted for Deliverable 2.2 of the TetRRIS Project, one of the interviewees characterized Hungary as a "*closed and introverted society*". Hungary is in between the western European and the post-communist societies with regard to the degree of trust in other people. In case of institutional trust, Hungary belongs to the lowest-ranking countries in Europe and among the former Eastern Bloc countries as well. Additionally, the social participation is at a low level in Hungary: friendship ties are often somewhat loose and levels of participation in voluntary and civil-society organisations (both recreational and more societal or political) are relatively low. People in Hungary do not like being members of other organizations.

2. **Lack of cooperation willingness**: Hungarians are the most convinced that during economic activities, the different actors can prevail only at the expense of another actor, compared to more than fifty countries of the world. In other words, Hungarians citizens refuse to support the view, which states that economic cooperation through mutual benefit can create an economic surplus, and the participation of it can occur without detriment to others. Nowadays, the new Hungarian research grant schemes (e.g., GINOP, GINOP Plusz) are designed to promote cooperation. This has borne some success. For example, many research groups are involved in these grants, and they has already started cooperating.

3. **Importance of informal channels:** Many interviewees highlighted that "*everything goes much easier and quicker if you know someone at the administration*". This is of course true of all countries, but in Hungary the perception of the importance of informal channels has had a very significant influence on the innovation environment.

4. **Low familiarity and exposure to RRI:** Hungarian researchers and other actors in the innovation process have mostly had minimal exposure to RRI and are unfamiliar with the concept. Diffusion of RRI and related ideas is also hindered by the low levels of societal trust and general climate of "suspiciousness" of cooperative endeavours noted above: Because the default assumption for many

people remains that humans are fundamentally selfish and economic and ostensibly cooperative activities are ultimately zero-sum, a concept aimed at securing a "greater good" like RRI tends to evoke scepticism and is often met with disinterest.

5.2.2 Challenges deriving from local factors or causes potentially more amenable to local action

In several previous RRI-related projects conducted in the region (FaRInn – Facilitating Responsible Innovation in South-East European Countries, D-STIR - Danube Framework for Responsible Research and Innovation using Socio-Technical Integration, ROSIE - Responsible and Innovative SMEs in Central Europe) we found that it is difficult to motivate both the academic and the business sector to be part of the pilot actions. We experienced a little awareness about social sciences in general and doubts about the usefulness of social sciences compared to "hard science". The different background also made it difficult to understand each other in the beginning.

Though some answers indicate that the companies operate properly from the point of view of RRI, but, in many cases, we had the impression that the positive answers given by them were the result of their willingness to come up to our expectations.

In the business sector, the question is how the participants can be convinced to save some time from their working hours on RRI raises several problems. All this is aggravated by the profit criterion in the business sector, namely that the participation in RRI-activities is definitely less productive on a short-term than participating in company activities that generate profit on a short-term basis also.

Also the specificity and the challenge of business sector is clearly visible during the participation in this kind of pilots, as the profit criteria, the daily workflow, the direct benefits and the short-term approach confronts RRI: Companies do not see direct benefits from participating in RRI actions.

In general, we can say that, the innovative companies consider the aspects raised as important, i.e. the majority think it is worthwhile to integrate economic, social, environmental and ethical aspects into research-development an innovation processes. Environmental and social aspects and their potential negative impacts are easier to clearly identify, while the clear identification of ethical ones in RDI processes is a harder nut to crack. The integration of economic aspects into the corporate strategy is a basic requirement, whose disregarding would give the company a competitive disadvantage. The reason is likely to be that companies do not directly experience environmental, social and ethical impacts and, consequently, pay less attention to these than to economic aspects.

The starting point of the analysis was to find out the level of knowledge and interest of the involved parties regarding the RI/RRI concept. The results showed that parts of the innovation sector have some rudimentary awareness of the concept (more than half of the interviewees have heard about the concept) but does not have accurate knowledge about

the elements, involved responsibility dimensions and benefits of RRI. The participants focus on some emphasised responsibility dimensions during the innovation process, but do not have a comprehensive approach to handle the embedded risks and negative effects of innovation. Especially as during their regular innovation decision making processes the tangible factors get major importance as expansion of product and service scale, open of new markets, expansion of market share, improve quality of products and services, and expansion of production capacity and effectiveness of products and services. Currently environmental awareness is the most significant and frequently found and in-focus responsibility dimension. The environmental-consciousness is integrated into a number of the organisations asked, some of it has even estimated the accidental or unintended effects of their innovative activity at least subsequently, and has drawn their consumers' attention to these effects regarding the environment protection.

Environmental considerations are also present in production as much as sustainable production technologies and processes are becoming increasingly important with the development of "smart production" applications.

