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Author(s): Nicholas Martin, Thomas Stahlecker, Ezekiela Arrizabalaga, Lisbet Frey, Petra Jung-Erceg, Hendrik Hansmeier, Nils Heyen, Ilona Koski, Henning Kroll, Lukas Kurzmann, Miklós Lukovics, Juha Oksanen, Nina Rilla, Raúl Tabarés

Contributors: SODERCAN, Tamas Gyulai, Emad Yaghmaei; TAMPERE, Mika Nieminen, Tiina Ramsted-Sen

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## Introduction: Mapping Case Study Regions' Systemic Characteristics & Existing RRI Activities

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 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.

### *Differences in Actor Structures & Governance*

The regions considered as cases for this project differ not only with regard to their (economic) size, but also with regard to their level of socioeconomic and sociotechnical development. Likewise, they have experienced different economic trajectories ranging from by and large dynamic ones in Germany to those characterised by past or comparatively recent structural crisis in Spain. In Hungary, sociotechnical dynamics remained at a relatively low level to start with.

Furthermore, this project's partner organisations are positioned in different ways with a view of governance, providing with quite different aspects of agency at different levels. In this regard, two main aspects have to be considered. First, differences in the overall governance setting of the relevant countries. While in Germany and, to a degree, Spain many relevant decision-making powers rest at the regional level, Finland, and even more so, Hungary are small, centralised polities. Second, the partner organisations perform different roles in their respective innovation systems. While the Council of Tampere and SODERCAN are local authorities or their directly dependent executive quasi-nongovernmental organisations (quangos) with substantive budgets and remit, the TechnologieRegion Karlsruhe as well as Hungarian local authorities and networks have to operate mostly on the basis of political persuasion. Taking both perspectives together, we conclude that, among the partner organisations, the Council of Tampere controls the most robust means to shape direct interventions, followed by SODERCAN, the TechnologieRegion Karlsruhe and, eventually, the Hungarian partners.

A different perspective on the starting situation, however, emerges, when partner organisations are juxtaposed with a view to their scope and convening power. While the TechnologieRegion Karlsruhe has little direct authority, it enjoys broad-based access to the arguably strongest innovation ecosystem covered by this project. While the network in Tampere may be denser and more closely knit, the ecosystem of the Upper Rhine area (around Karlsruhe) displays a larger number of individually relevant partners and has also displayed the more unambiguously positive development across the past decade. Consequently, therefore, local actors are in any case more interested in relevant ideas than funding alone, so that the TechnologieRegion's lack of direct means may not come to its detriment. Similar dynamics seem to be at work in the Tampere Region. Quite to the contrary, local networks in Hungary face the double challenge of having limited direct powers and budgets while at the same time they are positioned in a sparsely endowed local innovation systems in which it will remain challenging to successfully launch relevant bottom-up initiatives through persuasion and the formation of partnerships alone.

### *Current Prevalence of RRI Activities and Discourse in the Regions*

In the most general terms, we find that RRI discourses based on and articulated in the terminology formally defined by the European Commission remain rare at regional level. If at all, they are present in the academic domain – most commonly and prevalently in the two socio-technically more developed regions, Karlsruhe and Tampere. A partial exception to this, interestingly, is Hungary, where in the early 2010s local academic entrepreneurs were temporarily able to introduce the RRI terminology into local planning documents. (Subsequently however, reference to RRI seems to have been dropped again from later editions of these documents.)

Even in Karlsruhe and Tampere, however, the terminology's overall diffusion into the economic and broader societal domain is rather limited. While individual firms, organisations and relevant individuals may relate to and publicly promote individual RRI keys, an overarching, encompassing perspective on the subject is rare to entirely absent. By and large, most local stakeholders had never heard of the notion of RRI before they were first confronted with it in the interviews and preparatory background conversations.

Moreover, even in substance rather obvious RRI keys like 'open science', 'ethics' and 'societal engagement' (with the possibly exception of 'gender equality') do not pertain to the usual semantics in which the local business sector and/or government actors communicate. In everyday practice, such considerations are, if at all, expressed in other terms such as 'science-industry collaboration', 'corporate social responsibility' and/or 'public stakeholder consultation'.

Exceptions are provided by specific project contexts like that of TetRRIS or similar efforts like "New HoRRizon", "FaRIInn", "ROSIE" or "I AM RRI: Web of Innovation and Value Chains of Additive Manufacturing" in which, naturally, all participating partners are well aware of the projects' headline concept. In Tampere region which most commonly engages in such projects, the RRI concept and terminology may thus have dissipated more broadly in the local economy than elsewhere, including than in the vicinity of Karlsruhe.

That said, research during the mapping exercise has revealed a substantial share of "de facto RRI" activities that local stakeholders maintain but would so far never have considered referring to by that name.

First, next to all regions, with the possible exception of Szeged, either already display a reasonable level of co-creation in the local innovation system (Tampere, Karlsruhe), or at least manifest significant awareness of the value of co-creative and open innovation processes among local policy makers and innovation actors, and strong ambitions to increase these practices in their region (Cantabria). Evidently, in today's networked economy, it is less and less common to envisage innovation processes that can be effectively conducted without piloting activities and feedback from potential users. External input to reflexive innovation and development processes has become so commonplace that, it is, in part, no longer considered a specific perspective by relevant actors.

Second, many of today's innovations, e.g. in the domain of mobility or information technology, have a systemic character and cannot even be piloted without affecting specific communities. Without broader stakeholder consultation, developers would have to bear the political aftermath of not having informed relevant actors. More often than not,





stakeholder consultations have also become a formal requirement before licenses and authorisations for e.g. local test-beds can be issued.

Third, ethics are, and remain a central issue in many domains. In particular in the IT sector, matters of privacy, external control and individual agency keep related matters high on the agenda. Furthermore, many innovations have a tendency to develop socially exclusive tendencies which – with a view to their local piloting and roll-out – can become a matter of ethical concern. Due to concerns about localised 'tech-backlash', various partner regions display targeted efforts to inform about locally relevant activities.

Fourth, inclusiveness has become an issue of central importance in societies that are ageing, increasingly diverse, and increasingly accepting of societies' diverse subgroups' specific needs. For many firms, moreover, diverse communities have become core customer groups, transforming inclusiveness from an act of political compliance to one of self-evidence in business considerations. That said, their current understanding of them remains lacking so that different efforts to improve it have been put underway.

Fifth, sustainability has become one of the headline topics of our time to which all regions have to relate. Like gender issues, sustainability has become mainstreamed across close to all public - and increasingly private - activities in recent years. While sustainability mainstreaming is not the same as RRI per se, it helps develop several interfaces that are relevant for RRI projects as well, including those related to ethics, societal engagement and open science.

### *Hindrances for the uptake of RRI Activities and Discourse in the Regions*

First and foremost, many of the research interviews and background conversations conducted suggest that the EC's RRI discourse is expressed in a theoretical language to which few actors outside academia can naturally relate to. Also, the overall RRI concept is rather broad and encompassing. Hence, even those that can relate to individual issues and keys often display limited inclination to discuss those under the overarching heading of 'responsible research and innovation'.

In practical terms, the mapping exercises seem to suggest that RRI awareness may best be increased by the increasing dissemination of related projects in which the concept is naturally discussed in a down-to-earth manner for an extended period of time. That said, a number of obstacles have been identified that, in many cases, hinder or at least detrimentally affect participation in such projects.

First, commercial short-sightedness and the lack of regulatory stipulations prevent the inclusion of RRI perspectives in projects. Although making research and innovation responsible will pay off on the long term, it initially requires additional investments. Without formal requirements, companies will not embark on that endeavour.

Second, there is a lack of shared vision into which RRI projects could be embedded. Where project activities remain fragmented and without joint mission, it will be difficult to sustain the systemic approach required to make activities genuinely responsible. Even the more developed partner regions report challenges along these lines.

Third, regional funding systems tend to benefit a circle of usual suspects and provide limited leverage for increasing inclusiveness through dedicated actions. In some of the less developed partner regions, relevant regional funding may not be available at all. European funding alone, however, appears insufficient to transform regional systems.

Fourth, all partner regions with the possible exception of Karlsruhe report that localised science-industry relations may be deteriorating rather than improving. This has a negative impact on the web of natural, reflexive interactions in the regional system on which basis future RRI activities are expected to develop.

Finally, RRI is considered a 'soft topic' by many that - at least initially - would have to be promoted out of the social sciences and humanities. In the some of the partner regions, however, the social sciences and humanities community has been found to operate in a silo, with limited connections to the domain of engineering or industry proper.

### *Implications*

These findings have several implications for the further orchestration of the TetRRIS project appear twofold. For one, they suggest that “RRI” may in some cases be becoming a victim of its own success, or rather, of the success of its own underlying concerns and motivations: the more these concerns and motivations are already disseminating into the regions – albeit often under different labels than “RRI” – the less need and value-add local actors may perceive from dedicated “RRI activities”. While this implies a substantial openness on the part of local actors to engage with “RRI concerns”, it also suggests that in order to develop promising pilot activities in the further stages of the TetRRIS project, consortium partners will need to engage closely with local actors in order to identify areas of mutual interest germane to RRI concerns, where RRI may make tangible contributions to local endeavours.

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## EXECUTIVE SUMMARY

This report is part of Deliverable 2.2 of the TetRRIS project, funded by the European Commission under its Horizon 2020 Research and innovation program (H2020) Science with and for Society 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 Responsible Research and Innovation (RRI/RI). This document aims to dig into the socio-cultural particularities of one of the four pilots that TetRRIS projects will study: Cantabria region.

This document aims to screen the regional innovation ecosystem of Cantabria, paying special attention to its structure, actors, policy plans, dynamics, activities and culture. To this aim, this document is structured in seven sections that provide an overview of the region, describes the methods employed during the mapping of actors, analyse the different areas of the innovation ecosystem, explore “de facto RRI” features in the ecosystem and shed some light in the envisioned challenges that the implementation of RRI can create in the territorial innovation ecosystem.

The major findings of this report regarding the regional innovation ecosystem of Cantabria and “de facto RRI” features are:

- Low diffusion and adoption of the smart specialization strategy among the actors but a nice performance of its implementation during the period 2014-2020.
- Fragmented and atomized companies conducting R&D activities in the region but with a good efficiency and proved competitiveness at regional, national and international levels.
- High percentage of GDP associated to industry and industry services.
- Nice level of internationalization activities and exports in the companies based in the region.
- Overwhelming majority of SMEs and predominance of micro SMEs
- Lack of trust and cooperation between companies, and between research organizations and companies that creates difficulties for innovation.
- Large decrease of researchers in the territory in the decade 2008-2018
- High level of productivity between researchers, especially regarding peer-reviewed publications and research fundraising.
- Low level of R&D investment, especially in the private sector, but nice public efforts in recent years (mostly 2020-21) trying to revert this situation.
- Increasing number of technological start-ups and entrepreneurship culture.
- Low level of innovation culture in the territory but a growing perception of the importance of innovation in society for transforming the economy and the territory.
- Lack of innovation, innovation diffusion or research agencies that can create more dynamism in the ecosystem and that can facilitate innovation.

- Low level of “decentralized governance” that can empower actors and can create joint initiatives between actors.
- Incipient initiatives for promoting information exchange, knowledge brokering and knowledge sharing.
- Common awareness and implementation of initiatives related with responsibility and sustainability.
- Regular presence of RRI keys in research and innovation organizations such as ethics and gender equality
- Low level of public engagement activities, open access and science education related activities.

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## 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 first step in this endeavour is to understand better how each pilot territory’s innovation and development “system” is currently configured: who the main actors are, what structures they work through, and what the innovation/development aims and activities are that they are currently pursuing. Building on this, we next seek to understand which dimensions of responsible research and innovation are most relevant to the innovation/development activities and projects of the local actors, to what extent RRI-like practices are already occurring in these projects (albeit perhaps under another name – so-called “de-facto RRI” (Randles, Larédo, Loconto, Walhout, & Lindner, 2016)), and what the entry and leverage points are through which RRI thought and practice may be (further) introduced to these actors and integrated into their work. A particular focus is on identifying what challenges and problems the actors may be confronting in their work that RRI could help solve – how RRI practice can make a positive contribution to their work rather than appearing as a further (albeit, “soft”) compliance hurdle they need to jump through.

This report takes care of one of the regions that takes part in the project: **Cantabria**. During the following sections we pay attention to the different dimensions of the innovation ecosystem of this territory (Freeman, 1995; Lundvall, 1992) as well as we take a closer look to the potentialities and challenges that the implementation of RRI (Uyarra, Ribeiro, & Dale-Clough, 2019) can rise during the next months. For achieving this aim, this report is organized as follows: the next section provides an overview of the region, the third section explains the methods employed during the fieldwork, the fourth section pays attention to the structure of the regional innovation ecosystem, the fifth section explores RRI “de facto” features in the regional innovation policies and the sixth section comprises several challenges RRI future implementation. Last, literature reviewed by the research team is provided.

## 2.2 Overview of the region

Cantabria is a singular region in the Spanish territory located in the north of the country. It is surrounded by the sea in the north and by other regions such as Asturias (west), the Basque Country (east) and Castilla y León (south). According

to the latest data available at the Spanish National Institute for Statistics (INE), Cantabria has 582, 905 inhabitants<sup>1</sup> which makes it one of the least populated regions in the country. Its population is spatially dispersed into an area of 5,321 Km<sup>2</sup> which it also accounts for around 1% of the total population of the country (2019 data)<sup>2</sup>.

Half of its population is congregated into the capital of the region (Santander) with around 45% of its total population. There are other important urban areas such as Torrelavega, Castro-Urdiales or Camargo but only the first one as well as Santander host more than 50.000 inhabitants. It is a predominantly rural region (Gil de Arriba, 1998) with significant mountains and a complicated orography that historically has diffculted communication between the mountains and the coast (where the majority of population lives) due to the lack of adequate infrastructures. In last decades, this aspect has been improved noteworthy but there are still challenges regarding infrastructures as well as public transport and network communications for meeting the gap between inland and coastland areas (B. Ribeiro & Dosil, 2018). All in all, Cantabria accounts for around 1% of the entire population of Spain and its territory.

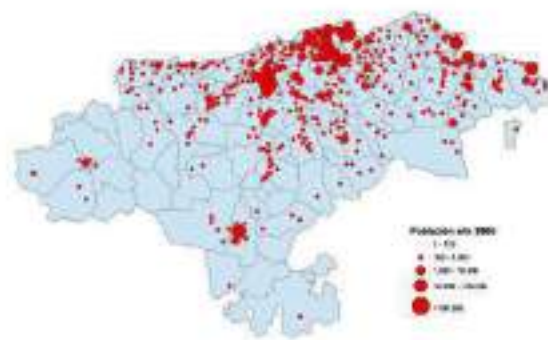


Figure 1 Population map of Cantabria in 2005. Source: Wikimedia

Despite its size and its limited population, the region has a long and rich history behind this territory, and this is visible in the diverse natural, architectural, cultural and ethnographic patrimony that hinder its roots till prehistorian times. This diversity of natural, cultural and artistic resources is one of the best claims for the tourism industry which is well-positioned and employ a significant number of workers in the region. Cantabria has been historically considered strategic for the different empires that have ruled its land (Roman and Spanish empires among others) and this situation also facilitated its industrialization in the XIX century when it acted as an important hub for heavy industries such as mining, metallurgy,

<sup>1</sup> See <https://www.ine.es/jaxiT3/Datos.htm?t=2893>

<sup>2</sup> For a full socio-economic description of the region see <https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/cantabria>



mechanical construction, shipyards and others (B. Ribeiro & Dosil, 2018). Thanks to the port of Santander, the region also started its reconversion from a primary based economy to a secondary one through an active commerce with the Spanish colonies during this era.

Now in century XXI, the region still maintains its strategic character, but it is also transforming its economy into a service oriented one due to the increasing degree of urbanization and loss of population in rural zones. It's economy is also suffering from an increasing deindustrialization in line with what is already happening at Spain and other EU economies (Benanav, 2020; Navarro Arancegui & Sabalza, 2016), despite the weight of the industry in its Gross Domestic Product (GDP) is still relevant.



Figure 2 Spatial location of Cantabria in Europe. Source: Own elaboration

The GDP of the region, 13,8 billion euros in 2018 according to the latest available data from Eurostat<sup>3</sup>, it accounts for 1.1% of the total national GDP. After a decade of high rates of economic growth, especially during the 2000-2005 period and the significant structural funds received from the EC (Potter & Miranda, 2008), it seems that the economy of the region is experiencing economic stagnation although there are some positive prospects. Economic crisis after the Grand Recession has heavily hit the region with many losses of companies (Kotzeva, Brandmüller, & Önefors, 2020) (see figure 4), especially in the construction sector which has been, historically, one of its biggest contributors. The economic growth seems to be slower than the national average and one of the lowest among the country but its GDP per inhabitant in 2019 remains at middle levels when

<sup>3</sup> EUROSTAT, 2020.

compared to other regions according to INE (see figure 3)<sup>4</sup>. The unemployment rate in the region in 2019 was 10,3% (ICANE, 2020) which was below the national medium average for the same period (13,78%) according to INE<sup>5</sup>.



Figure 3 GDP per inhabitant in 2019. Source: INE

Nevertheless, Cantabria seem to be an active region regarding internationalization, good exports and market services which has been one of the recipes for recovering from the economic crisis of 2008. Tertiary sector is the biggest sector of the economy and it accounts for the 68,62% of its GDP, followed by the secondary sector (29,79%) and the primary sector (1,6%)<sup>6</sup>. The most important sector of the regional economy is mainly dominated by tourism activities that capitalizes the natural, historical, cultural and ethnographic capital of the region. Industrial activities are mainly located in coastal areas and specially around the biggest two cities of the region: Santander and Torrelavega.

Although is really difficult to speak about predominant sectors clearly visible in the structure of the economy, there are some sectors that poses a long industrial tradition in the region. These are automotive, metallurgy, chemical and the agri-

<sup>4</sup> For further details see

<https://www.ine.es/dynInfo/Infografia/Territoriales/capituloGraficos.html#!graf>

<sup>5</sup> See <https://www.ine.es/jaxiT3/Datos.htm?t=4247#!tabs-tabla>

<sup>6</sup> INE, 2019

food sectors. At the same time there are other emergent sectors such as biotechnology, marine energy and Information and Communication Technologies (ICT) that are gaining greater importance and they possess a strategic role for the future of the regional economy (B. Ribeiro & Dosil, 2018).

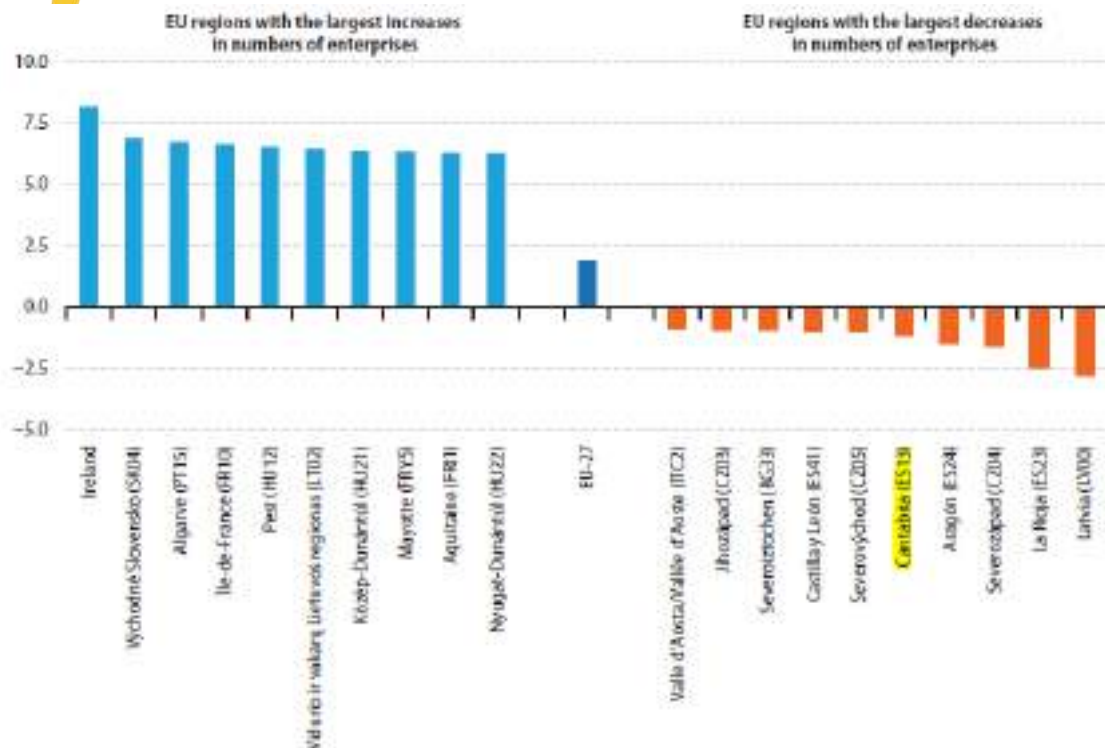


Figure 4 Change in the number of enterprises across EU regions 2016-2017. Source: Eurostat Regional Yearbook 2020

When speaking about its innovation performance and expenditure, the size of the region, its population and its GDP seems to be particularly relevant for understanding their efforts regarding Research & Development & Innovation (R&D&I). Cantabria is currently considered as a “Moderate innovator” region according to the EU Regional Innovation Scoreboard (RIS) (see figure 5)<sup>7</sup>. It shows an increase in its performance of 8,8%, rising by three positions since 2007, when it was considered a “Modest Innovator”. This achievement has been possible due to the efforts carried out by several innovation programs oriented to promote innovation and knowledge transfer between research organizations and companies. In addition, the region has benefited from EU cohesion programs fostering Research & Development (R&D) policies to promote economic growth based on innovation in less developed EU regions (De Noni, Orsi, & Belussi, 2018) during early 2000s.

<sup>7</sup> See [https://ec.europa.eu/growth/industry/policy/innovation/regional\\_en](https://ec.europa.eu/growth/industry/policy/innovation/regional_en)



Figure 5 EU Regional Innovation Index. Source: RIS

Cantabria has some positive prospects towards a change in its economic model towards research and innovation as an engine of economic growth and some strengths can be observed in the last Regional Innovation Scoreboard such as sales of new-to-market and new-to-firm innovations, the number of people with a tertiary education or the number of scientific publications produced by the region (see figure 6).

However, there are important gaps in the current innovation performance of the region and the low expenditure of R&D in the private sector or the low-innovative character of the regional SMEs are some of the major challenges that demand strong efforts in the territory.

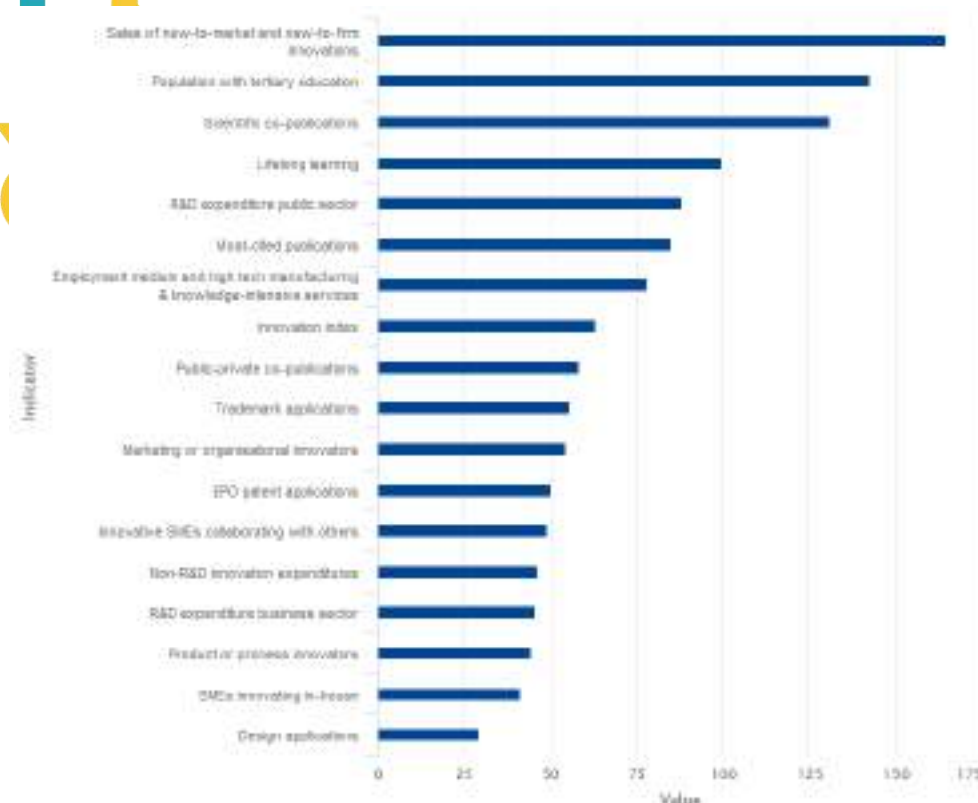


Figure 6 Cantabria innovation profile in 2019 compared with the EU in 2011. Source: RIS 2019

## 2.3 Methods & mapping

For achieving a better understanding of the reality of the innovation ecosystem in the region, **the research team conducted a case study that was structured around a policy documentation analysis and several interviews with key informants.** The objective of this case study is to understand the socio-cultural particularities of the regional innovation ecosystem as well as which kind of “de facto RRI” (Randles et al., 2016) features are embedded in their actors.

Integrating RRI into a regional innovation ecosystem should pay particular attention to the context and the special circumstances of where innovation and research practices are embedded (Uyarra et al., 2019). Specially, because geography is mostly missing in RRI (Fitjar, Benneworth, & Asheim, 2019). Therefore, delivering “a mapping” of the region for identifying relevant actors, initiatives, activities dynamics, priorities and particularities is the first step in this path. This mapping also aims to provide an understanding of the configuration of the regional innovation ecosystem, how it works and what are their dynamics. In addition, there is a strong need on RRI for acquiring knowledge about the context where it will be implemented (Tabarés et al., 2020).

For achieving this objective, a policy document analysis comprising several documents of interest such as policy documents at regional level, national level as well as other documents delivered by experts were screened. Several



searches in Google Scholar and Scopus databases were also delivered introducing keywords such as innovation, regional economy, Cantabria, and smart specialization. In addition to this, another relevant documentation facilitated by policy representatives and regional experts was also incorporated and analysed.

For complementing this desk research, the research team also conducted several semi-structured interviews with key informants. Following the work presented in Deliverable 2.1, which includes a “Mapping Tool” and two different kind of questionnaires (one for the policy actors and another one for the innovation ecosystem actors), we developed our fieldwork during the months of January, February and March of 2021. In this period of time we were able to interview 16 participants that represents 19 organizations in 12 interviews.

Some of the interviews were collective, that is, they involved several interviewees as well as others were developed on an individual basis. This was due to the adequacy of having several representatives of different organizations regarding particular sectors of the economy in the region such as automotive industry or chemicals. This formula was also used with policy representatives for gathering different visions of the innovation ecosystem of the region through particular participants representing different innovation policy-making activities. Some of the participants interviewed represented two or more organizations because of double affiliations while other participants not. Interviews commonly lasted from 40 minutes to 1 hour and there were transcribed and resumed into templates for later analysis. In concordance with the EU Regulation 2016/679 General Data Protection Regulation (GDPR) all participants received and Informed Consent Form (ICF) reviewed and approved by the TetRRIS consortium. In addition, all participants interviewed received a summary of the interview for giving them the opportunity to contrast, check and edit what they consider about their participation in the study.

The “Mapping Tool” paid attention to the socio-cultural particularities around innovation that participants in this study have. That is why they were questioned about factors such as sustainability, responsibility or risk governance in their innovation activities and how they include these factors in their R&D projects. The influence of the current smart specialization strategy (S3) as well as the innovation strategy of the region was also inquired throughout some of the questions posed to our interviewees. This set of interviews allowed to the research team to capture a better snapshot of the current challenges that the innovation ecosystem of the region faces nowadays as well as how “de factor RRI” features (Randles et al., 2016) are currently implemented by different actors of the innovation ecosystem. In figure 7 we offer a detailed list of the different stakeholders interviewed for this purpose

Organization	Full name	Website	Type of stakeholder	Number of interviewees
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<b>DGIDTEI</b>	General Board of Innovation of Cantabria Government	<a href="https://dgidtei.cantabria.es/inicio">https://dgidtei.cantabria.es/inicio</a>	Public administration	1
<b>SODERCAN</b>	Society for Regional Development of Cantabria	<a href="https://www.sodercan.es/">https://www.sodercan.es/</a>	Public administration	5
<b>UNICAN</b>	University of Cantabria	<a href="https://web.unican.es/">https://web.unican.es/</a>	Public university	1
<b>CTC</b>	Technological Components Centre	<a href="https://centrotecnologicotc.com/en/">https://centrotecnologicotc.com/en/</a>	Technological Centre	1
<b>UNEATLANTICO</b>	European Atlantic Sea University	<a href="https://www.uneatlantico.es/en">https://www.uneatlantico.es/en</a>	Private University	1
<b>CEOE-CEPYME</b>	Confederation of Cantabria businessmen and SMEs	<a href="https://ceoecantabria.es/">https://ceoecantabria.es/</a>	Business association	1
<b>CITICAN</b>	Center for Industrial Research and Technology of Cantabria	<a href="https://citican.org/">https://citican.org/</a>	Technological Centre	1
<b>CISE</b>	Santander International Entrepreneurship Centre	<a href="https://www.cise.es/">https://www.cise.es/</a>	Entrepreneurship center	1
<b>IDIVAL</b>	Marqués de Valdecilla University Hospital and Health Research Institute	<a href="https://www.idival.org/en">https://www.idival.org/en</a>	Research institute	1
<b>IBBTEC</b>	Institute of Biomedicine and Biotechnology	<a href="https://web.unican.es/ibbttec/en-us/">https://web.unican.es/ibbttec/en-us/</a>	Research institute	1



	y of Cantabria				
<b>IHCANTABRIA</b>	Environment al Hydraulic Institute of Cantabria	<a href="https://ihcantabria.com/en/">https://ihcantabria.com/en/</a>	Research institute	1	
<b>CINC</b>	Cluster of the Nuclear Industry in Cantabria	<a href="https://cincantabria.es/">https://cincantabria.es/</a>	Cluster	1	
<b>ENSA</b>	Nuclear Equipment's S.A.	<a href="https://www.ensa.es/?lang=en">https://www.ensa.es/?lang=en</a>	Company	1	
<b>ENWESA</b>	ENSA and WESTINGHOUSE participated company	<a href="http://www.enwesa.com/">http://www.enwesa.com/</a>	Company	1	
<b>GIRA</b>	Group of Regional Automotive Initiatives	<a href="https://giracantabria.com/">https://giracantabria.com/</a>	Cluster	1	
<b>SEG AUTOMOTIVE</b>	Large Company Automotive industry	<a href="https://www.seg-automotive.com/">https://www.seg-automotive.com/</a>	Company	1	
<b>TEXTIL SANTANDERINA</b>	Part of Santanderina Group.Textile industry	<a href="https://textilsantanderina.com/">https://textilsantanderina.com/</a>	Company	1	
<b>SEA OF INNOVATION</b>	Marine and offshore energy cluster	<a href="https://cantabriseaofinnovation.es/">https://cantabriseaofinnovation.es/</a>	Cluster	1	
<b>APRIA SYSTEMS</b>	UNICAN Spin Off SME	<a href="https://apriasystems.es/">https://apriasystems.es/</a>	Spin Off/SME	1	

Figure 7 List of stakeholders interviewed

Participants involved in this study have helped to illustrate an updated perspective of what are the societal challenges that the regional innovation ecosystem face after one year of COVID-19 crisis. In following sections, we pay attention to specific aspects of this ecosystem (industry, science, innovation culture, etc.) presenting the findings obtained by the development of this case study





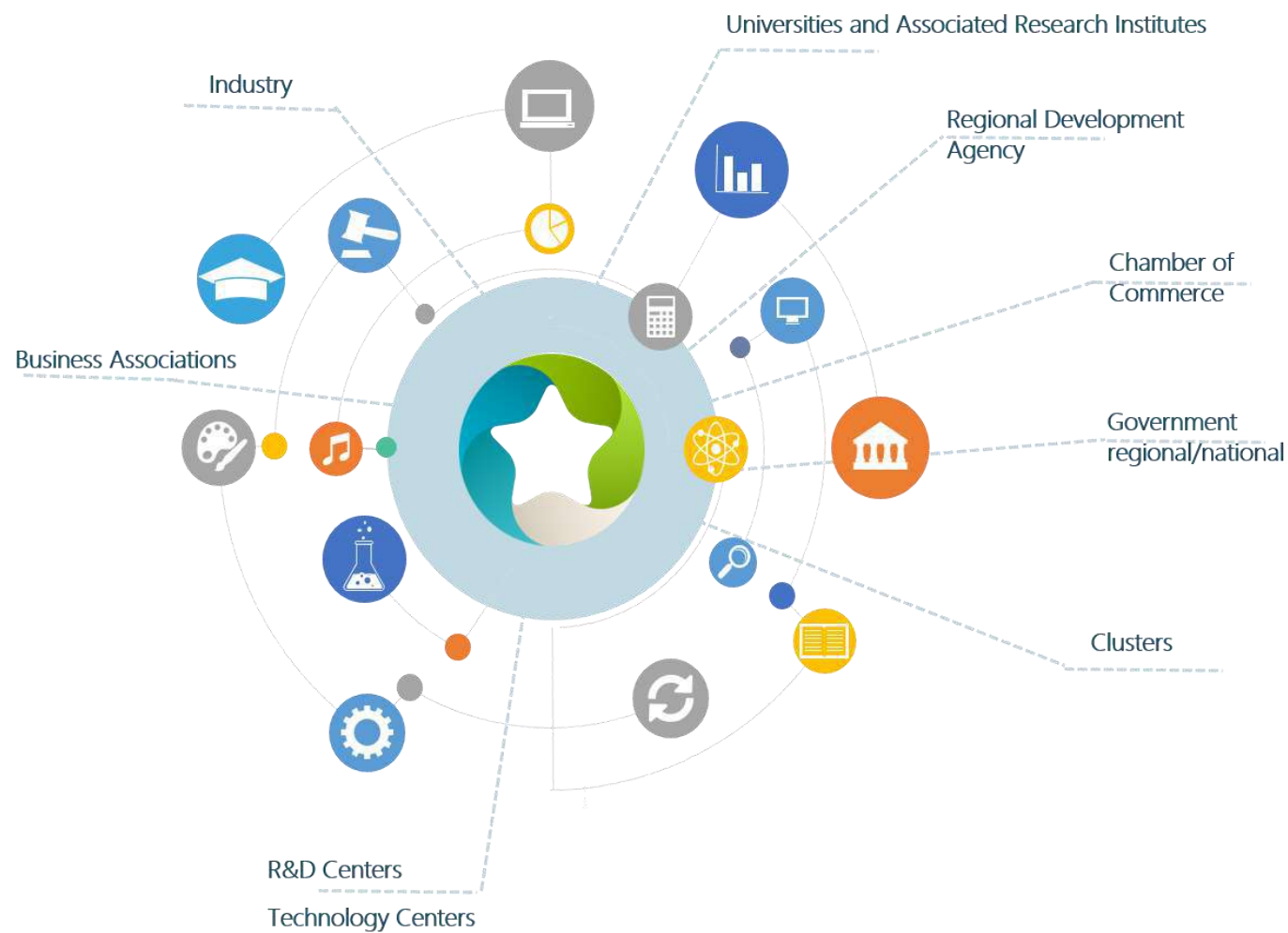
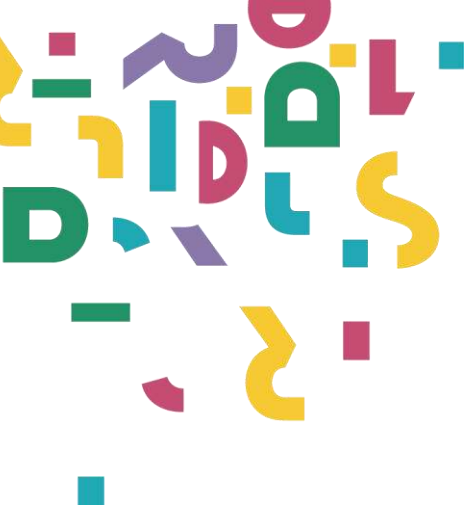
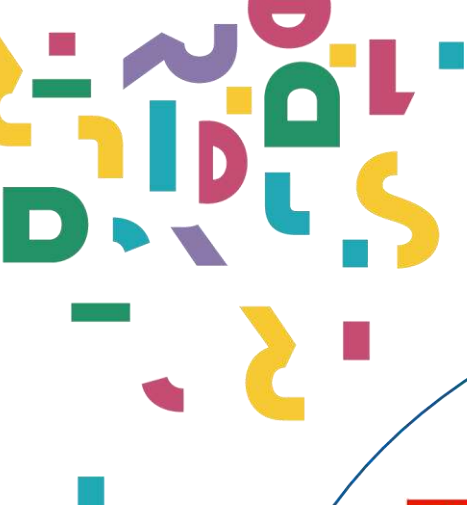


Figure 8 Graphical representation of an innovation ecosystem. Own elaboration



# tetRRIS

# tetRRIS



Figure 9 Graphical representation of innovation ecosystem actors in Cantabria. Own elaboration

## 2.4 Structure and organization of the regional innovation system

### 2.4.1 Smart Specialization Strategy

The S3 of the region for the period 2014-2020 was commonly known as iCan 2020. This document comprises what it means a S3 for the region as well as the policy plans and strategies that precede it in the territory. It also gathers another set of national and EU frameworks, a deep socio-economic and innovation potential analysis of the region and the main lines of specialization. Last, a governance structure is also provided in this document (Gobierno de Cantabria, 2013).

Technological innovation and development seem to be a priority in the Cantabria regional policy and the S3 strategy as well as the innovation strategy for the region comprises a number of objectives and plans associated for facilitating and supporting these activities (Gobierno de Cantabria, 2013, 2016b). The current focus of the strategy is on the combination of current industrial trajectories and emerging sectors. The main vision of this document presents a combination of new developing sectors based on knowledge and regional capacities with consolidated productive sectors that show innovative potential. Regarding sectorial priorities the strategy focuses on:

- **Consolidated sectors:** machinery and automotive components, agri-food, metal manufacturing, chemistry and tourism.
- **Emergent sectors:** biotechnology, maritime engineering, and telecoms, satellite and radiofrequency. It also focuses on cross cutting technological fields: manufacturing, ICT services and nanotechnologies.

However, in 2018 the region spent 0.85% of its total GDP in R&D. Around €109 million euros (COTEC, 2020) which is one of the lowest expenditures in the whole country<sup>8</sup> and it is still below from the national average of 1.2% and the EU average of 2.1%. Nevertheless, some positive signs have started to appear, and recent efforts of the Cantabria Government have been implemented to revert this situation.

The iCan strategy is structured around 9 objectives that comprises several strategic lines of action that also comprise further actions. A table below is provided comprising the 9 axis and its associated lines of action:

Axis	Strategic lines of action
------	---------------------------

<sup>8</sup> EUROSTAT 2020

<b>Entrepreneurship</b>	<ul style="list-style-type: none"> <li>• <b>Line 1.1:</b> Entrepreneurial Cantabria</li> <li>• <b>Line 1.2:</b> Support to set up, development and consolidation of innovative and technology-based companies.</li> </ul>
<b>Internationalization</b>	<ul style="list-style-type: none"> <li>• <b>Line 2.1:</b> Support to internationalization of Cantabrian SMEs</li> <li>• <b>Line 2.2:</b> Export Cantabria</li> <li>• <b>Line 2.3:</b> Foreign investment in Cantabria</li> </ul>
<b>Technology and knowledge transfer</b>	<ul style="list-style-type: none"> <li>• <b>Line 4.1:</b> Intersectoral cooperation in Cantabria</li> <li>• <b>Line 4.2:</b> Intersectoral cooperation with other regions</li> </ul>
<b>R&amp;D&amp;I boost</b>	<ul style="list-style-type: none"> <li>• <b>Line 5.1:</b> Support to private R&amp;D&amp;I</li> <li>• <b>Line 5.2:</b> Empowering R&amp;D in priority domains and technologies</li> <li>• <b>Line 5.3:</b> Cantabria/Santander, Living Lab territory</li> </ul>
<b>Energy efficiency, renewable energies and sustainability</b>	<ul style="list-style-type: none"> <li>• <b>Line 6.1:</b> Development of new energy sources</li> <li>• <b>Line 6.2:</b> Energy efficiency</li> <li>• <b>Line 6.3:</b> Sustainability and resource efficiency</li> </ul>
<b>SMEs funding</b>	<ul style="list-style-type: none"> <li>• <b>Line 7.1:</b> Innovative public funding for SMEs</li> <li>• <b>Line 7.2:</b> Private funding mobilization for Cantabrian SMEs</li> </ul>
<b>Digital agenda</b>	<ul style="list-style-type: none"> <li>• <b>Line 8.1:</b> Development and optimization of telecommunications infrastructure</li> <li>• <b>Line 8.2:</b> Digital growth: ICT use for citizens, companies and public administration</li> </ul>
<b>Participatory and coordinated innovation governance system and oriented to results</b>	<ul style="list-style-type: none"> <li>• <b>Line 9.1:</b> New innovation governance system</li> <li>• <b>Line 9.2:</b> Cantabria, innovative society. R&amp;D&amp;I socialization and valorisation</li> </ul>

Figure 10 Summary of axis and lines of action of iCan. Own elaboration

In the S3 of the region we also found different funding programs that can support the development of this policy plan. These policy programs are alluded as the main funding sources for this plan but there is no budget breakdown for each of them nor a tentative outline nor an estimation that can serve as a basis. During 2014-2020, the regional Operational Programmes (ERDF and ESF Operational Programmes) represent the largest financing instruments for Cantabria. The region expects to receive €154m from ERDF and ESF. It is also mentioned in RIS3 Cantabria that a total budget of more than €80m is expected from Horizon 2020 programmes.

The main funding sources cited are:

- European financing, through ERDF;
- ERDF Operational Programme 2014-2020 of Cantabria;

- ESF Operational Programme 2014-2020 of Cantabria;
- Sectoral multi-regional Operational Programmes 2014-2020;
- European territorial cooperation programmes 2014-2020.
- Horizon 2020;
- National financing;
- Regional financing;
- Private financing; and
- Other instruments of multi-regional financing.

At the moment this document is being written, the evaluation of the current S3 in the region for the period 2014-2020 has not been accomplished yet. It is expected that this process will be finished in the first semester of 2021 and it exists a policy document that provide the basis for this analysis and evaluation that needs to be developed prior the setup of the new strategy (Gobierno de Cantabria, 2018). In words of some participants in our fieldwork, there are a lot of key performance indicators (35) for this policy plan whilst other Spanish regions have much less. It seems that the majority of these indicators are doing well but it will be needed for the next strategy to reduce this list of indicators whilst focusing on the most important ones as some participants argued.

The new S3 that will be put in place for the period 2021-2027 is currently being developed at the time that this document is being written. This strategy will be probably aligned with the innovation strategy already in place for the region and that is structured around 4 main axis (see next section) (Gobierno de Cantabria, 2016b). As some of our interviewees stressed it is expected that the new RIS 3 plan will confer to the region more “freedom” as it won’t be too much focused on “classical sectors” for specialization and it will pay attention to emergent sectors, skills and others. Something that Cantabria seems to be benefited due to the structure of its economy (see 4.3). In addition, a survey is also available for citizens that want to be engaged in the process of identifying potential domains of interest for Cantabria towards the development of the new RIS3.

This survey is available at [https://dgidtei.cantabria.es/actuaciones/detalle/-/journal\\_content/56\\_INSTANCE\\_DETALLE/3603955/12241979](https://dgidtei.cantabria.es/actuaciones/detalle/-/journal_content/56_INSTANCE_DETALLE/3603955/12241979)

Some of the interviewees stressed that they have been not consulted or involved in the development of this new strategy. This can be partially answered because of the delays carried out in the development of the strategy and the impact of the COVID-19 in the consultation processes.

## 2.4.2 Innovation Strategy

Innovation is getting a paramount importance in the region as the transition to a knowledge economy is posing several challenges to the economy of Cantabria. In this sense, the inclusion of a new General Board for Innovation, Technological Development and Industrial Entrepreneurship (DGIDTEI in Spanish) in September 2015 was a tipping point in the policy making of the region. This milestone was achieved by the Regional Ministry of Innovation, Industry, Tourism



and Trade of Cantabria Government which have as one of its objectives to set up an innovation model for the region, ensuring the R&D activities are at the core of industrial development into the region.

The mission of this General Board of Innovation is:

*to boost, dynamize and support Cantabria companies in their transformation processes towards innovation. It also aims to promote entrepreneurial and innovation culture throughout society.*

(Gobierno de Cantabria, 2020)

This board also has the vision to become the public institution of reference regarding entrepreneurship and innovation support, facilitating instruments adapted to the needs of companies, entrepreneurs and other government bodies. It also aims to help with different lines of action during the different stages of the innovation process. Last, it also wants to provide value-added services to innovative projects, promoting technological development and industrial growth.

To this end, different activities and initiatives linked to innovation have been deployed, many of them comprised in the Cantabria Innovation Strategy 2016-2030. This strategy is articulated around 4 axis and 7 plans with the main objective of:

*to set the basis for achieving regional growth through innovation in the short, medium and long term.*

(Gobierno de Cantabria, 2016b)

The four axis that comprises this innovation strategy are:

- Axis 1: Cultural change and industrial model change
- Axis 2: Knowledge generation
- Axis 3: Technology transfer
- Axis 4: Innovative and Industrial Entrepreneurship. Results exploitation

These four axis also includes several actions and activities aimed to promote seven guiding plans that will try to achieve the key objectives throughout the innovation strategy during the following 15 years (Gobierno de Cantabria, 2016b).

These seven plans are also enclosed into the four axes:

- Plan 1: Development of Factories of the Future (axis 1)
- Plan 2: Development of Bioeconomy Cantabria (axis 1)
- Plan 3: Development of a regional system of technological foresight and oversight (axis 2)
- Plan 4: Development, follow-up an evaluation of RIS3 strategy (axis 2)
- Plan 5: Setting up of the PINNCAN (axis 2)
- Plan 6: Creation of Industrial Innovation Communities (axis 3)
- Plan 7: Participation increase in R&D&I international programs (axis 3)

The first of these seven plans, the Factories of the Future Plan, has its own policy document and it has several objectives for facilitating the digitalization of the

regional industry throughout several actions. This plan also has three axes in the Industry 4.0 model that comprises 1) training and education, 2) Collaboration and positioning and 3) Growth and consolidation (Gobierno de Cantabria, 2016a). Some of these axes are already being deployed throughout some horizontal activities such as the “Regional Technological Umbrella”<sup>9</sup> or “Industry 4.0” support program<sup>10</sup>.

Axis	Associated Plans	Key actions to be conducted
<b>1) Cultural change and industrial model change</b>	<ul style="list-style-type: none"> <li>• <b>Plan 1:</b> Development of Factories of the Future</li> <li>• <b>Plan 2:</b> Development of Bioeconomy Cantabria</li> </ul>	<ul style="list-style-type: none"> <li>• Launching the Forum and Commission for Coordination of Innovation</li> <li>• Training and dissemination on innovation</li> <li>• Development of social innovation</li> <li>• Innovation improvement in public sector</li> <li>• Development of factories of the Future</li> <li>• Position bio economy as a central axis.</li> </ul>
<b>2) Knowledge generation</b>	<ul style="list-style-type: none"> <li>• <b>Plan 3:</b> Development of a regional system of technological foresight and oversight</li> <li>• <b>Plan 4:</b> Development, follow-up an evaluation of RIS3 strategy</li> <li>• <b>Plan 5:</b> Setting up of the PINNCAN</li> </ul>	<ul style="list-style-type: none"> <li>• Joining efforts and resources in RIS3 priority areas</li> <li>• Creating the Regional Observatory for prospective and technological surveillance</li> <li>• Boosting innovative culture in companies and academia</li> <li>• Creating the PINNCAN</li> </ul>
<b>3) Technology transfer</b>	<ul style="list-style-type: none"> <li>• <b>Plan 6:</b> Creation of Industrial Innovation Communities</li> <li>• <b>Plan 7:</b> Participation increase in R&amp;D&amp;I international programs</li> </ul>	<ul style="list-style-type: none"> <li>• Involvement of innovative SMEs in an open system of innovation</li> <li>• Pushing innovative models of academia-business cooperation and business-business cooperation</li> <li>• Increasing the number of R&amp;D results transfer to the market</li> </ul>
<b>4) Innovative and Industrial Entrepreneurship. Results exploitation</b>		<ul style="list-style-type: none"> <li>• Setting up of an accelerator of innovative companies</li> <li>• Gathering of R&amp;D data results and scientific and technological regional capacities</li> <li>• Increasing the number of international and innovative Spin-Offs and Start Ups</li> </ul>

<sup>9</sup>See <https://www.europapress.es/cantabria/noticia-gobierno-crea-paraguas-tecnologico-centros-especializados-region-20160429162943.html>

<sup>10</sup> For further information see <https://dgidtei.cantabria.es/documents/3603955/9896030/Publicaci%C3%B3n+Convocatoria+IND4+0+2020.pdf/56f0858a-63cc-871b-393b-a1e0368b8151?t=1596606559308>





Figure 11 Summary of axis, associated plans and key actions in the innovation strategy of Cantabria. Authors

Plan 5, “Panel of Innovation of Cantabria” (PINCANN), was initiated through a first event in February 2020 throughout a collaborative workshop held in CISE facilities at Santander. This workshop gathered more than 40 participants, representing different companies, research organizations, associations and institutions with the objective of elaborating an “innovation map” of the region, that will be extended and improved by new participants and new experiences to subsequent forums<sup>11</sup>. PINCANN is envisioned as a meeting point for companies, universities, public and private institutions and the government itself for exchanging information and transfer knowledge between actors that can boost the promotion of R&D&I in the region (Gobierno de Cantabria, 2016b). There is also a “Cantabria Innovation Forum” that it is focused at institutional level and where the President of the Cantabria Government is leading the process and different representatives from research organizations, clusters, public companies, mayors of Santander and Torrelavega and the Cantabria Chamber of Commerce among others. This forum has the objective of safeguarding the exchange of information throughout the region, assuring the setup of the innovation strategy and establishing the needed adjustments for implementing it (Gobierno de Cantabria, 2016b).

The main instrument for the implementation of the innovation strategy lies at the different innovation programs that are offered by DGIDTEI such as INNOVA, INNOVA PLUS or INDUSTRY 4.0. These innovation programs offer funding for companies that want to develop R&D projects in the region. In addition, there are other initiatives developed by DGIDTEI carried out in coalition with other actors or not that complement this approach.

It is also interesting to mention that the major association of businesspeople and SMEs in the region also undertook a SWOT analysis in 2018 which comprised the participation of 123 participants representing several companies, clusters and other actors in the region. This analysis outlined a roadmap that according to this document is shared by the 85% of the companies and business associations of the region (CEOE-CEPYME Cantabria, 2019). This roadmap also pays attention to the current S3 of the region and it also outlines 29 lines of action grouped into 9 strategic objectives organized into 4 main transformative blocks. Here and again, innovation, entrepreneurship and the need of taking care of human talent in R&D&I along the territory is stressed.

<sup>11</sup> See <https://www.elfaradio.com/2020/02/28/comienzan-los-trabajos-para-la-definicion-del-panel-de-innovacion-de-cantabria/>

<https://centrotecnologicoctc.com/2020/03/05/ctc-panel-innovacion-cantabria/>

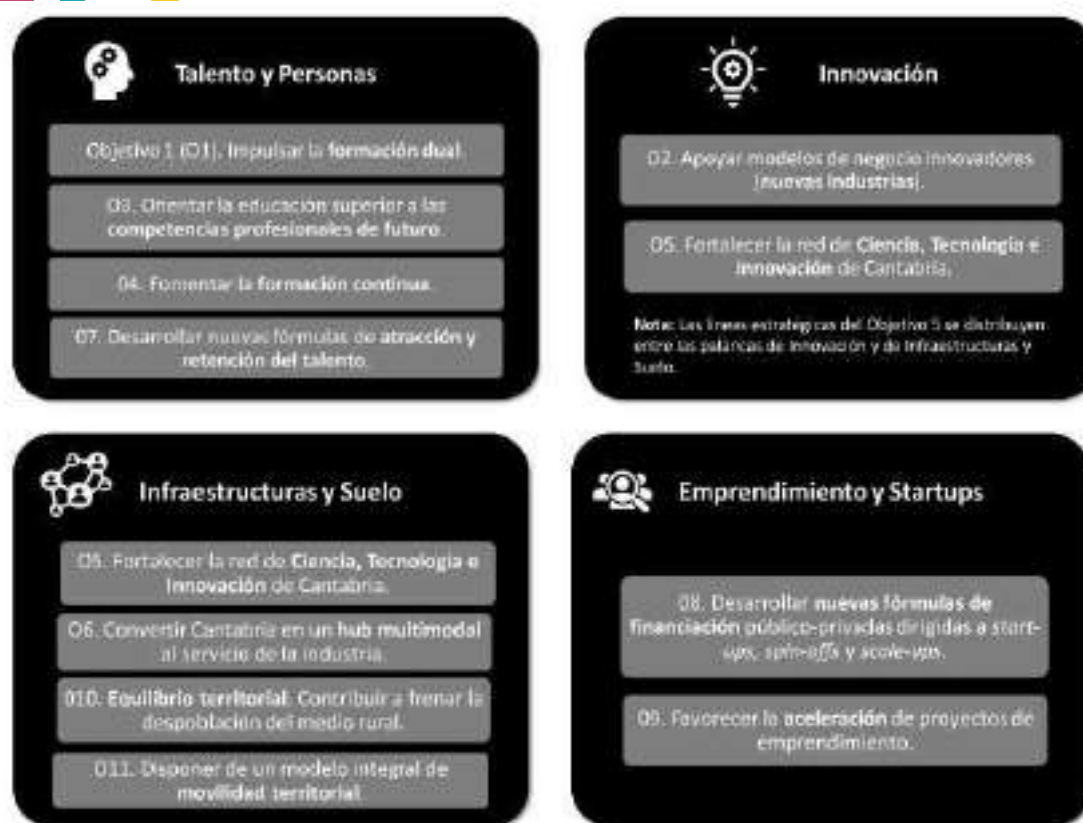


Figure 12 Transformative blocks for the economy of Cantabria. Source: (CEO-CEPYME Cantabria, 2019)

These recommendations seem to be aligned with the findings from our fieldwork as the majority of interviewees stressed the need to allocate dedicated and adequate resources to research organizations in the region and promoting efforts to promote the role of the innovation in the region's economy. Technology transfer from research organizations was commonly alluded as a big challenge in the region as there are several excellent research groups in STEM (Science, Technology, Engineering and Mathematics) disciplines (mainly in the UC) that don't have too many collaborations with companies. Spin offs and start-ups are the most innovative companies in the region and the ones that usually participate in innovation activities and innovation programs such as Horizon 2020. This contrasts with the behaviour of other SMEs, more engaged in traditional sectors and other big companies. This was considered by many participants in the study as a big disadvantage that demands active efforts to reverse this situation in the region.

### 2.4.3 Industry structure: actors, priorities and dynamics

As we have previously explained in the first section, the industrial sector in Cantabria accounts for nearly 30% of its GDP and the region is among the top-ten regions of Spain in terms of % of industrial GDP. The main industrial zones are located into the two big cities of the region (Santander and Torrelavega) despite there are some singular industrial plants and zones in other locations.

Santander is the capital of the region and it gathers the majority of companies as well as it holds the port of Santander which gathers a significant ecosystem of companies around different sectors such as logistics, ship building, metallurgy, energy, transport, mobility and tourism. Torrelavega also acts as the capital of the Besaya region, which has been historically the entrance door to the Castilian plateau and where several multinational companies associated to the chemical industry have been located as well as other SMEs in metal-mechanic and automotive sectors (Ruiz Puente, Romero Arozamena, & Evans, 2015). Despite tourism is the biggest sector in the region, Cantabria has a long industrial tradition where four main sectors have greater visibility than others (B. Ribeiro & Dosil, 2018). These sectors are:

- **Metalworking and mechanical engineering** which has a long tradition in the region, and it comprises a significant number of SMEs focused in manufacturing machinery, metal products manufacturing or shipping building.
- **Automotive** that gather several companies that cover all sub-sectors such vehicle manufacturing, automotive component manufacturing, and/or auxiliary companies among others.
- **Chemicals** which is mainly represented by big industrial plants located in the region that belong to multinational companies.
- **Agri-food** which is composed of two main sub-sectors comprising the production and processing of food and the manufacturing of beverages and dairy's.

At the same time there are other emergent sectors in the region that are mainly driven by research and technology development. These sectors are supported by universities, research institutes, technological centres and companies that promote them. These emergent sectors are:

- **Biotechnology** which has two noteworthy research centres in the region such as IDIVAL and IBBTEC (see next sub-section for further details).
- **ICT** which has in the region an important group of companies as well as the existence of two clusters: TERA and ASCENTIC (see figure 15).
- **Marine engineering** which benefits from the long tradition of shipping building and metal mechanic companies, dedicated clusters as MARCA and Sea of Innovation and research centres such as IH Cantabria (see next section for further details).

A graphic summary of the established and emergent sectors can be seen below (figure 13). Generally speaking, the level of specialization of the regional industry is not too high but it shows in some particular sectors such as metal manufacturing, waste treatment, wood or cork a high degree of specialization (B. Ribeiro & Dosil, 2018). The added value of industrial services is well above the national average which is a very remarkable for a small region like this.



Figure 13 RIS3 Sectorial priorities and emergent R&D domains of Cantabria. Source: DGIDTEI website

However, the financial crisis of the 2008 hit the region heavily due to some cases of relocation of production processes by several multinational companies. There is also great uncertainty around COVID-19 and its effects on the industrial landscape as it is too soon to know how it will finally affect the economy of the region. Specially, because of the predominance of the micro-companies in the economy, with 96% of Cantabrian companies having less than 10 employees and 53% of companies that don't have employees (B. Ribeiro & Dosil, 2018). Another disadvantage is that the few large firms that are located in the region are mainly factories of multinational companies like Bridgestone, Nissan, Nestlé, Sidenor, Solvay or Teka. These companies have their decision-making centres outside the region, which can aggravate relocations or disinvestments in factories. Some large companies with their headquarters in the region are Santander Bank (finance), Global Steel Wire (metalworking/mechanical engineering), SEMARK (food retail), ASPLA (chemical), Textil Santanderina (textile) or ENSA (nuclear).

One of the challenges that the region seems to face is how to promote private investment in R&D as statistics show a low rate of investment by companies. Some of our interviews stressed that the maturity of the consolidated sectors in the region don't favour investment in R&D. Others usually stressed that traditional industries show a better performance than emergent ones (more prone to innovate). Last, other participants in our study also underlined that there are a set of companies that congregates these activities as well as exports and this is also a symptom of the fragmentation that can be visible in the region. All in all, the low level of R&D activities in companies can be observed by the low proportion of



researchers working on a full time basis at Cantabrian companies, representing a 0,6% of the total at national level (Observatorio Español de I+D+I (ICONO), 2020). The employment in the high-tech sector has also been fluctuating over the years, with a figure around five thousand employees in 2019<sup>12</sup>

#### PERSONAL EMPLEADO EN ACTIVIDADES DE I+D (EJC) POR COMUNIDADES AUTÓNOMAS Y SECTOR DE ACTIVIDAD. 2018

Estructura porcentual

Comunidades autónomas	Empresas e IPDIs		Actividades Planificadas		Empleados Registra	
	Personal en I+D	Investigadores	Personal en I+D	Investigadores	Personal en I+D	Investigadores
Andalucía	7,8	4,4	11,9	10,9	15,1	14,0
Aragón	3,4	2,4	3,1	3,3	2,9	3,3
Balears (Illes)	1,3	1,3	1,2	1,3	1,9	2,1
Barcelon (Cataluña)	0,7	0,7	1,0	1,7	1,9	2,1
Canarias	0,7	0,7	1,0	2,4	2,3	2,5
Cantabria	0,7	0,4	1,0	1,3	1,8	0,9
Castilla y León	4,1	3,8	2,6	2,3	4,2	4,3
Castilla-La Mancha	1,6	1,1	1,2	1,2	—	—
Cataluña	23,7	24,3	21,0	27,5	19,4	16,3
Comunidad Valenciana	7,7	7,4	5,3	6,8	11,9	11,2
Extremadura	0,6	0,7	1,5	1,2	—	—
Galicia	4,9	4,8	4,0	4,8	5,5	5,0
Madrid (Comunidad de)	24,7	25,8	31,4	29,1	21,3	22,8
Murcia (Región de)	2,2	1,4	1,4	1,4	4,4	4,7
Navarra (Comunidad Foral de)	2,3	2,3	1,2	1,4	—	—
País Vasco	13,2	13,8	9,4	9,8	5,7	6,3
Región de Murcia	0,3	0,4	6,7	0,8	0,6	0,7
Valencia (Comunidad de)	—	—	—	—	—	—
TOTAL	100,0	100,0	100,0	100,0	100,0	100,0

Nota: (1) El personal en I+D comprende al personal investigador, técnico y auxiliar (I+D). (2) Datos provisionales por sectores económicos. Fuente: ICONO. Elaboración sobre actividades de I+D.

INFORMACIÓN DEL SECTOR DE ACTIVIDADES DE I+D+I. TENDENCIAS Y PROYECCIONES

Figure 14 Percentage of personnel employed in R&D activities per sector of activity and region in Spain. Source: (Observatorio Español de I+D+I (ICONO), 2020)

One of the most interesting initiatives that has been promoted during the last years in the region is the promotion of clusters. This has been revealed as a way to promote cooperation and collaboration within companies as well as internationalization, exports and R&D. In this sense, the role of SODERCAN has been critical in the process, facilitating the establishment of this associations in close collaboration with DGIDTEI (SODERCAN, 2017). As some of our interviews stressed, the emergence of clusters in the region has been a tipping point as they have facilitated a number of joint initiatives that were not possible before. Specially, because of the fragmentation of economic sectors in the region and the disparity of companies in these sectors.

However, the majority of clusters are quite emergent and are not consolidated as they don't have their own entity (most of them have not a dedicated office), they rely on funding available from SODERCAN (no economic viability achieved yet) and most of them have not yet incorporated R&D&I in their DNA (low level of research and innovation activities). In the following table (figure 15) we provide a brief description of the clusters developed in the region. We also include the Port of Santander as it comprises an ecosystem of companies related with mobility,

<sup>12</sup> EUROSTAT, 2020.

logistics and other sectors. This is a dynamic institution that exerts a pivotal role in this domain and through national initiatives such as “Ports 4.0” and within collaboration with SODERCAN, it also aims to promote innovation and entrepreneurship around the ecosystem of harbours<sup>13</sup>. “Ports 4.0” is a national plan that have comprised 25 million euros budget for supporting start-ups and facilitating the transition to Industry 4.0 in a 4 years period. The majority of clusters represented here are grouped mainly into consolidated sectors and emergent ones.

Cluster	Website	Description
<b>GIRA</b>	<a href="https://giracantabria.com/">https://giracantabria.com/</a>	The Automotive Cluster of Cantabria, GIRA, is the “Group of Regional Automotive Initiatives”. It is a non-profit association that brings together manufacturers of automotive components, auxiliary automotive industries and public, business and social entities of the regional scope of the Community Autonomous of Cantabria
<b>CINC</b>	<a href="https://cincantabria.es/">https://cincantabria.es/</a>	The Cluster of the Nuclear Industry in Cantabria (CINC) is a business organization that serves as the meeting point between all the nuclear industry stakeholders in Cantabria.
<b>MARCA</b>	<a href="https://www.clustermarca.com">https://www.clustermarca.com</a>	The Cantabria Maritime Cluster (MARCA) was established in 2017. The promotion of this cluster is part of an initiative of the Government of Cantabria itself through SODERCAN. The aim of this promotion is focused on the entire maritime and naval sector of the region. The mission of the cluster is to promote cooperation and commercial development and technology of the maritime industries and activities of Cantabria, creating opportunities and synergies that boost their competitiveness in national and international markets, generating high value and wealth for society. At the same time, the vision of the cluster is to position the Cantabrian maritime industry at its maximum development exponent with the aim of leading areas of specialization in these strategic national and international markets.
<b>Sea of Innovation</b>	<a href="https://cantabriaseaofinnovation.es/">https://cantabriaseaofinnovation.es/</a>	The Sea of Innovation Cantabria Cluster was created with the aim of integrating all the actors that operate in the marine energy sector in Cantabria, in order to promote the region as a center of excellence within the national and international market.
<b>TERA</b>	<a href="https://clustertera.es/">https://clustertera.es/</a>	TERA is the Association of ICT of Cantabria. It was born in February 2019 with the aim of bringing together all the ICT companies in Cantabria interested in promoting the business, seeking synergies and being able to participate in public tenders and tenders jointly.
<b>CIF</b>	<a href="https://cifcantabria.com/">https://cifcantabria.com/</a>	Cluster of Fire Research and Behavior (CIF) was set up in April 2019, thanks to the support of the Government of Cantabria itself, through SODERCAN and the coalition of a group of companies and institutions. The cluster is focused is on innovation in fire safety solutions, services and products, paying special attention to companies, public bodies, technology and research centers and universities.

<sup>13</sup><https://www.sodercan.es/sodercan-y-la-autoridad-portuaria-de-santander-aps-firman-un-protocolo-general-de-actuacion-para-promover-acciones-conjuntas-que-favorezcan-el-emprendimiento-la-innovacion-y-la-internacionalizacion/>

<b>CIDEI</b>	<a href="https://www.clusterdefensa.es/">https://www.clusterdefensa.es/</a>	The Defense Industry Cluster (CID) is a pioneering initiative in Spain, formally born on July 10, 2019, coinciding with the 920th anniversary of the death of El Cid (July 10, 1099). The main objective is to contribute to the strengthening of the technological and industrial base at the service of the defense of Spain.
<b>ASCENTIC</b>	<a href="https://ascentic.org/">https://ascentic.org/</a>	ASCENTIC is the acronym for the Cantabrian Association of New ICT Companies. It brings together the most representative companies of Cantabria in the Information Technology and Communications sector, so we can define it as the employers' association of the ICT sector in Cantabria.
<b>Santander Global Metal</b>	<a href="http://santanderglobalmetal.com/en/">http://santanderglobalmetal.com/en/</a>	Santander Global Metal congregates specialized working centers with a significant number of professionals specialized in the metal-mechanical sector and an extensive experience. It offers a wide range of services, covering various processes required by industry, from engineering, supplement of materials, casting and valves, precision machining, mechanical engineering, specialized welding processes and overlay, industrial assembly, mechanized boiler making, electroplating and recovery of parts, piping, process automation and robotics, and reviews machinery and industrial.
<b>Santander Fine Food</b>	<a href="https://www.santanderfinefood.com/en/index/">https://www.santanderfinefood.com/en/index/</a>	Santander Fine Food is an export consortium made up exclusively of Spanish companies producing gourmet food products. Formally established in July 2015, the consortium is dedicated to the promotion and sale of our products abroad. These products are highly regarded in Spain and the natural next step is to make them known to consumers beyond our frontiers.
<b>The Port of Santander</b>	<a href="https://www.puertoasantander.es/ing/home.aspx">https://www.puertoasantander.es/ing/home.aspx</a>	The origins of port activity in Santander date back more than 2,000 years. Throughout this period, the sea and the port have become one of the fundamental symbols of progress in a community that, through fishing, defense, naval construction, maritime trade and nautical sports, has been constantly present on the international stage, gaining relevant experience with which to take on the challenges of the new century.

Figure 15 Regional clusters in Cantabria

In the next table we also present other kinds of organizations that can play a role in the innovation ecosystem of the region but there are not structured around sectors. This is the case of CEOE-CEPYME, which is the biggest businessmen and SMEs association in the region, the Chamber of Commerce of Cantabria and the Torrelavega Chamber of Commerce and Industry. These three organizations developed several activities around innovation and entrepreneurship promoting trainings, dedicated courses, information and raising awareness about them. They have also several initiatives related with Corporate Social Responsibility (CSR), sustainability and circular economy and they work not only with business and entrepreneurs but also with high schools and universities for raising awareness and training future generations in these issues as it was stressed during the fieldwork.

Last, we include here the Cantabrian Regional Tourism Promotion Agency (CANTUR). Despite it is a public owned company by Cantabria Government it exerts a notable work of dynamization and facilitation of innovation activities in tourism. It is noteworthy that the only and single experience of Public Procurement of Innovation (PPI) in the region has been promoted by this organization<sup>14</sup> (Peñate Valentín & Sánchez Carreira, 2018). We also include ACANTA in this table which is the Cantabrian Association of Active Tourism and Hostels and it aggregates several companies in the tourism sector that are “usually prone” to be engaged on innovative activities (surf, bike riding, hiking and others).

Other association	Website	Description
<b>CEOE-CEPYME Cantabria</b>	<a href="https://ceocantabria.es/">https://ceocantabria.es/</a>	CEOE-CEPYME is the organization that represents the interests of companies and the self-employed professionals in Cantabria. This is the only business organization recognized by the Constitution as an interlocutor with the government and trade unions, and as a representative of companies in collective bargaining.
<b>Cantabria Chamber of Commerce</b>	<a href="http://camaracantabria.com/">http://camaracantabria.com/</a>	The Chambers of Commerce in Spain are an essential part of the elaboration and development of the public policies adopted to help grow the entrepreneurial spirit, the internationalization and the improvement of competitiveness, especially for SMEs. The Chamber of Cantabria has a vast experience collaborating with the Governments of Spain and Cantabria regardless of political standing, attesting its role as an effective instrument, and a loyal partner for the Administration in the development and implementation of public service programs that help improve the economic environment and the competitiveness of companies.
<b>Torrelavega Chamber of Commerce and Industry</b>	<a href="https://camaratorrelavega.es/inicio/">https://camaratorrelavega.es/inicio/</a>	The Torrelavega Chamber of Commerce and Industry was set up on January 10th of 1913. Nowadays, it has a numerical census of 5,008 registrations in the Economic Activities Tax, being represented by 26 members in the Corporate Plenary. It provides several services such as trainings, courses, legal representation, internationalization services, funding support, marketing services, etc.
<b>CANTUR</b>	<a href="http://cantur.com/inicio">http://cantur.com/inicio</a>	The Cantabrian Regional Tourism Promotion Society (Cantur, SA) is a public company of the Government of Cantabria attached to the Ministry of Industry, Tourism, Innovation, Transport and Commerce. It was founded in 1969 with the mission to facilitate the development of the tourist sector in Cantabria. Currently, it manages 8 tourism facilities such as Cabárceno Natural Park or Fuente Dé Cable Car that have become hot spots for economic growth in Cantabria, sustaining an average of 400 direct jobs.

<sup>14</sup> See

[https://dgidtei.cantabria.es/actuaciones/detalle/-/journal\\_content/56\\_INSTANCE\\_DETALLE/3603955/5867030](https://dgidtei.cantabria.es/actuaciones/detalle/-/journal_content/56_INSTANCE_DETALLE/3603955/5867030)



**ACANTA**<https://acanta.es/>

The Cantabrian Association of Active Tourism and Hostels (ACANTA) aims to represent, manage and defend the business and professional interests of active tourism companies and associated hostels, as well as the protection of the natural environment and the environment in which they develop.

Figure 16 Other kind of organizations relevant for innovation

#### 2.4.4 Science sector (actors, scientific priorities and dynamics)

The research sector in the region is composed by several universities, research institutes and research and technological organizations. The four universities that are located in the region are embedded into the University System of Cantabria (SIUCAN in Spanish)<sup>15</sup>. Universities as well as the other actors are enclosed in what is known as the “Research and Transfer System of Cantabria” (SITCAN in Spanish)<sup>16</sup>. This system is coordinated with the objective of promoting innovation in the region throughout the different programs offered by DGIDTEI. Currently, this research system is under reflection and further planning for the period 2021-2030 with the objective of updating its strategy and incorporating new priorities that can facilitate the transition of the region to the knowledge economy.

As it can be observed in figure 16, there are 4 universities located in the region. The University of Cantabria (UC) is the biggest one and is usually included in the top ten rankings of the country both in education and research. Without a doubt is the main backbone of the research ecosystem in the region and it is very competitive at regional, national and international levels (López-Fernández, Maté-Sánchez-Val, & Somohano-Rodriguez, 2021). Their main research strengths are situated in disciplines such as construction, engineering, health, biotechnology, physics, economics and history. In addition, a new private university was settled in 2014 also in Santander. This is the European Atlantic Sea University (UNEATLANTICO) which also hosts the Centre for Industrial Research and Technology of Cantabria (CITICAN). This university is focused in agri-food research and innovation and it offers several official degrees in this topic. Moreover, there is also a delegation in Santander of the National University of Remote Education (UNED) which has an extensive variety of degrees offered in a remote mode. Last, the International University Menéndez Pelayo (UIMP) is also based in Santander and it has a considerable impact in the city during the summer. It is in this period where a great number of summer schools, courses and trainings are offered at the Magdalena Palace with a remarkable variety of

<sup>15</sup> See <https://www.cantabria.es/web/dg-universidades-investigacion-y-transferencia/sistema-universitario-de-cantabria-siucan>

<sup>16</sup> See <https://www.cantabria.es/web/dg-universidades-investigacion-y-transferencia/sistema-de-investigacion-y-transferencia-de-cantabria-sitcan>

researchers, industry representatives, businessmen, political representatives and different top-level international speakers.

University	Website	Description
<b>University of Cantabria (UC)</b>	<a href="https://web.unican.es/en/Pages/default.aspx">https://web.unican.es/en/Pages/default.aspx</a>	The University of Cantabria (UC) is one of the three universities that has been in the Top 10 list of the main Spanish rankings both in education as well as in research quality. The UC confers a wide range of official degrees within graduate, postgraduate and doctorate programs. Since its creation in 1972, it has provided university education for more than 40,000 students. Institutes: 4/Departments: 32 / catalogued research groups: 167
<b>European Atlantic Sea University (UNEATLANTICO)</b>	<a href="https://www.uneatlantico.es/en">https://www.uneatlantico.es/en</a>	The European University of the Atlantic (UNEATLANTICO) is a higher learning institution that offers students a well-rounded education based on academic excellence and personal commitment. Along with the specific competencies required in each area or discipline, the University guarantees that students will acquire a high level of proficiency in English, as well as cross-curricular skills in cutting-edge technology, teamwork and project planning and management.
<b>National Distance Education University (UNED)</b>	<a href="https://www.unedcantabria.org/">https://www.unedcantabria.org/</a>	The National Distance Education University, known in Spanish as Universidad Nacional de Educación a Distancia (UNED), is a public research university of national scope. It was founded in 1972 and is dependent of the Ministry of Universities. It has headquarters in Madrid, Spain, with campuses in all Spanish autonomous communities. Focused on distance learning combined with traditional classroom instruction (called hybrid or blended). With over 150.000 students, UNED is the largest university in Spain and the second largest in Europe. It was not until the end of 1980, once the Board of Trustees that would finance it was constituted, when the Associated Center of the UNED in Cantabria began to function. Its first headquarters was located in Santander at the time known as the Gerardo Diego National School - in the Cazoña neighbourhood - and officially opened its doors as an Associated Center of the UNED in Cantabria, on January 10, 1981.
<b>Menéndez Pelayo International University (UIMP)</b>	<a href="http://www.uimp.es/en/">http://www.uimp.es/en/</a>	Menéndez Pelayo International University ("UIMP" in Spanish) is a public university with administrative headquarters in Madrid and campuses in Santander, Valencia, Barcelona, Cartagena, Cuenca, Granada, La Línea de la Concepción, Seville and Tenerife. UIMP offers Master's degrees in many areas of study and it also promotes summer courses during June, July, August and September in Santander at the Palacio de la Magdalena. In 2009 UIMP joined with the University of Cantabria in the Cantabria International Campus (CCI), which the Ministry of Education and Science declared to be a regional "Campus of International Excellence"

Figure 17 List of universities in the region

Associated to the UC, there are several research institutes that are considered as "excellence centers" and have been also promoted by SODERCAN/Cantabria

Government or are also associated to the Spanish National Council of Research (CSIC). These research institutes also gather many of the research strengths of the region in strategic sectors such as health, renewable energies or biotechnology to name a few.

UC associated research institutes	Website	Description
<b>Environmental Hydraulics Institute (IH Cantabria)</b>	<a href="https://ihcantabria.com/en/">https://ihcantabria.com/en/</a>	A joint research centre that emerged thanks to the collaboration between two institutions: the Universidad de Cantabria and the Government of Cantabria, represented through the Foundation for the Institute of Environmental Hydraulics of Cantabria carries out research, knowledge transfer and training of specialists in the fields of fresh and saltwater. IH Cantabria IS at the forefront of national and international organizations working in the water cycle in its various facets. At IH Cantabria there are over 140 researchers and the centre has over thirty years of experience Cantabria's facilities have been financed by the Ministry of Economy and Competitiveness, Government of Cantabria and European Union FEDER funds.
<b>Biomedicine and Biotechnology Institute of Cantabria (IBBTEC)</b>	<a href="https://web.unican.es/ibbttec/en-us/">https://web.unican.es/ibbttec/en-us/</a>	A joint research centre belonging to the University of Cantabria, CSIC, and the regional government through its Society for the Development of Cantabria (SODERCAN). Its main aim is to carry out high-quality scientific research in biological disciplines, both in basic and applied aspects, with the aim of advancing scientific knowledge and boosting the transfer of results and technology to the production sector.
<b>International Institute for Prehistoric Research of Cantabria (IIPC)</b>	<a href="https://www.iipc.unican.es/">https://www.iipc.unican.es/</a>	The International Institute for Prehistoric Research of Cantabria (IIPC) is a mixed University Research Institute, jointly owned by the Government of Cantabria, the University of Cantabria and Santander Universities. It is also a unit associated with the CSIC (Institutió Milà i Fontanals, Barcelona). It was created in 2004 from an existing research group in the UC Department of Historical Sciences. The Institute is dedicated to research in Prehistory, in its basic and applied research sections, as well as to provide technical advice in the field of its competence.

<b>Physics Institute of Cantabria (IFCA)</b>	<a href="https://ifca.unican.es/en-us">https://ifca.unican.es/en-us</a>	<p>Joint Centre with the combined effort of two institutions, Spanish National Research Council (CSIC) and University of Cantabria (UC) oriented to perform research on basic science: to understand the components of nature, from elementary particles (Particle Physics) to the largest structures of the Universe (Astronomy and Space Science) as well as the complex collective behaviour of matter (Statistical and Non-linear Physics).</p>
<b>Marqués de Valdecilla University Hospital and Health Research Institute (IDIVAL)</b>	<a href="https://www.idival.org/en">https://www.idival.org/en</a>	<p>Benchmark in research, translation and co-generation of wealth in the region. Founders from the Government of Cantabria and the University of Cantabria. IDIVAL promotes and develops research and innovation in the biomedical environment of Cantabria whose epicentre is the Marqués de Valdecilla University Hospital, with a vocation to seek solutions to health problems and contribute to the scientific, educational, social and economic growth.</p>

Figure 18 Research excellence institutes associated to the University of Cantabria

In addition, other research organizations can be found in the region. These are research centres that can be associated with the UC, with UNE Atlántico or with other public and private institutions of relevance such as the National Ministry of Environment or the Santander Bank. These main organizations are oriented to sectors such as health, logistics, industry, economics, entrepreneurship or agri-food technologies.

Research organizations	Website	Description
<b>Technological Component Centre (CTC)</b>	<a href="https://centrotecnologicoctc.com/">https://centrotecnologicoctc.com/</a>	<p>Technological Centre, Private non-profit-making foundation. The mission of the CTC is to enhance companies by means of the application of Science and Technology, designing practical advanced solutions for industry. Three fields of activity: Industry and Energy/Navigation and Robotics/Advanced Materials and Nanomaterials</p>
<b>Environment Research Centre (CIMA)</b>	<a href="https://cima.cantabria.es/">https://cima.cantabria.es/</a>	<p>Regional agency attached to the Ministry of the Environment, dedicated to environmental research, education and information.</p>
<b>Agricultural Research and Training Centre (CIFA)</b>	<a href="https://cifacantabria.org/">https://cifacantabria.org/</a>	<p>Depends on the Ministry of Rural Development of the Government of Cantabria. Research, experimentation and technological innovation projects developed with the aim of finding solutions to problems in the agricultural sector.</p>

<b>Integral Logistics Technological Centre of Cantabria (CTL)</b>	<a href="http://www.ctlcantabria.org/ctl/ctl.php/web/">http://www.ctlcantabria.org/ctl/ctl.php/web/</a>	Foundation belonging to the public sector of Cantabria, liaison between the public sector dedicated to research and companies in integral logistics in the passenger and freight transport sectors in general and especially in activities involving port and airport logistics.
<b>Centre for Industrial Research and Technology of Cantabria (CITICAN)</b>	<a href="https://citican.org/">https://citican.org/</a>	Is part of the European University of the Atlantic, the centre is aimed toward developing R&D&I projects through the promotion of activities related to knowledge transfer. Main Action Plan focuses on agri-food technology.
<b>Foundation for Study and Research in the Financial Sector (UCEIF)</b>	<a href="https://www.fundacion-uceif.org/">https://www.fundacion-uceif.org/</a>	The UCEIF Foundation is a founding entity created by the University of Cantabria and Santander Group which aims to contribute to creation and dissemination of knowledge in the financial field.
<b>Santander International Entrepreneurship Centre (CISE)</b>	<a href="https://www.cise.es/">https://www.cise.es/</a>	CISE develops initiatives and programs that incorporate the latest methodologies to train and stimulate people's entrepreneurial skills, promote innovation within companies and support the creation of new start-ups. CISE has the support of Banco Santander, the University of Cantabria and the Government of Cantabria.

Figure 19 Other research organizations located in the region

In the policy documentation analysis carried out is worthy to mention that the data that has been gathered through several studies and policy documents points out to a significant loss of researchers in the region during the period 2009-2018 with around a 15% decrease (COTEC, 2020). This decrease is also significant from an EU perspective as Cantabria is one of the EU regions with the largest decrease in researchers (Kotzeva et al., 2020). Most recent data available indicates that around 1.150 people are employed in R&D (ICANE, 2018), or 0,76% of the active working population of Cantabria (COTEC, 2020). These numbers are far lower than nearby communities like the Basque Country (2,1%), Castilla y León (1,01%) or Navarra (1,74%). In relation to this aspect, the majority of stakeholders interviewed stressed that dedicated efforts in terms of research funding and investment are needed to make the region a “hotspot” in terms of R&D and a territory able to retain and to attract human talent due to competition with other territories. Specially, when the region has one of the best rates of educated people in the country.



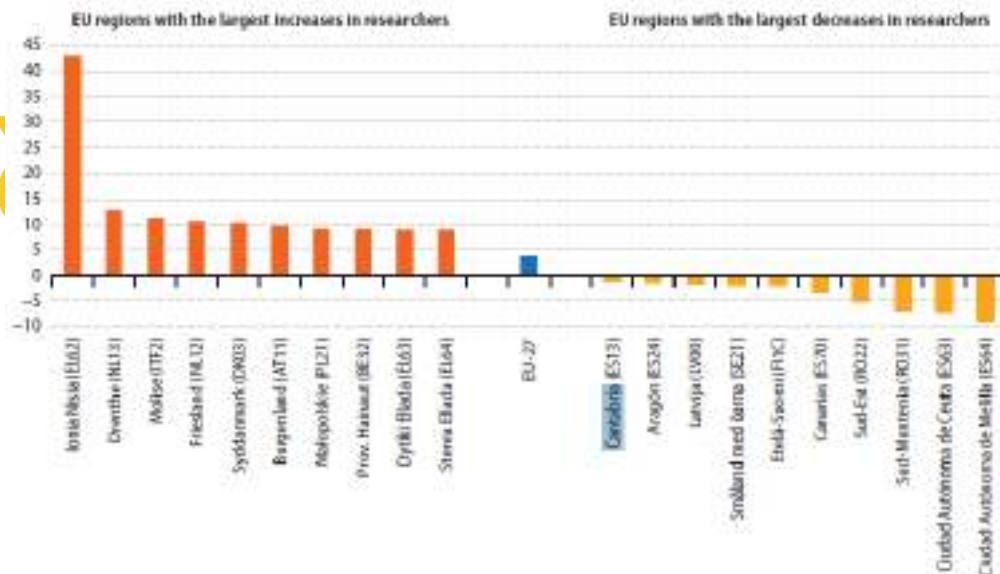


Figure 20 Average annual change (%) in the number of researchers 2007-2017. Source: (Kotzeva et al., 2020)

#### 2.4.5 Innovation activities and technological profile, priorities, and dynamics

Innovation activities in Cantabria are promoted throughout the development of several innovation programs carried out by DGIDTEI. This regional ministry articulates several programs oriented to promote innovation activities in the region such as INNOVA, INNOVA PLUS or other more focused in particular themes such as Industry 4.0 or Social Innovation<sup>17</sup>. The INNOVA 2021 program, which is the most recent one, is allocating four million euros to innovation projects for companies settled in the region<sup>18</sup>. This amount of funding equals the previous one in 2020 which it was the highest in the history of the region<sup>19</sup>. In addition, SODERCAN also complements this line of funding 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. The range of funding available in these programs vary from 100.000 to 500.000€.<sup>20</sup>

However, Cantabria is still ahead of the most advanced regions in terms of R&D investment in the country with a 0,85% of its GDP allocated in 2018 (Observatorio Español de I+D+I (ICONO), 2020). Due to the economic crisis of 2008 and its

<sup>17</sup> <https://dgidtei.cantabria.es/ayudas>

<sup>18</sup> <https://dgidtei.cantabria.es/documents/3603955/13105808/CONVOCATORIA+21.12.20.pdf/73df405f-be96-6594-2600-627a0ddcd5dd?t=1614589670466>

<sup>19</sup> <https://www.20minutos.es/noticia/4578317/0/industria-aprueba-ayudas-por-4-millones-de-euros-para-fomentar-la-innovacion-de-las-empresas/?autoref=true>

<sup>20</sup> <https://ayudas.sodercan.es/ayudas>



subsequent cuts, the region experienced a peak in this category in 2010 with a 1,23% investment of its GDP in R&D but after that a downfall will follow during the 2010 decade (see figure 20). The last efforts in R&D spending by the Cantabria Government seem to be directed towards the reconversion of this trajectory.

### GASTOS INTERNOS TOTALES EN I+D POR COMUNIDADES AUTÓNOMAS. 2008-2018

En porcentaje del PIB regional.

Comunidades autónomas	2008	2009 <sup>(1)</sup>	2010	2011	2012 <sup>(2)</sup>	2013	2014	2015	2016	2017	2018
Aragón	1,33	1,38	1,21	1,15	1,05	1,04	1,03	1,03	0,92	0,91	0,92
Asturias	1,33	1,12	1,15	0,95	0,93	0,96	0,91	0,90	0,89	0,80	0,90
Balears (Principado de)	0,77	1,01	1,06	0,76	0,85	0,80	0,80	0,75	0,74	0,88	0,80
Basura (Euz)	0,36	0,38	0,40	0,36	0,34	0,32	0,32	0,31	0,31	0,38	0,41
Canarias	0,63	0,84	0,63	0,58	0,51	0,58	0,64	0,69	0,67	0,58	0,67
Cantabria	1,31	1,17	1,23	1,08	0,98	0,91	0,83	0,85	0,84	0,82	0,85
Castilla y León	1,27	1,18	1,11	1,00	1,12	0,95	0,98	0,99	1,10	1,20	1,30
Castilla-La Mancha	0,72	0,63	0,69	0,70	0,64	0,50	0,51	0,51	0,50	0,53	0,52
Cataluña	1,62	1,78	1,66	1,56	1,51	1,58	1,67	1,52	1,66	1,67	1,52
Comunidad Valenciana	1,30	1,11	1,07	1,00	1,01	1,00	1,02	1,00	0,99	0,99	1,00
Extremadura	0,86	0,98	0,98	0,94	0,75	0,76	0,67	0,67	0,60	0,67	0,63
Galicia	1,36	0,76	0,76	0,70	0,80	0,84	0,87	0,89	0,87	0,94	0,96
Madrid (Comunidad de)	2,32	2,05	2,05	1,95	1,82	1,73	1,65	1,71	1,66	1,68	1,71
Murcia (Región de)	0,86	0,87	0,92	0,84	0,80	0,84	0,86	0,85	0,94	0,91	0,92
Narura (Comunidad Foral)	1,36	2,18	2,04	2,08	1,91	1,75	1,73	1,62	1,62	1,73	1,66
Pais Vasco	1,30	2,10	2,00	2,11	2,19	2,08	2,03	1,91	1,89	1,88	1,96
Rioja (La)	1,31	1,88	1,77	1,01	0,87	0,79	0,91	0,90	0,84	0,91	0,83
Ceuta y Melilla	0,20	0,22	0,12	0,11	0,11	0,08	0,09	0,03	0,09	0,01	0,08
Total	1,25	1,29	1,29	1,33	1,38	1,24	1,23	1,22	1,19	1,28	1,24

(1) Desde el año 2009, PIB base 2008.  
(2) Desde el año 2012, PIB base 2011.  
Fuente: I+D+i, Encuesta sobre actividades de I+D+i.

INDICADOR DE ACTIVIDADES DE INVESTIGACIÓN E INNOVACIÓN (ICONO)

Figure 21 R&D % of expenditure among Spanish regions from 2008 to 2018. Source: (Observatorio Español de I+D+I (ICONO), 2020).

In addition to the aforementioned programs, DGIDTEI also develop several further actions for promoting innovation in the region. One of them is intimately related with its role of industrial facilitator, providing assessment and support to companies in the region when these have to deal with national and EU innovation programs and funding. Moreover, DGIDTEI has also been behind the first and only (at the moment) experience of PPI in the region<sup>21</sup> (Peñate Valentín & Sánchez Carreira, 2018).

The Government of Cantabria throughout DGIDTEI has also conducted several significant actions in terms of entrepreneurship. One of them has been to develop a map of entrepreneurship in the region, setting up a tool for analysing and gathering data about different actions related with entrepreneurship in the region and its main outcomes. In relation to this and with the help of CISE, another study was conducted for analysing regional capacities regarding entrepreneurship in 2018. In this study, there is a major recap of the work done in terms of entrepreneurship in the region by different agents since 2011. Some of the

<sup>21</sup> [https://dgidtei.cantabria.es/actuaciones/detalle/-/journal\\_content/56\\_INSTANCE\\_DETALLE/3603955/5867030](https://dgidtei.cantabria.es/actuaciones/detalle/-/journal_content/56_INSTANCE_DETALLE/3603955/5867030)

conclusions that are underlined are the growing number of activities offered by different agents since that year (development agencies, business associations, city councils, UC, Regional Government), the need of coordination of these activities at all stages of the entrepreneurial activity (awareness, training, research and support), the demand for creating a coordinated internationalization entrepreneurship and the need for a participative governance in the regional system (CISE, 2018).

Regarding entrepreneurship, SODERCAN plays an important role in the region as it constitutes the reference for several generations of young Cantabrian companies and its business creation program remains fully active in the design of new instruments to support entrepreneurship. In this sense, promoting entrepreneurial attitudes in the region and in the business culture of the region, helping to generate services that are demanded by entrepreneurs and support them in business set up and development of their initiatives are some of the main objectives of SODERCAN. To this extent, SODERCAN offers a comprehensive service to entrepreneurs in Cantabria. From the initial inception of the idea to the consolidation and growth of the company, there are a series of stages that have dedicated assessment, training and finance support from SODERCAN

SODERCAN also provides co-financing for carrying out GEM study since 2019 and it promotes the development of this study at national level since 2018. This initiative is framed in its strategy as a transversal instrument of the Government of Cantabria and aligned also with iCan S3 strategy of Cantabria. This international study provides a very well detailed diagnosis of the entrepreneurial activity in countries and regions across the globe. In its last edition, the study shows an increase of 15% in the region of entrepreneurial activities and Cantabria is ranked 4<sup>th</sup> in percentage of entrepreneurs at national level, only behind regions such as Cataluña, Castilla y León and Madrid<sup>22</sup>. In addition, Cantabria is the region in the country which has increased most its participation in the “Emprendedor XXI” contest. This is a national contest supported by La Caixa Bank and ENISA that has witnessed a significant increase in start-ups from this region (18 in 2020)<sup>23</sup>

Cantabria is also one of the EU regions selected as a pilot together with other 12 regions (Cantabria (ES), Centre Val de Loire (FR), East-North Finland (FI), Grand-Est (FR), Greater Manchester (UK), Hauts-de-France (FR), North-Middle Sweden (SE), Piemonte (IT), Saxony (DE), Slovenia and Wallonia (BE)) and two countries (Lithuania and Slovenia) in the EC’s Innovation for Industrial Transition program. Being in this program means to receive customized advice on modern cluster policy by the EC and OECD with the overall aim of helping regions to explore new approaches for meeting the challenges that pose on the territories the industrial transition. The pilot action stressed the importance for industrial

<sup>22</sup> <https://www.sodercan.es/informe-gem-cantabria/>

<sup>23</sup> <https://www.sodercan.es/cantabria-comunidad-que-mas-crece-en-candidaturas-a-los-premios-emprendedorxxi-de-caixabank-y-enisa/>

transition of the innovation-led and place-based approach inherent in smart specialization. One of the good practices selected in the Cantabria region has been the development of CISE as its impact in the region has been considered noteworthy for this industrial transition (OECD, 2019). In addition, Cantabria is also member of the Vanguard initiative<sup>24</sup> and the capital of the region is well known for its decided bet on digital technologies and smart mobility through innovative initiatives such as “Smart Santander”<sup>25</sup>.

Last, DGIDTEI also take part in several EU funded projects related with innovation, digitalization or sustainability. Some of the current EU projects where DGIDTEI is involved are listed below:

- **DEVISE:** “Digital tech SMEs at the service of Regional Smart Specialization Strategies” project, aims to give response to the current challenge that 9 European regions are facing to unlock and exploit the potential that digital tech SMEs have as enabler for the competitiveness of other SMEs belonging to sectors included in their Regional S3 Strategies. <https://www.interregeurope.eu/devise/>
- **SAFER:** “Smart Atlantic Seafood Clusters” project aims to improve the innovation performance of the seafood industry by increasing technology adoption and transnational cooperation. SAFER will work to achieve the following objectives: 1) Create an innovation platform to sustain an effective transnational network of seafood clusters by putting in place the means that the network needs to effectively drive innovation in a fast-moving network of SMEs and 3rd level and Applied Research Centres distributed across the Atlantic area. 2) Promote technology transfer and collaboration methods within the seafood sector by jointly implementing and evaluating Living Lab pilots. Partners will monitor the activity and share and discuss the results. 3) Serve as empirical input for the Regional Innovation Smart Specialization Strategies (RIS3) of Atlantic regions where the seafood industry is a priority. SAFER will work to become a reference for the promotion of these kind of clusters. <http://saferatlantic.eu/>
- **TIDE:** “Atlantic Network for Developing Historical Maritime Tourism” project, will aid organizations and practitioners in the Atlantic region tourism development sector in identification of potential niche tourism packages. TIDE will use Virtual Reality (VR) and Augmented Reality (AR) in archaeology and submarine exploration fields to enrich visitor experiences and introduce an exciting new dimension to tourism and cultural heritage of the Atlantic regions. The framework will be piloted with particular focus on the Napoleonic, Spanish Armada, World Wars and Atlantic Migrations eras. <http://www.tide-atlantic.eu/>
- **DIGITAL REGIONS:** In this project, eight European regions are working together to address a common challenge: how to best adapt innovation policies to support the manufacturing sector as a result of the emergence

<sup>24</sup> <https://www.s3vanguardinitiative.eu/partners/cantabria>

<sup>25</sup> <https://www.smartsantander.eu/>

of Industry 4.0 (I4.0). The main objective of the DIGITAL REGIONS partnership is to, by 2022, achieve a 15% increase of the number of SMEs from manufacturing sector cooperating with other innovation actors in the participant regions to implement I4.0 solutions as a result of improved innovation policies. Project partners will cooperate together and will propose measures to facilitate improved I4.0 policy cooperation between regions, increased SMEs participation and availability of I4.0 skills. DIGITAL REGIONS aim to benefit all stakeholders in each region's innovation ecosystem, i.e. innovation policy makers, SMEs that use I4.0 solutions, suppliers of I4.0 services, universities and innovation centres. <https://www.interregeurope.eu/digitalregions/>

- **ENTERPRISE EUROPE NETWORK:** This is a network to support the scientific-business fabric of Europe, and of other countries on other continents, which has been offering its services since 2008, under the auspices of the European Commission. The Enterprise Europe Network is made up of more than 600 organizations in more than 50 countries that, from a local perspective, promote innovation and competitiveness of companies, making it the most extensive network of information and advice to companies in European themes. Throughout SODERCAN, support and assistance to businesses in the fields of Internationalisation, Innovation, entrepreneurship and Horizon Europe is provided to companies in Cantabria. <https://een.ec.europa.eu/about/branches/es00501>
- **ENTRECOMP:** This project will support actors from the whole learning system to enhance the development, validation and recognition of the entrepreneurship competence across lifelong learning. It will create cross-sectoral Collaborative Communities, piloting actions at national and regional level and supporting an EU-wide forum to provide guidance, share practices and connect those working on policy level and on practical implementation of EntreComp. While implementing all activities indicated in the call through 8 WPs, it will target the following beneficiaries: national organisations, educators from secondary schools and VET, employment support organisations, enterprise support organisations, employers. Direct beneficiaries are at least 732 and indirect beneficiaries are over 40.000. The project will introduce key stakeholders to EntreComp through the national and regional Collaborative Communities and will allow them to build common understanding through active networking and knowledge sharing; it will create new initiatives and funding channels for EntreComp through European-level project development workshops; it will create practical and replicable learning and assessment tools to develop EntreComp competences; it will support relevant actors in understanding how to develop EntreComp competences. SODERCAN is member of this consortium but DGIDTEI also supports it. <https://www.sodercan.es/proyectos-europeos/entrecomp/>

It is important also to mention that as several stakeholders interviewed argued, it seems to be in the region a lack of an open innovation strategy or a coordinated set of instruments and programs that can promote the cooperation and collaboration of different stakeholders in joint initiatives. This kind of strategies can be observed in nearby communities such as the Basque Country (Ruiz, Tejero, Gutiérrez, & Kuittinen, 2014; Salazar-Elena, Guimón, López, Muñoz, &



Landeta, 2020). The limited budget and limited reach of the different programs offered by DGIDTEI is probably not adequate for provoking the mobilization of the agents for major initiatives. In this sense, the majority of the participants in the study also stressed that they don't usually participate in networking events organized by other agents in the region as well as the majority of these participants commonly stated that they don't usually organize public dissemination events or others related. This particular problem seems to be one of the bottlenecks for mobilizing the agents in the territory around innovation.

#### 2.4.6 Innovation culture

Innovation culture in Cantabria seems to be predominately characterized by the number, characterization and size of its companies. In this sense, there is an overwhelming predominance of SMEs that are usually rooted in family traditions and have a low interest in innovation. This argument was made by several interviewees who stressed the difficulties of many SMEs have when dealing with innovation due to the lack of resources.

According to a recent study carried out by COTEC (Spanish Foundation for Innovation), 76% of Cantabria citizens think that there is a low culture of innovation in the region (COTEC, 2021) (see figure 21). This number seems to be in line to what some of our participants reported in the interviews. Many of them argued several factors behind this pattern. For some of them the lack of tradition regarding collaboration and cooperation between actors in the innovation ecosystem was the main critical factor. This was commonly observed in many of the interviews as the research team observed a lack of forums or events where the interviews can meet together around different technological trends or other kinds of informal events where these actors can be mobilized or dynamized.

Another common explanation argued by several interviewees was intimately aligned with the structure of the regional economy, which has a significant fragmentation in terms of sectors, geographical locations and the size of its companies, which presents an overwhelming majority of SMEs (Potter & Miranda, 2008). This last fact seems to be in line with the structure of the national economy, but it also seems to be a bit over the national average, with a significant proportion of companies having no employees or less than 10 employees (B. Ribeiro & Dosil, 2018). Undoubtedly, these particular micro SMEs have more barriers to face regarding innovation management than other kinds of SMEs.

A common third reason for this low culture of innovation underlined by the interviewees has been the lack of dissemination and promotion of innovation calls and funding schemes that can reach these SMEs as well as the main actors in the innovation ecosystem of the region. Another interesting point argued by several participants also stressed the kind of traditional sectors that are probably the most popular of the region (metal-mechanic, automotive, agri-food) and their "conservative attitude" in management and business development. This point

was also usually aligned with the family business managed SMEs that usually are not prone to be engaged in innovation activities.

Last, the majority of participants reported an inadequate and unattractive funding schemes for innovation activities in public programs. Most of the interviewees raised this issue as well as they also argued the low investment of the majority of companies in R&D&I in the region.

**¿CREE VD. QUE EN SU COMUNIDAD AUTÓNOMA  
HAY Poca CULTURA DE LA INNOVACIÓN? (%)**

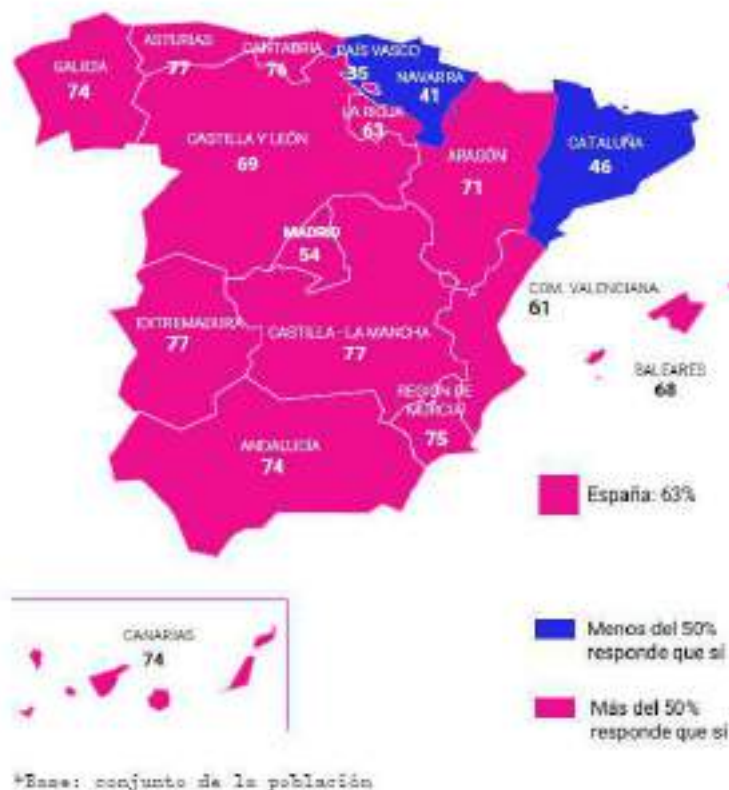


Figure 22 Percentage of citizens that think that their regions have little innovation culture. Source: (COTEC, 2021)

However, the majority of actors were convinced that the region is and will be facing several challenges such as digitalization, industrial transition, knowledge economy, climate change, sustainability or circular economy to name a few, and the most common answer for addressing all of them lies at innovation. This trust in innovation for meeting different challenges is also aligned with recent studies conveyed among the population of Cantabria and its attitudes around innovation. Citizens of this territory seems to have a highly positive public perception of innovation with a 76% of respondents making this plea (COTEC, 2021).

Another recent study developed by CEOE-CEPYME Cantabria also stressed that innovation is and will be one of the major transforming forces for the economy of the region. In this study, innovation is considered as one of the pillars where the transition to the knowledge economy should lie. However, in the same study is



also recognized the low rate of private investment in R&D&I (CEOE-CEPYME Cantabria, 2019) that it is also aligned with the findings of our fieldwork and other statistical data.

One of the possible answers behind this low innovation culture in the region can be situated in the physical disconnection that seems to be between the coast and the interior of the region in terms of R&D. Some studies stressed that geographical particularities associated to innovation can also be intimately associated to the geographical proximity to research centres and universities (López-Fernández et al., 2021).

All in all, it seems that the region demands a dedicated strategy to meet this low innovation culture, mobilizing the nice capacities that some of the actors of the ecosystem currently shows and creating synergies with the rich industrial know-how that exists in the territory. It is also worthy to mention that the Ministry of Universities and Research of Cantabria is promoting the “*Conciencia project*” which aims to raise awareness about the need of rising the R&D investment towards the 2%<sup>26</sup>. This should be one of the first steps towards provoking a change for reverting this situation.

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<sup>26</sup><https://www.europapress.es/cantabria/noticia-cantabria-inicia-camino-sellar-pacto-ciencia-20200701185830.html>

## ¿CREE VD. QUE LA INNOVACIÓN ES POSITIVA?

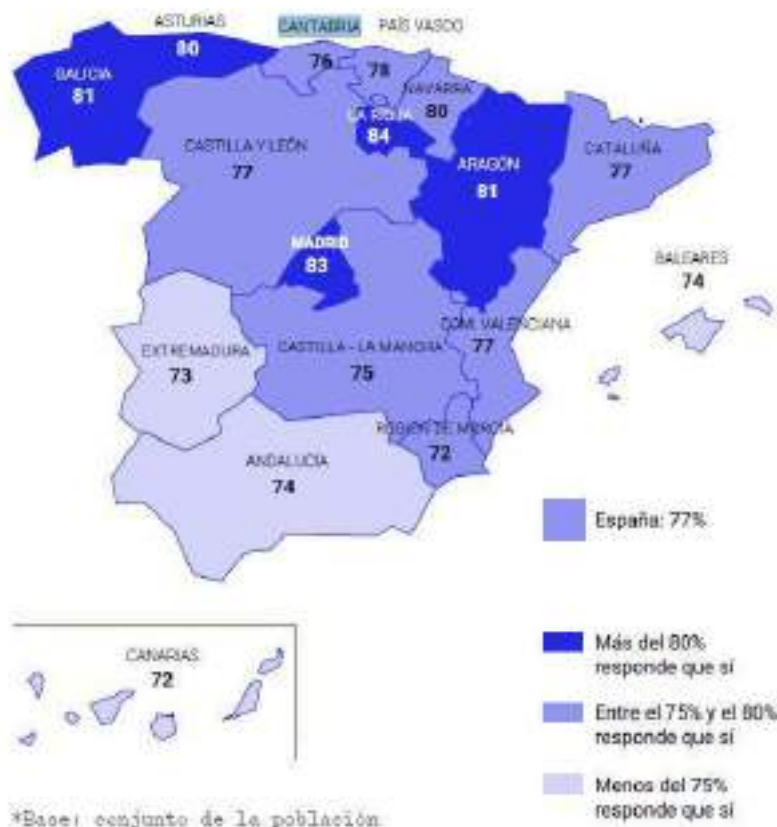


Figure 23 Percentage of citizens that think that innovation is positive. Source: (COTEC, 2021)

#### 2.4.7 Intermediaries related to regional innovation

The main intermediary in the regional innovation ecosystem of Cantabria is SODERCAN, the Regional Development Agency of Cantabria. SODERCAN serves as the main platform and coordinating body to orchestrate economic development within the territory. This public agency has the role of actively contribute to the strengthening of the industrial fabric of Cantabria by supporting all the activities that contribute to improving it, facilitating the processes of creation, consolidation and business growth, and promoting activities and / or R&D&I projects, which promote the competitive improvement of companies in the region. SODERCAN also offers several services to the innovation ecosystem actors in three main areas: entrepreneurship, internationalization and R&D&I. It also has several funding lines associated to these services<sup>27</sup>.

Besides SODERCAN, there is no really other kind of intermediaries in the innovation ecosystem of the region. The UC also has its Research Results

<sup>27</sup> <https://ayudas.sodercan.es/ayudas>

Transfer Office<sup>28</sup> (OTRI in Spanish) that acts as a meeting point between research groups from UC and companies in the region, but the scope of its activities is limited. There are no research or innovation agencies or other kinds of actors that can provide innovation diffusion, facilitation or dynamization services in the region. Indeed, this is probably one of the gaps that can be found in the territorial innovation ecosystem and one of the main reasons why most respondents in our fieldwork noted a lack of dedicated forums or events for sharing ideas, information and promote co-creation between different stakeholders in the ecosystem.

It is also important to underline that the cluster development policy promoted and supported by DGIDTEI and SODERCAN has also tried to close this gap. In words of several of our interviews it was commonly argued that this kind of sectoral associations have started to reverse this situation and provide more dynamism to the ecosystem. However, clusters in the region seem to mainly focus on internationalization and exports and it has been observed a low level of R&D activities in their portfolio.

Last, it also seems that there is room for more actors in the territory that can promote and support innovation such as the CTC, which is technically speaking the single technological centre in the region. This centre is mainly focused in the automotive sector despite it collaborates with other sectors such as the nuclear sector. Other technological centres that can support research and innovation in emergent sectors such as ICT or renewable energies could strength “knowledge brokering” activities in the region.

#### 2.4.8 Governance structure

Regarding governance structure of the innovation ecosystem, we indicate that in the current RIS3 of the region, there is a dedicated chapter focused on the governance model of this strategy. This governance model is structured into three levels:

- Formal governance bodies of the innovation ecosystem
- Management team
- Development units and working groups

In the first level there are two governance committees that are the Cantabria Innovation Forum and the Innovation Coordination Commission. These two committees have a different role:

- **Innovation Coordination Commission:** this commission is responsible for the promotion, planning, coordination and monitoring of the material of research, technological development and innovation; and
- **Cantabria Innovation Forum:** the participation body for agents of the Cantabria innovation system for the elaboration, monitoring and

<sup>28</sup> <https://web.unican.es/unidades/otri>



evaluation of policies of research, technological development and innovation in the region.

— The second level (management team) is occupied by DGIDTEI which is the public department that is in charge of the development of RIS3 in Cantabria. Regarding the third level (working groups) it seems that there has not been any dedicated working groups during these years of RIS3 in the region.

■ Another interesting mechanism of soft governance at play in the region is PINCANN<sup>29</sup>. This is envisioned as a meeting point for companies, universities, public and private institutions and the government itself for exchanging information between actors and to stimulate co-creation. This mechanism has also been explained in detail in section 4.2 previously. In addition, and as it has been mentioned in 4.1 there is also a survey available to citizens for express their domains of interest for the next RIS3<sup>30</sup>. However, the research team has not found any diffusion activities related with this survey to maximize its reach.

It is also worthy to mention that in Spain, the Council for Science, Technology and Innovation Policy (Ministry of Economy, Industry and Competitiveness of Spain) defined the Spanish Strategy for Science, Technology and Innovation (STI) 2013-2020 and recently published the Spanish Strategy for STI 2021-2027<sup>31</sup>. This Strategy sets the priorities for the elaboration of the National Plan for STI 2021-27 as well as the Regional STI Plans, whose interaction will result in the RIS3 Strategies. It is important to note that Spain is a decentralized country and therefore the regional governments and its assigned agencies are the main responsible for the RDTI steering. In the case of Cantabria, the regional innovation policy is designed by the Regional Government of Cantabria through its Ministry of Innovation, Industry, Tourism and Trade, and more specifically through DGIDTEI.

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<sup>29</sup><https://www.cantabria.es/web/pinncan>

<sup>30</sup> [https://dgidtei.cantabria.es/actuaciones/detalle/-/journal\\_content/56\\_INSTANCE\\_DETALLE/3603955/12241979](https://dgidtei.cantabria.es/actuaciones/detalle/-/journal_content/56_INSTANCE_DETALLE/3603955/12241979)

<sup>31</sup> <https://www.ciencia.gob.es/stfls/MICINN/Ministerio/FICHEROS/EECTI-2021-2027.pdf>

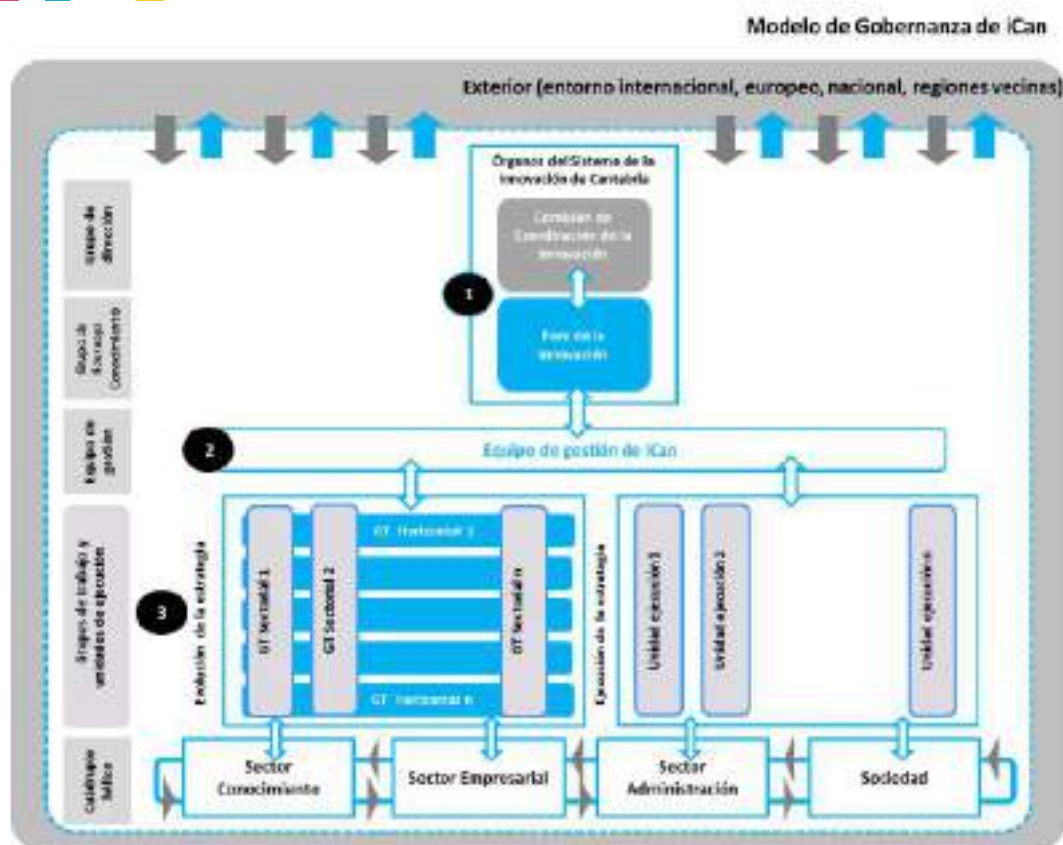


Figure 24 Governance model of RIS 3 Cantabria. Source: (Gobierno de Cantabria, 2013)

However, it seems that there is “decentralized governance” as such. As we have underlined before, the main intermediary in the regional innovation ecosystem of Cantabria between DGIDTEI and the rest of agents is SODERCAN. This public company usually works hand in hand with DGIDETI in some activities and projects but both actors offer several innovation programs where the different actors try to meet with project proposals. There are no established forums or dedicated events where informal exchange of information, collective brainstorming, innovation facilitation dynamics or co-creation practices can be stimulated by intermediaries into the regional ecosystem of innovation. It also seems that an open innovation strategy is also missing in the ecosystem. As some of our interviewees acknowledged the Innovation Forum has been only celebrated three times and there is a lack of diffusion around innovation programs, events and activities that deter the participation of actors in related activities.

Last, current governance mechanisms seem to be too focused at the political and institutional level what it can create delays and slow progresses in the development of these activities. Most of the interviewees stressed that they don’t usually participate in these kinds of events and they don’t usually organize it.



## 2.5 Aspects of RRI in regional innovation policy

As part of the mapping exercise it is important to identify possible connection points between the various aspects and concerns of RRI and the local actors' concerns and priorities. This section aims to find where the practice of RRI is a reality and may make a palpable, positive difference to the local actors, helping them to achieve superior outcomes for their innovation/development endeavours (Martin, Kroll, Stahleckler, & Hansmeier, 2020).

To understand better how and to what extent different elements of RRI are practiced in the Cantabria region, this chapter contains the information collected through desk research and the background interviews with regional R&D&I actors. The first section gives an overview of the implementation of the RRI agenda in the region. The second establishes the status of the "grand challenges" and scans the different RRI Keys and some of the underlying ideas that share synergies with the RRI paradigm to analyse the existence of "de-facto RRI" (Randles et al., 2016).

### 2.5.1 Status in the implementation of the RRI agenda: overview

Cantabria is at early stages of the process of integrating RRI concepts into regional policies, but the government is aware of the role of RRI in general to support a more open, responsive, engaged and socially accountable R&D system. None of the strategies explicitly mentions the term RRI (von Schomberg, 2013) or "responsible innovation" (Owen & Pansera, 2019). Institutional support for the promotion of innovation focuses especially by SODERCAN and DGIDTEI with the purpose of promoting a culture of innovation in all of Cantabrian society and especially, in the business and scientific environment as an engine of economic growth and social development (López-Fernández et al., 2021).

The first axis of the regional innovation strategy stress the need of changing the cultural and industrial model existing in the region (Gobierno de Cantabria, 2016b). This is due to the high dependency of particular industries of the old economy such as chemicals, metalworking and mechanical engineering, agri-food and farming. In addition to this, the rural character of the region (Gil de Arriba, 1998) joined to its dependency on these industries poses significant challenges in this transition, that won't be only facilitated by technological advances. In this sense, the development of a generous social capital and a collaborative, open and reflective culture will be a necessary asset for facing this transition.

The regional innovation strategy 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, establishing a critical mass of actors with a high level of commitment in the social



innovation sector, in order to support 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. On the other hand, Innovation and environmental issues are becoming more and more permeable and re-oriented towards a just and sustainable future in line with the European Commissions 'green deal orientations and addressing the "grand challenges" of climate change and sustainability (European Commission, 2017; Geoghegan-Quinn, 2012).

### 2.5.2 Role of the "grand challenges" in the region

Europe has to address the challenges of the green transition and the digital transition to become a modern, competitive economy that uses natural resources efficiently. For this reason, the European Commission has determined that research and innovation policies should be geared towards sustainability in the broad sense (social, environmental and economic sustainability) via a transformative approach based on the principles of co-creation, diffusion, uptake, transformation and directionality (European Commission, 2020).

Horizon Europe will incorporate research and innovation missions to increase the effectiveness of funding by pursuing clearly defined targets. Five mission areas have been identified: Adaptation to climate change including societal transformation, cancer fighting, climate-neutral and smart cities, healthy oceans, seas, coastal and inland waters, soil health and food (European Commission, 2020).

In this context, RIS3 are transformative R&D&I agendas geared at building a more sustainable, inclusive future, and therefore they will have to promote RRI pathways for a more sustainable, inclusive and fair development (Kaltenbrunner, 2020). Regional S3 in Cantabria follows a challenge-based approach that brings together resources and knowledge across different fields, technologies and disciplines that cover activities from research to market with a focus on innovation-related activities.

The region is ambitious to foster innovations to respond to the 21st century social, environmental, and economic 'Grand Challenges' and missions such as climate change and resource efficiency, demographic change, clean energy, inclusive societies etc. that have come top-down push. Some examples of this are:

- **Blue economy** related to offshore energy which is the sustainable use of ocean resources for economic growth, improved livelihoods and jobs.
- The Cantabrian **Rural Development** Program is the programming instrument for the development of livestock farming and the rural environment in Cantabria.
- **Health** is highly represented through the business innovation that it is done in the region based on biotech research and links with the health sector. Investment in health research and innovation
- There are some **smart city** and green and integrated mobility projects. Santander Smart City initiative is city-scale experimental research facility that does experimental advanced research technologies and realistic assessment of users' acceptability tests, etc.
- Several Initiatives on the development of **the social economy**, make Cantabria a great European ideas laboratory on the Third Sector.

### *Sustainability and SDGs*

For the region all the actions that facilitate a transition to a low-carbon economy are a priority, in accordance with the priorities established in the European Union. The objective is to achieve a cleaner and more sustainable economy, favouring the transition to a low carbon economy in all sectors, promoting energy efficiency and the use of renewable energies by businesses and in public infrastructure and services. Sustainable development has been considered transversally in many of the lines of action developed in the region, being especially services of general and social interest in which environmental, climate change, resource efficiency actions have been specifically enhanced. There are other strategies and initiatives directly linked to sustainability:

- Climate Change Strategy, a Cantabria Climate Change Action Strategy for the period 2018-2030.
- Local Sustainability Network of Cantabria. A network made up of municipalities and groups of municipalities in Cantabria, which work to improve the quality of life of citizens through the implementation of local Agenda 21.
- Development of a Circular Economy Strategy, with the aim of making Cantabria a reference region in this field at national and European level (in process)
- The regional hydrogen strategy in Cantabria, a plan that aims to develop hydrogen technologies as an alternative to fossil fuels in the field of energy (in process)

The figure below (24) elaborated by the S3 Platform show the link of Social Challenges in Spanish RDI public policies. Cantabria region has been active in health, agri-food, clean energy, smart& sustainable transport and climate change.

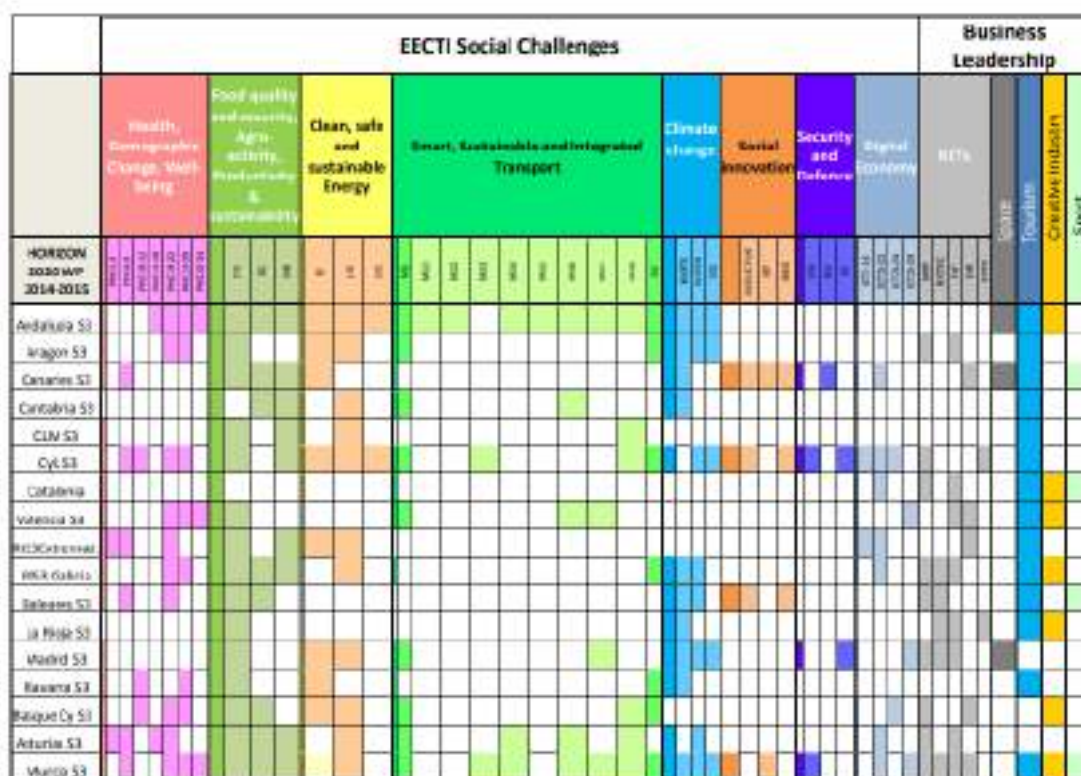


Figure 24: Spanish RDI public policies Source: S3 Platform

Addis Ababa Action Agenda recognizes STI as a means to achieve Sustainable Development Goals (SDGs). The agenda establishes S3 considered as one of the global methodologies for STI roadmaps for the achievements of SDGs (United Nations, 2015). The World in 2050 (TWI2050) report states that there is a slow but growing understanding of governance needs for integrated SDG implementation and highlights the S3 concept as one of the regional and national STI approaches for sustainability (TWI2050, 2018).

The Sustainable Human Development Strategy (SHDS) developed in Cantabria region is a multi-departmental and multi-level strategy. It is a planning document, assessable and measurable which builds in a coherent, coordinated and effective way the political and social commitment of Cantabria to the 2030 Agenda. The objective of this Strategy is threefold. Firstly, it aims to serve as a Cantabrian public institution, the University, associations and social movements, business and other agents associations, companies and other stakeholders to take ownership of the SDGs and take co-responsibility for sustainable human development. Secondly, the Strategy is expected to support the global Agenda and promote the implementation of the SDG and to promote the implementation of an autonomous regional plan for the territorializing of sustainable development, adapted to a global perspective, based on the SDGs.

Nevertheless, there is not any plan yet. Sustainability related SDGs objectives are in general somehow taken into account in the R&D projects developed in the

region, in general the research teams align them with the research objectives, and this happens 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<sup>32</sup>

### *Open Innovation*

As the Commission notes, “open innovation” is a broad term encompassing several different nuances and approaches (European Commission, 2016). Generally, it expresses the idea that the innovation process should be opened up to all relevant stakeholders along and across sectors and value chains, with a particular emphasis on drawing end-users into the innovation process (Martin et al., 2020). The collaboration in Cantabria region is based on a triple helix innovation model, where universities, research organizations, industry and government are the key players and where society is not properly considered or engaged. One might argue that it is rather conservative, which can be seen in the low level of the absence of established practices of co-creation or the unusual presence of organizational innovations.

Based on the conducted interviews, the concern of many R&D&I agents in the region is the low level of collaboration between them. They consider that there are ineffective mechanisms to motivate cooperation and call for increased inter-institutional collaboration and partnerships. Innovation processes in Cantabria region have traditionally been developed by large companies or entities individually and in isolation from collaboration with other agents. This is what is known as the linear innovation model, characterized by a logic of vertical integration, where basic research, technology development and innovation diffusion are the precedents of exploitation and commercialization of innovations are carried out within the main organizations (Bush, 1945; Godin, 2006). In this model, the transmission and diffusion of knowledge is slower and more costly. However, in the current context, characterized, among other aspects, by the rise of ICTs, innovative activity can be boosted without the need for specific R&D departments or it can be distributed between different actors. This is where open innovation comes in as a new way of organizing and promoting innovation (Chesbrough, 2003).

The Spanish Confederation of Business Organizations in Cantabria, CEO-CEPYME proposes the creation of an open innovation strategy that encourages cooperation between organizations and external professionals, in order to facilitate the innovation processes of any organization, regardless of its size. In this sense, open innovation is based on participation and collaboration with agents outside the entity or company itself (von Hippel, 2005). Thus, it is

<sup>32</sup> <https://ods-cantabria.github.io/ods-cantabria/>





necessary to consider two dimensions of open innovation. On the one hand, the acquisition of technology, on the other hand, the exploitation of technology.

Another interesting regional project is the creation of the Cantabria Research and Transfer Agency. It is proposed to strengthen knowledge transfer bodies in Cantabria in order to favour relations between the different agents of the regional system and the creation of a commission for the governance of R&D&I in Cantabria.

### *Gender equality*

Regional policies in Cantabria have adequately integrated the transversal principle of equal opportunities between women and men in the different stages of the planning, management and monitoring cycles. The region counts with a recently published Regional Equality Law<sup>33</sup> and a Royal Decree which regulated an equal pay for women and men<sup>34</sup>. In addition, specific measures have been defined to favour the reduction of gender gaps existing in the labour market and to favour the participation of women. However, there is no particular regulation regarding women & science.

In Spain, women represent the 40% of research personnel while in Cantabria this difference is somewhat smaller, with approximately 42% being women researchers<sup>35</sup>. Cantabria must also take advantage of the momentum to work for greater equality in access to research careers, a challenge not only in Cantabria but in many European regions. In Cantabria region, there seems to be quite sensitivity to issues surrounding gender equality. Overall, it seems that most of the R&D&I actors in the region are aware of its importance and accomplish with the gender key in Horizon Europe related to fostering gender balance in research teams, research decision-making and advisory bodies. Another issue is giving systematic attention to gender dimensions of R&D&I contents that it is also a requirement by default. In this sense, the perception is that it is challenging for research organizations and teams addressing gender in the research content.

There will be a new eligibility criterion to get access to Horizon Europe funding for public bodies, research organizations and higher education establishments that will be required, starting in 2022, to have a gender equality plan (GEP) in place. Some research actors in the region already have GEPs. Specific funding is available for actions supporting the development of gender equality in the region. Some efforts on gender equality and support more talented women in research and innovation are:

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<sup>33</sup> Ley de Cantabria 2/2019, de 7 de marzo, para la igualdad efectiva entre hombres y mujeres. See <https://www.boe.es/buscar/pdf/2019/BOE-A-2019-4565-consolidado.pdf>

<sup>34</sup> Decreto 902/2020, de 13 de octubre, de igualdad retributiva entre mujeres y hombres. See <https://www.boe.es/buscar/pdf/2020/BOE-A-2020-12215-consolidado.pdf>

<sup>35</sup> ICANE 2020

- **Stem talent girl (STG) Cantabria and Woman and Talent Association**  
STG is an educational project for the development of talent and the promotion of scientific and technological vocations aimed specifically for women, increasing the talent identification, involving companies and institutions in the development of talent and encouraging female entrepreneurship. Participants have the opportunity to develop a project in collaboration with a mentor. In Cantabria, STG works thanks to the W&T Association and the support of public institutions.
- **FEMINA is an INTERREG** project that particularly addresses thematic of promoting innovation and cooperation for innovation, in particular social innovation. Within the specific line to promote female entrepreneurship, the ROP (Regional Operational Plan) supports female job creation under a technological perspective (e.g. within digital sectors). FEMINA partners in Cantabria consider female entrepreneurship as one of the most important drivers of job creation and economic growth. The project output will be to make a policy change in this context.

### *Science Education*

Citizen involvement in STI requires fostering initiatives that promote interaction between scientists and society, taking into account the youngest members of society. To this end, it is essential to encourage diversity and to give access to science and innovation to society whilst promoting diversity and meeting the deficit of scientific culture that can arise in these interactions.

In general, there is a modest quality of local science education. There are only a few education and training programs supported by the government, although some bilateral private initiatives exist, especially in secondary schools. Local innovation projects and agents sometimes contribute to raising scientific in the general population as part of their dissemination and engagement activities, but in general no adequate dissemination of results is perceived. The lack of transfer of knowledge generation to certain areas is considered a problem in certain fields. To this end, it would be necessary to strengthen the scientific culture and innovation units for involving citizens in science and innovation.

### *Social Dialogue and Public Engagement*

In an RRI environment, science and the research and innovation process have to include citizens in all phases: identifying and defining the challenges, collecting and analysing the data, designing the project, raising awareness and disseminating and assessing the impact. This social dialogue is extremely important within this framework because they generate new knowledge with citizens' active participation in research. The EC describes public engagement as



*Establishing participatory multi-actor dialogues and exchanges to foster mutual understanding, co-create research and innovation outcomes, and provide input to policy agendas.<sup>36</sup>*

The involvement of citizens in science and innovation has markedly cross-cutting nature in the new Spanish Technology and Innovation Strategy 2021-2027<sup>37</sup> (EECTI), which is included in Action Line 14. The EECTI 2021-2027 is based on a conceptual framework in which civil society must be a central element of the strategy. This conceptual framework is, as previously mentioned, also reflected in European science policies and initiatives in favor of science and innovation. Civil society also acts as a generator of knowledge and relevant practices of social innovation. As previously mentioned, the regional Innovation strategy 2016-2030 establishes the aim of achieving a sustainable innovation ecosystem and stimulating social innovation (Gobierno de Cantabria, 2016b), but at the time this report is being written modest steps have been taken to this direction.

Overall, it seems that most of the ecosystem actors in the region are aware of the importance the public in general and specific stakeholders in particular have for their activities. In this sense, it will be essential in Cantabria for citizens to perceive R&D&I as an essential element to improve their quality of life and the environment in which they live, becoming actively involved in improving their knowledge of science and technology and innovation, but this is not happening at the moment.

- It will be advisable to reinforce Spanish society's knowledge in general, of the technological capacities and R&D.
- New forms of participation that must be promoted engaging the wider public (in terms of ordinary citizens and non-professional interest groups) and including a wide diversity of actors or stakeholders in R&D&I process.

Several interviewees stressed the importance of involving users or beneficiaries of projects but some of them consider that citizens are not the clients of their innovations. It is worth mentioning that this approach varies considerably between R&D actors and interviewed industrial companies. In general, industrial companies tend to consider their clients end-users and have a very straight communication with their suppliers.

The panel of interviewees showed a very irregular picture about the potential and interest in co-creation and societal engagement that can be observed in the within current of the ecosystem. Whilst some representatives were seduced by the idea of being involved in co-creation and societal engagement such activities, others were not attracted by this proposal at all. Some of the reasons given for this disinterest in the interviews were:

<sup>36</sup> <https://ec.europa.eu/programmes/horizon2020/en/h2020-section/public-engagement-responsible-research-and-innovation>

<sup>37</sup> <https://www.ciencia.gob.es/stfls/MICINN/Ministerio/FICHEROS/EECTI-2021-2027.pdf>

- In some cases, interviewees justify this response due to the lack of resources that are needed for establishing these dynamics with citizens, and the need of generating incomes for being economically sustainable.
- Citizens are not considered part of innovation processes and there are limits to the practical involvement of citizens in many innovation projects, especially those with strong technological components.

Citizens are commonly not seen as contributors for technology development. The levels of public engagement vary and many actors include users in the project and the innovation process in some way through surveys, market research, some living lab experiences, consumer behaviour research, open, transparent and free platforms where citizens can translate their ideas, prioritize and vote them online etc. The reported experiences with these public engagement activities are generally quite positive. Some of them also mentioned that these initiatives give legitimacy to the R&D.

### *Ethics*

In Horizon 2020, the Ethics-Key is related primarily to compliance with research ethics and integrity rules and frameworks. In particular for those relating to the involvement of human subjects and animals, use of human embryonic stem cells, or privacy and data protection issues, but also fabrication or falsification of data or plagiarism (Martin et al., 2020).

The research community of the territory generally followed the research integrity and deliberation on scientific processes and quality standards. Within the interviews we conducted and the innovation projects we examined in the region, there is a majority of compliance with data protection rules and standards. Some institutions are adhered to the highest research-integrity standards, but this depends a lot on the topic of research. Some institutions also have code of ethics and ethics committees that set out the organization's ethical guidelines. Other dimensions of ethics such as anticipation and reflective processes have been not particularly observed in the interviews, but this probably will need of further and fine-grained analyses.

### *Corporate Social Responsibility*

CSR shares synergies with the RRI paradigm (Tabarés et al., 2020; van de Poel et al., 2017). RRI aims to make research and innovation more reflexive as its primary goal. The lack of an explicit understanding and conceptualization regarding RRI has provoked that industry has not shown too much interest on the concept while others previous concepts such as CSR, have triggered remarkable interest in the business community (Dreyer et al., 2017; Nazarko & Melnikas, 2019). Nevertheless, RRI and CSR also share some values at their respective discourses and many companies in the region have a CSR Plan. There are some public initiatives in the region that support this last paradigm.

The Government of Cantabria, through the Regional Ministry of Economy, Finance and Employment has established an agreement with the Chamber of Commerce in the field of CSR and promotion of the Social Economy, through which services are provided to companies in the region of Cantabria, free of charge. This program is also known as “Cantabria Responsable”<sup>38</sup>. SODERCAN also runs a CSR Program. The program has two objectives; the first is 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<sup>39</sup>.

## 2.6 Challenges related to the implementation of RRI in the Region

### 2.6.1 RRI and Regional policy literature

The following section digs into the discussion carried out in the last section, by first addressing the possible benefits, but also the challenges of systematically integrating RRI into the regional innovation and development system. Adapting RRI-drivers in regional innovation and development policies and innovation and entrepreneurial activities would facilitate regional development, which are based on societal needs (European Commission, 2013; Uyarra et al., 2019). In the RRI literature, society is viewed as a unit of multiple values comprised of individuals and societal actors such as the state, firms and civil society with conflicting interests (Blok & Lemmens, 2015). Directing research and innovation towards ‘societal desirability’ could be challenging (Tabarés et al., 2020). Consequently, the themes within this domain are the possible obstacles that may arise while implementing RRI aspects in research and innovation policy.

One major driver of RRI is engagement, in particular the engagement of users, customers, relevant stakeholders, experts, policymakers, politicians and the public in the early stage of the research and innovation process by way of active and deliberate participation (Thapa, Iakovleva, & Foss, 2019). There is a strong need on RRI that requires an understanding of its framing and its context of implementation. Here, cultural, political and institutional dimensions gain major attention (European Commission, 2013). The ecosystem understanding is seen as a useful concept to considerate and make visible (complex) relationships in networks of actors where the governance framework could be identified as a key element in either facilitating or hindering the process. Context matters and it is

<sup>38</sup> <http://camaracantabria.com/calidad/asesoramiento-responsabilidad-social-empresarial.php>

<sup>39</sup> <https://www.sodercan.es/responsabilidad-social/>



important to include backgrounds, goals and the interest of stakeholders before establishing RRI-processes and make sure to develop a shared understanding of backgrounds, interests and expectations. Tailoring the involvement of external stakeholders and being aware of their socio-cultural differences is really important.

RRI remains ambiguous in theory and practice (Burget, Bardone, & Pedaste, 2017; B. E. Ribeiro, Smith, & Millar, 2017). This makes it difficult to implement, particularly when it comes to regional development (Fitjar et al., 2019). Following the ongoing discussions around RRI and regional innovation studies, especially on cohesion and smart specialization, there is an opportunity for engaged pluralism between academic disciplines, innovation studies and regional studies, there is a potential opportunity for both RRI and regional innovation studies to collectively contribute to combined advancement of theory and practice (Thapa et al., 2019).

The place-based approach inherent in RIS3 is missing from RRI, which has a fuzzy concept of geographical scale and is vulnerable to mismatches between the scale of innovations and of the associated governance networks involved in the process. The ideal picture of how S3 should be designed and implemented might be described as a double top-down/bottom-up logic between the EU (DG Regio) and the individual regions, as well as within each region (or between the national and regional level within each country) (Fitjar et al., 2019)

There will be a great influence during the next decade in the current S3 strategies that have been delivered by EU regions (McCann & Ortega-Argilés, 2015; Uyarra et al., 2019) (McCann & Ortega-Argilés, 2015; Uyarra et al., 2019). S3 strategies are a pre-requisite for receiving funds for regional development and this new recovery plan aligned with these top priorities will create vibrant conditions for updating current S3 strategies to these headings. In this sense, the RRI paradigm has a unique opportunity to effectively be implemented in many STI regional policies during the 2021-27 period.

## **2.6.2 Regional challenges for the integration of RRI concepts and practices**

A recently non-published diagnosis carried out by a consultancy hired by the Regional Ministry of Research and Universities<sup>40</sup> detected some special features in the regional innovation environment. The challenges and needs identified by the research and transfer agents in Cantabria are as follows:

- The system is highly dependent on public funds and that the budgets allocated to it have fallen in recent years.

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<sup>40</sup> Análisis y diagnóstico de la situación de la Investigación y la Transferencia (I+T) en Cantabria

- The precariousness of employment in the research field, with low salaries and unstable contracts. There is also a pressing need to recruit and retain talent in order to strengthen and rejuvenate the research plans and modernizing recruitment, which they consider to be a barrier in itself.
- Lack of cohesion of the Research and Transfer System of Cantabria.
- Need of a defined R&D&I plan with continuity over time that integrates the different instruments and objectives.
- Need of mechanisms to motivate cooperation between agents
- Need to promote an innovative culture in the political and business spheres. Cantabria is a region with little research tradition.
- Low technological capacity of medium-sized companies.
- Low development in terms of digitalization which is perceived as unprepared and unresponsive to the changes derived from new technologies.
- Deficit in the training and skill-building of the people involved in transition processes.
- Need to invest into skills and to put them to use, by strengthening sustainable competitiveness.
- Need of training in scientific culture to address social deficits and inspire changes in society.

The integration of RRI concepts and practices in the Cantabrian region making research and innovation responsible will pay off on the long term. During the development of our interviews with the different stakeholders of our case in Cantabria, we have realized about the enormous variety that lies at the rising of responsibility in the innovation ecosystem of the region. The level of perceived responsibility and also the perception of individual or shared responsibility. This might create obstacles in deciding whether to innovate responsibly or not. In this sense It is important to understand individual motivation processes.

Whereas regional development strategies may have some instruments that entail elements of RRI thinking, the question still remains how to change institutions in a way that will provide incentives for all actors involved to follow the ideas of RRI. The integration of RRI initially requires additional investments and for that purpose the system should see a potential benefit for RRI, so they should be supported. Awareness is needed also as a first step

The regional innovation ecosystem agents working on proposals and projects in the European context are already aware and usually include social aspects in the impact strategy such as gender, ethics, SDGs, etc. What it is still lacking is the culture of including other types of agents, specially citizens. This has not yet been achieved, although it is included in all the recommendations. A help to overcome these challenges could be to focus on active and productive engagement strategies to design specific actions in local and regional contexts.





We can imagine the ideal picture of how the nest S3 should be designed and implemented but the reality is that RIS3 policy, in general, is primarily oriented towards regional competitiveness and therefore does not fully incorporate notions of social value or responsibility. However, we are in a unique and historically situated policy context with the development of the new RIS3 strategy where the development of a generous social capital and a collaborative, open and reflective culture will be a necessary asset for facing the challenges of the region, to legitimate and reflect society's interests and needs, and therefore promoting RRI as a valuable tool for achieving that aim.

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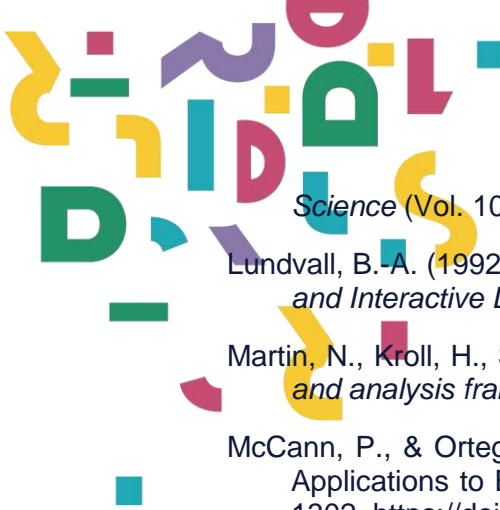
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### 3 Tampere Region

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I6	Commerce and Industry	9.2.2021
I7	Industry and Research and Co-creation	4.2.2021
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### 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 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. Today the innovation system in the Tampere region is a multi-actor, multi-level innovation network. The weight of the industrial profile still lies with technology, manufacturing industry and ICT.

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 has taken determined steps towards addressing the Responsible Research and Innovation (RRI) agenda.

The themes of sustainability and responsibility are evidently reflected at the strategic level in the region. Also, various initiatives and RDI projects related to sustainability and responsibility have been executed by different actors. However, further development and more efficient responsiveness in terms of sustainability and responsibility require much support and favorable systemic structural and cultural shift.

This report takes an in-depth look at the status of RRI and sustainability in the region from the perspective of regional development and industrial RDI networks. Based on the executed desk research and expert interviews, six most important RRI themes in the regional development and industrial RDI networks are identified in this report. The themes are (1) anticipation: impact and risk assessment and management, (2) openness: open innovation and open science, (3) gender and diversity, (4) stakeholder inclusion and public engagement, (5) transparency and communication of RDI activities, including science education, and (6) reflexivity and responsiveness.

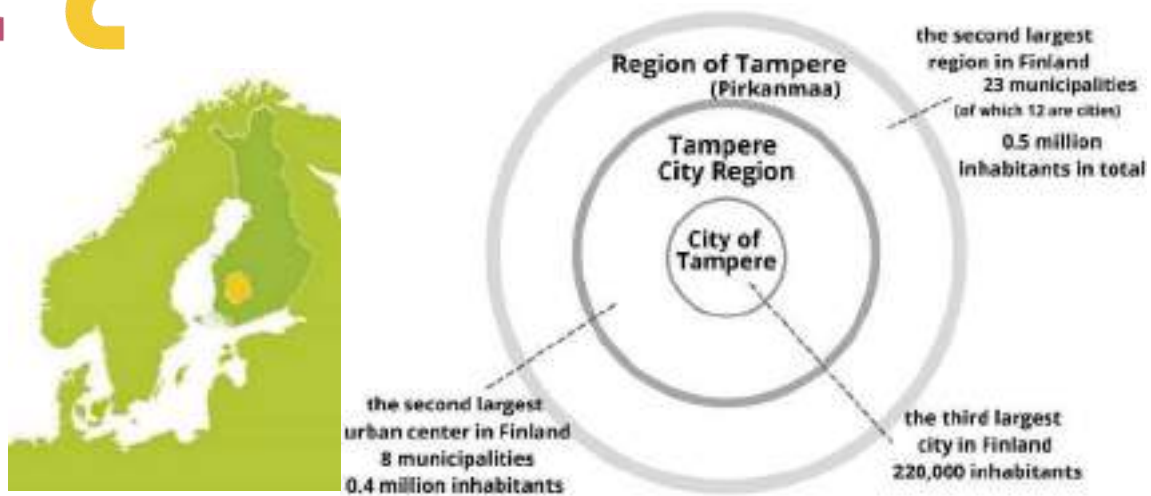
In addition to these six themes, the key factor for all the six themes is increasing and broadening practitioners' and other actors' multidimensional understanding of sustainability. Broader and more systemic understanding facilitates the ability for practical implementation and increases motivation to commit to sustainability and responsibility actions.

### 3.2 Structure and organization of the regional innovation system

The **Region of Tampere**, i.e. Pirkanmaa in Finnish, is the second largest region in Finland with a population of 521,147 (December 2020). The population density within the region is over twice the Finnish average. Most of the region's population is concentrated in the **Tampere City Region** consisting of 8 municipalities, including the City of Tampere and the surrounding urban area (c.f. the figure 1.). It is the second largest urban center in the country and the second fastest growing

urban region in Finland.<sup>41</sup> Additionally, the biggest city in the region is the **City of Tampere** which is also the third largest city in Finland.

Figure 1. On the left: the Tampere region on the map<sup>42</sup>. On the right: the region of Tampere, Tampere city region and City of Tampere visualized.



Throughout the 2000's the population of the Region has continued to grow.<sup>43</sup> The regional GDP accounts for 8.5% of the national economic output and has 23 municipalities. The region has a strong industrial heritage that is still prominent on the landscape especially in Tampere but also other parts of the region. With industrial heritage comes a strong heritage in innovation and innovation ecosystems.

### 3.2.1 Industry structure

A story of industrial development in the Tampere region cannot be told without reference to Scottish industrialist James Finlayson. He was first to start large scale industrial production in area by founding a machinery in 1820 and some years later a cotton mill. For well over hundred years, the Tampere region was known for fabric and shoe manufacturing amongst other products.<sup>44</sup>

Alongside of growing textile industry other industrial activities started to develop and were laying groundwork for present day mechanical engineering industry in the region. Development accelerated from 1930s onwards as demand for products of metal industries and mechanical engineering increased. The Government's decision to move the state airplane factory from Helsinki to Tampere in 1931 was both strengthening the regional industrial base and increasing local demand for business-to-business products. After the WWII, industrial companies locating in Tampere region stood for a substantial share of

<sup>41</sup> In this report this area is referred to as the Tampere City Region. The City Region consist of eight municipalities surrounding the City of Tampere.

<sup>42</sup> Picture on the left side sourced from <https://www.pirkanmaa.fi/en/>

<sup>43</sup> Stat: [http://tilastokeskus.fi/til/vamuu/2020/09/vamuu\\_2020\\_09\\_2020-10-22\\_tie\\_001\\_en.html](http://tilastokeskus.fi/til/vamuu/2020/09/vamuu_2020_09_2020-10-22_tie_001_en.html)

<sup>44</sup> Business Tampere: <https://business tampere.com/investments/investment-opportunities/intelligent-machines-and-manufacturing-industry/>

machines and vehicles production geared to war reparations Finland paid to the Soviet Union. Also, domestic demand was acute and new machinery had to be built to facilitate production of both industrial and consumer products. To cope this demand, the local technical professionals had to develop their skills and innovate to produce machines and machinery not manufactured in Tampere before - thus giving thrust to upgrading of skills and discovery of new markets.

Closer today, ICT industry and related activities have grown markedly and become an important sector in the region's economy. As a single actor, Nokia Corporation has had an important role in development of electronics and ICT related competences and activities in the region during the last 30 years. Nokia established a research center focusing on telecommunications technologies in 1987 in Tampere.<sup>45</sup> The company has a long track record of active research collaboration especially with local university sector but also partner companies. The collaboration has supported knowledge and know-how diffusion between academia and global corporate business while same time being an important recruitment channel for Nokia particularly around 2000s when company was growing fast and became to dominate global mobile phones market.<sup>46</sup> Nokia's fall and withdrawal from mobile phone business in the early 2010s sent reverberations through the local innovation system and economy but at the same time gave a thrust to development of new businesses building on competences in telecommunications and ICT more broadly. The ICT and software-based businesses have further diversified through growth of start-up sector and decisions of companies to locate their ICT activities in the region in recent years.

While regional industry base has diversified, the mechanical engineering industry has remained important part of the economy in Tampere region. In recent decades, the industry has succeeded renew itself; it has gone through a transformation which has turned according to Martínéz-Vela and Viljamaa (2004) *"a relatively low productivity, labor intensive metal industry to a concentration of export oriented and highly specialized firms supported by strong focus on R&D and high technology"*. This change has been accompanied by a wave of mergers and acquisitions result of which many of the core mechanical engineering companies in the Tampere region are today part of Finnish-origin or foreign owned corporate structures operating on global market.<sup>47</sup>

Based on the latest available statistics, Tampere region hosts circa 35000 business establishments (2019), which is one thousand more than in year 2015. The largest business sectors by turnover in Tampere region are in descending order industrial sectors (incl. manufacturing), trade, services, construction, experience economy activities and ICT. Total turnover of the sectors in Tampere

<sup>45</sup> Year before, in 1986 the city of Tampere had founded science park next to the University of Technology campus in the district of Hervanta. Nokia's research center were located in the same neighbourhood.

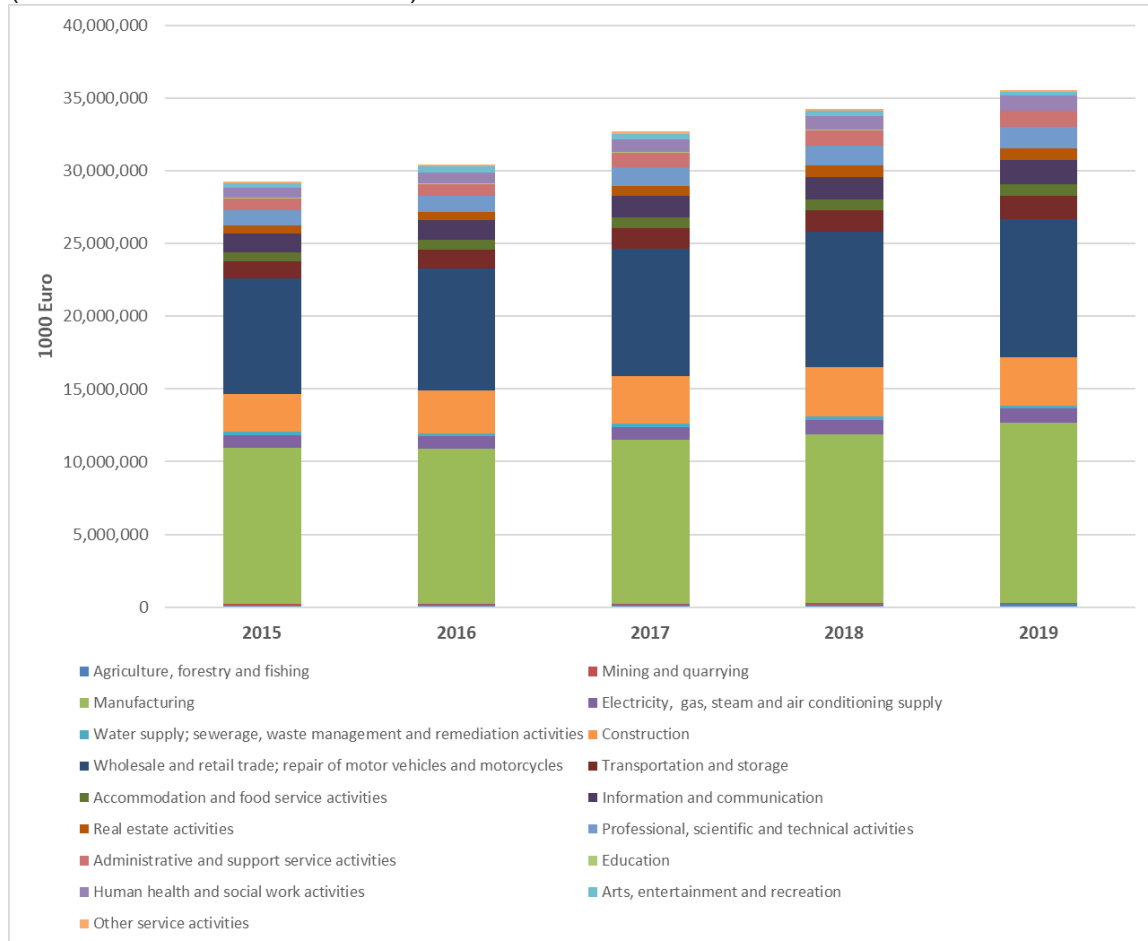
<sup>46</sup> Cf. Ali-Yrkkö, Jyrki; Hermans, Raine (2002) Nokia in the Finnish Innovation System. Discussion Papers, no. 811. ETLA, Elinkeinoelämän Tutkimuslaitos, The Research Institute of the Finnish Economy. Helsinki.

<sup>47</sup> Martinez-Vela, Carlos A.; Viljamaa, Kimmo (2004) Becoming High-Tech: The Reinvention of the Mechanical Engineering Industry in Tampere, Finland. Massachusetts institute of Technology, Industrial Performance Center. Special Working Paper Series on Local Innovation Systems (MIT-IPC-LIS-04-001, February 2004).



Region has increased from 29.2 billion euro in 2015 to 35.5 billion euro in 2019 (c.f. the figure 2 below).<sup>48</sup>

Figure 2. Turnover of establishments by business sector in Tampere region 2015–2019 (source: Statistics Finland data)



Industrial sectors account for more than one third of the total turnover in the region. Within this category, technology industry stands for 48%, forest 21%, chemical industry 16%, foodstuff 5% and textile 2% of the industrial sectors combined turnover. Regarding other major industries in the region, share of trade is 27%, services 15% and construction 9% while experience economy activities and ICT stand for 5% each of the total turnover in 2019.

Export volume of the sectors was in total 7 billion euro in 2019. Technology industry's share of the export value in Tampere region was 48% (3.4 billion euro), forest industry accounted for 29% (2.1 billion euro) and chemical industry 15% (1.1 billion euro).

<sup>48</sup> A closer look on the regional economy can be found in the report published jointly by the Business Tampere, the Council of Tampere Region, Tampere Chamber of Commerce and Suomen Yrittäjät (association presenting SMEs and their owners): [Tampere Region Economy 2020](#).

Employed labor force in the region grew from 205,000 persons in 2013 to 218,000 in 2018. 63% were employed in private sector, 10% worked as entrepreneurs and 27% were employed in public sector or in public sector-controlled companies in year 2018.

Personnel employed in businesses in the Tampere region has increased from 127,000 in 2015 to 138,000 in 2019.<sup>49</sup> Manufacturing industries share of the employment was 24% in 2019, down from 26% in 2015. Trade was second largest sector by employment by 14% of personnel employed in businesses, down from 15% in 2015. Construction and business service activities employed each 10% of the personnel in 2019. In absolute terms employment in the five-year period 2015–2019 increased most in health and social services, business services, information and communication sector and professional and scientific activities. (Stat.fi data)

Key industries and priority areas in the Tampere region include nowadays ICT including imaging technologies; intelligent machines and automation industries; RDI intensive health technologies to name a few. Public actors and agencies involved in regional and local development have in strategy processes identified areas in which the region has strengths and opportunities. The current Regional Strategy (2017) defines four thematic priority areas for smart specialization and renewal in the region: digital manufacturing, smart city solutions, circular economy, and wellbeing and health services and systems. The economic development strategy of the Tampere city region (2019) sees opportunities for ecosystem development in a wide set of areas covering safety and security, audiovisual productions, imaging technology, cleantech and circular economy, automotive industry, education and technology-based learning solutions, intelligent transport services and AI and analytics.

### 3.2.2 Science and education sector

The science and education sector in the region has gone through quite a metamorphosis from the 1960s until today. Prior to 1960, there was no higher education institutions in the region. University of Tampere was originally founded as a School of Social Sciences in 1925 and located in Helsinki. In 1960, the School of Social Sciences moved to Tampere and was renamed as University of Tampere in 1966. The social sciences heritage has remained strong also today within the university. Alongside of social sciences, the university has been swift to expand education and research in new fields and has been a forerunner for instance in computer science; the university chair in computer science was founded already in 1965, first in Nordic countries.<sup>50</sup>

As the region had been the most important industrial center in Finland since the 19<sup>th</sup> century, local actors and industry saw it crucial to have a technological university in the region as well. In 1965 Helsinki University of Technology established a Tampere-based branch. The branch then gained independent university status in 1972.<sup>51</sup> From the beginning, the new university put emphasis

<sup>49</sup> The figures presented here cover only enterprise sector establishments in the Tampere region.

<sup>50</sup> Kostiaainen, Juha & Sotara, Markku (2002) Finnish city reinvented. Tampere's path from industrial to knowledge economy. Massachusetts Institute of Technology, Industrial Performance Center, Special Working Paper Series on Local Innovation Systems. See, also Paakki, Jukka Opista tieteksi – Suomen tietojenkäsittelytieteiden historia (History of computer Science in Finland, only in Finnish). Tietojenkäsittelytieteen Seura ry. Helsinki: 2014.

<sup>51</sup> Times Higher Education: <https://www.timeshighereducation.com/world-university-rankings/university-tampere>

on cooperation with industry and transfer of expertise and know-how to the industry. The legislation of the University of Technology even stipulated that it had to invest in product development alongside of teaching and research.<sup>52</sup>

Possibility of a merger between these two universities has been in discussion throughout the years. However, it was not until 2014 before the official merger process, called Tampere3 began. The merger was approved by the Finnish Parliament in 2017 and following the decision University of Tampere (TAU) and Tampere University of Technology (TUT) merged in 2019 and formed new **Tampere University (TUNI)**.<sup>53</sup> In addition to the two universities, the merger process included Tampere University of Applied Sciences (TAMK) and these three institutions created the new **Tampere Universities community**.<sup>54</sup> As a result of this process, formerly separate organisations of TAU, TUT and TAMK share e.g. common strategy and priorities.<sup>55</sup>

Today, the foundation-based Tampere University is the second largest university in Finland. The University has 20,700 enrolled degree students and 3,500 staff members of which 2,100 in teaching and research (full-time equivalent). Comparative figures for the Tampere University of Applied Sciences are 10,000 enrolled degree students and 700 staff members.<sup>56</sup>

Technology, health, and society stand in the core of the Tampere University's research and education.<sup>57</sup> The university develops solutions to tackle climate change, preserve the natural environment and improve the well-being and sustainability of societies.<sup>58</sup> In its strategy, the university puts emphasis on quality and impact of research, attractiveness among international students and researchers and the internal synergies, which the Tampere Universities community offers.<sup>59</sup> TAMK, Tampere University of Applied Sciences is in its activities oriented toward working life and collaboration with partners in research, development, and innovation. Focus areas include technology, wellbeing services, business administration, and culture.

Decision to locate two of **VTT Technical Research Centre of Finland's** laboratories in Tampere in 1974 strengthened further the public research infrastructure, which was building around the universities in the region. VTT facilities were originally located in immediate vicinity of the University of

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<sup>52</sup> Kostiaainen, Juha & Sotarauta, Markku (2002) Finnish city reinvented. Tampere's path from industrial to knowledge economy. Massachusetts Institute of Technology, Industrial Performance Center, Special Working Paper Series on Local Innovation Systems.

<sup>53</sup> Aviisi: <https://www.aviisi.fi/2017/03/tampere-3-close-to-the-finish-line-record-of-conflicts-expunged/>

<sup>54</sup> Further information: [Tampere University | Tampere universities \(tuni.fi\)](https://www.tuni.fi/en/tampere-universities)

<sup>55</sup> Further information: [Tampere University | Tampere universities \(tuni.fi\)](https://www.tuni.fi/en/tampere-universities) [Tampere University | Tampere universities \(tuni.fi\)](https://www.tuni.fi/en/tampere-universities)

<sup>56</sup> Vipunen education statistics Finland: <https://vipunen.fi/en-gb/>

<sup>57</sup> University of Tampere: <https://www.tuni.fi/en/news/together-we-are-greater>

<sup>58</sup> University of Tampere, Strategy: <https://www.tuni.fi/en/about-us/tampere-university/strategy-and-key-information>

<sup>59</sup> <https://www.tuni.fi/sites/default/files/2020-04/tampere-university-strategy-2030.pdf>

Technology and still today are not located far away. Tampere office has become VTT's second largest office outside of Espoo in the capital region.

In addition to higher education and research, development and maintenance of vocational skills and competences is an important factor for companies locating in the region. Vocationally oriented education in the region is provided by TAMK and **Tampere Vocational College Tredu**. In its current strategy, Tredu has selected three focus areas for the period 2019-2022, namely technologically more intelligent future, future entrepreneurship, and sustainable way of life. Cooperation with partners in networks, industrial and innovation ecosystems locally and nationally is seen important element of Tredu's operation. Annually, Tredu with its 1,000 staff members arranges training for around 17,000 students.

There are also other actors active in provision of education and training in the Tampere region. For instance, **TAKK, Tampere Adult Education Centre** offers vocational qualifications and vocational further education in over 20 vocational fields including technology, construction, business, information services, and various service industries. TAKK collaborates closely with working life and companies in development of education, operations and learning environments. Annually over 12,000 adult students participate in education arranged by TAKK.

### 3.2.3 Innovation activities and technological profile

Regional strengths and industry potential play an important role in the development of future innovation- and technology strategies and innovation platforms and systems. Regional resources, capabilities, competences, and future business opportunities can give the region a competitive advantage over other regions. Alternatively, historically strong expertise on one innovation- and industry sector within the region can cause hindrance to future innovation activities.

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.

Today the innovation system in the Tampere region is rather a 'multi-actor, multi-level innovation network'. The weight of the industrial profile still lies with technology, manufacturing industry and ICT. These structures have a natural impact on the regional innovation activities and vice versa. As noted earlier, the strong industrial base of the region is complemented by an extensive network of educational institutions and research institutes.

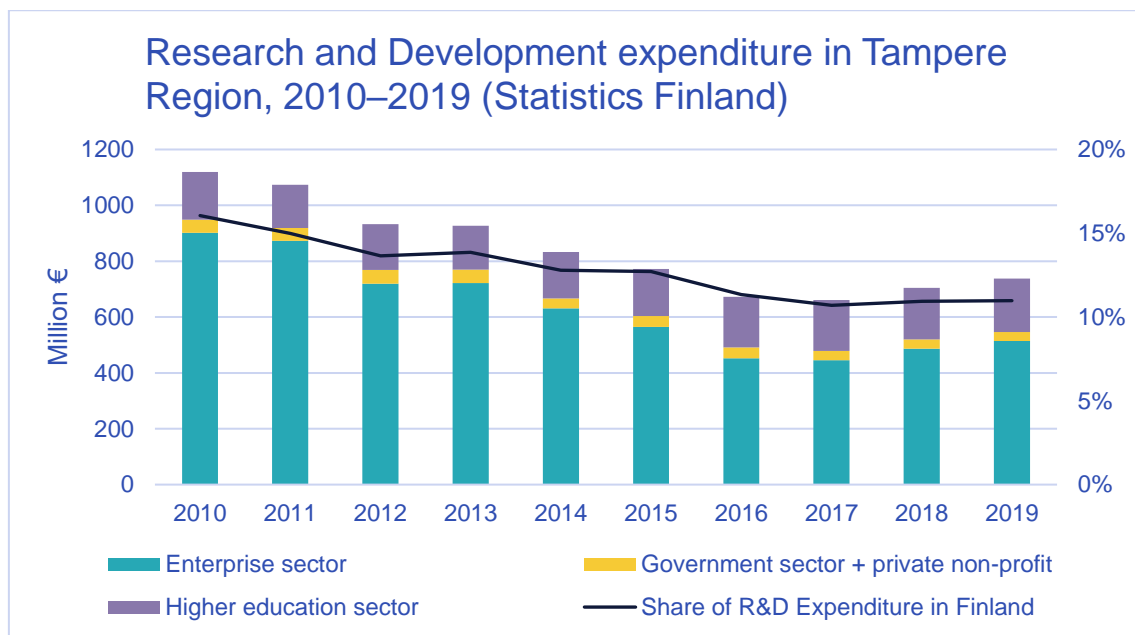
Presence of R&D oriented industries and higher education and research institutions shows in statistics on investments in research and development. Figure 3 below presents the trend for research and development expenditure in the Tampere Region and the region's share of R&D expenditures in Finland in 2010–2019. Research and development expenditures peaked regionally and in Finland in aftermath of the financial crisis in 2010–2011. After this, investments in R&D were nationally and regionally in decline until the years 2017–2018. Just

before the global Covid19 pandemic, expenditures in R&D increased by 5% year-over-year between 2018 and 2019 in the Tampere Region.<sup>60</sup>

The region's relative share of the national R&D expenditures hovered around 15% to 16% most of the early 2000s but have lowered somewhat and the region accounts nowadays circa 11% of total R&D expenditures in Finland. This is however above the region's weight in terms of population or GDP in Finland.

Private companies stand for majority of R&D expenditures in Tampere region. In its highest, companies share of R&D expenditures was over 80% (in period of 2005–2011) while today the corresponding figure is 70%. In comparison, however, the firms' share of R&D in the region continues to be higher than nationally; companies share of R&D investments is currently 66% in Finland. (Statistics Finland)

Figure 3. Research and Development expenditure in Tampere Region 2010–2019. (Statistics Finland data)



Tampere was one of the biggest R&D sites of Nokia as the company dominated global mobile phone market. In its peak, Nokia employed 4000 high-tech coworkers in R&D in Tampere alone. Changes in global mobile phone market forced Nokia to refocus its business and to sell handset business to Microsoft in 2013. This deal, in turn, affected R&D landscape across Finland and particularly in those locations in which Nokia mobile phones had major research and development centres – Tampere being one of them. The company did not

<sup>60</sup> The decline in R&D investments in Finland and the Tampere region relate to large extent to one industry sector, electronics and within it disappearance of Nokia's mobile phone business (cf. Ali-Yrkkö, Jyrki, Kuusi, Tero & Maliranta, Mika (2017). "Miksi yritysten investoinnit ovat vähentyneet?" ETLA Raportit No 70. <https://pub.etla.fi/ETLA-Raportit-Reports-70.pdf>, incl. executive summary in English). In addition, the decline was contributed by cuts in public expenditure and funding of R&D in Finland in the mid-2010s.



however withdraw completely from R&D in the region; Nokia networks has an R&D centre in Tampere and the company continues to collaborate with local actors. Late 2020 Nokia announced that the company together with Tampere University establish a centre of excellence at the university campus in order to enhance research and development in areas important to the company such as in 5G chipsets.<sup>61</sup>

■ Nokia legacy and the local competence base has continued to attract domestic and foreign companies to set up research and development units in the region. Recent examples include Chinese Xiaomi, which opened camera and imaging R&D centre in close vicinity to the technology campus of Tampere University in 2019.<sup>62</sup> A year later, HMD Global, a Finland origin startup company developing and producing Nokia branded smartphones, announced about foundation of new R&D centre in Tampere through acquisition of local start-up Valona Labs which specialised in the mobile, enterprise, and cybersecurity software.<sup>63</sup> In the beginning of 2021 Tampere-based M-Files, a software company developing and commercialising intelligent information management solutions, received 67 million euro growth investment from a group of international investors - being the largest inbound VC investment ever in Tampere region.<sup>64</sup>

Furthermore, there are number of other large companies in different industries carrying out R&D activities in their sites in the Tampere region. The region hosts several globally operating manufacturing and mechanical engineering companies from different market segments. Companies having local R&D units and/or pilot facilities include e.g. Cargotec Corporation producing cargo-handling equipment, Valmet Corporation active in the pulp, paper and energy industries, Sandvik Group specializing in development and manufacturing of technologies for mining and rock excavation, and John Deere Forestry producing forest machinery and equipments.

Economic activity in a region evolves and expands not only through renewal of existing industries but also through entrepreneurial activity and new ventures. Number of start-up and growth companies have increased notably in the Tampere city region during the last 10 years. The start-up and growth companies present wide variety of sectors from arts, entertainment, and recreation to manufacturing and further to ICT and scientific activities. There were 220 start-ups in 2020 in the city region – the number increased by 28% from 2019. The headcount of employees working in start-ups reached 1249 in 2020. Employment in start-ups was strongly concentrated into three sectors of which information and communication sector is by far largest, but also new businesses active in professional, scientific, and technical areas and in manufacturing employ

<sup>61</sup> Further information: <https://www.nokia.com/about-us/news/releases/2020/10/06/nokia-and-finlands-tampere-university-join-forces-to-develop-5g-chipsets/>