5.2.3 Challenges with mixed causes

In Csongrád county there is no strategical conscious RRI-awareness in general: the strategic documents of the local and regional bodies do not include Responsible Research and Innovation (RRI) or/and Responsible Innovation (RI). There are some steps being taken in applying RRI in the regional innovation, but these are mainly **individual efforts** of several organizations. This means, that it is often done in at least an implicit, de-facto manner (i.e., without calling it "RRI") in this region. There are some key persons in the region who understand and believe in RRI, and the majority of the regional achievements are in line with their persuasion.

This fact is not surprising, because similar issues like responsible innovation usually play little role (or only a rhetorical one) in local strategies and activities in less developed regions. Such "post-Materialist" concerns often only break through at higher levels of economic welfare.

5.3 Analysis of Needs

Based on the current status and the challenges, defining needs of the local actors is really difficult.

1. In the local academic (and maybe public) environments the openness on RRI is definitely higher, so in the first step, the most visible results could be achieved in this sector. In this environment there is a need for more competitive research activity with a broadened horizon, which can be fostered by RRI, too. In this sector raising awareness trainings and external coordination in the organizations are needed.

2. As we state in our scientific paper: "*A direct consequence of the above logic is that innovators' profit-maximising aim is in conflict with society's interest to maximise the quality of life, and rational innovator businesses will not choose the responsible innovation model in the absence of internalisation*"[28]. If we agree with this, a signal-type approach may be suitable for endorsing the practical application of responsible innovation. A further option could be the regulation: the majority of businesses consider that regulatory authorities could make the most contribution to the promotion of responsible research and innovation in RDI processes. It seems that without the cooperation of these authorities – regulation by the state and the bids themselves – we cannot expect a major positive change in RRI. Efficient and sufficiently stringent control would be needed.

We envisage the following types of steps to help integrate RRI principles into the RDI practices in Csongrád-Csanád county:

- Raising awareness: the starting point should be an effective dissemination of the concept, overcoming negative attitudes.

- Increasing passive knowledge: introducing RRI into the passive knowledge of society then turning it into the active one.

- Bottom-up approach: embedding RRI principles in local and regional level politics.

- Successful regional/local pilots: regional/local pilot projects can become success stories illustrating the implementation of RRI.

- RRI indicators as grant indicators taking advantage of the large ratio of grant-driven innovation, attention should be paid to introducing RRI orientated indicators among criteria for evaluation of funding awards. This could be an effective tool to raise awareness and promote responsibility among organizations managing funding and the final beneficiaries.

- Financial tools: in initial phases of RRI introduction, public authorities and business support organizations should consider providing funding tools to SMEs. Due to the challenging financial circumstances in SEE regions, innovative SMEs have to cope with daily survival which make them insensitive to the potential benefits of RRI.

- Closer to society: governmental organizations or local authorities may be deemed to be somehow partial in the process of mainstreaming RRI (they are

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[28] Miklós Lukovics – Benedek Nagy – Nikoletta Nádas – Emad Yaghmaei (2020): *Signalling Theory Based Economic Approach to Facilitate Responsible Innovation Uptake for Businesses*. Journal of Responsible Innovation (submitted)

stakeholders). Therefore, the creation of an multi-stakeholders agency or association may prove a better promoter of RRI in a given context.

5.4 Pre-existing local activities, partners and stakeholders that could potentially be leveraged

Our logic to foster Responsible Research and Innovation in Csongrád-Csanád county could be built on two different factors:

1. Quadruple Helix logic: in order to reach all types of actors, involving organizations around the QH logic could be suitable.

2. Pre-existing knowledge on RRI: the process could be faster in case of involving organizations with RRI-experience.

Organization	Quadruple Helix Status	Current RRI experience
University of Szeged	Academia	• FaRInn project, • two STIR pilots (Oscillatory Neuronal Networks Research Group and Photo electrochemistry Research Group) • RRI research group at the Faculty of Economics and Business Administration led by Miklós Lukovics
EMFIE – First Hungarian Responsible Innovation Association	Civil	• D-STIR project knowledge provider - Danube Framework for Responsible Research and Innovation using Socio-Technical Integration, • ROSIE project knowledge provider - Responsible and Innovative SMEs in Central
DARIÜ – South Great Plain Regional Innovation Agency	Civil	• tetRRIs
ELI – Extreme Light Infrastructure	Academia	• D-STIR project test bed - Danube Framework for Responsible Research and Innovation using Socio-Technical Integration,
Municipality of Csongrád-Csanád County	Government	• D-STIR project partner - Danube Framework for Responsible Research and Innovation using Socio-Technical Integration,

Chamber of Commerce and Industry of Csongrád-Csanád County	Business	• Stakeholder in previous RRI-related projects

It is very important to note, that:

- some of these organization's RRI experience is very limited, only a few people of these institutions has widespread knowledge and experience in the field of RRI

- organizing and managing cooperation among these organizations is very difficult

Taking these notes into consideration, the dream RRI ecosystem in Csongrád-Csanád County can be imagined as follows: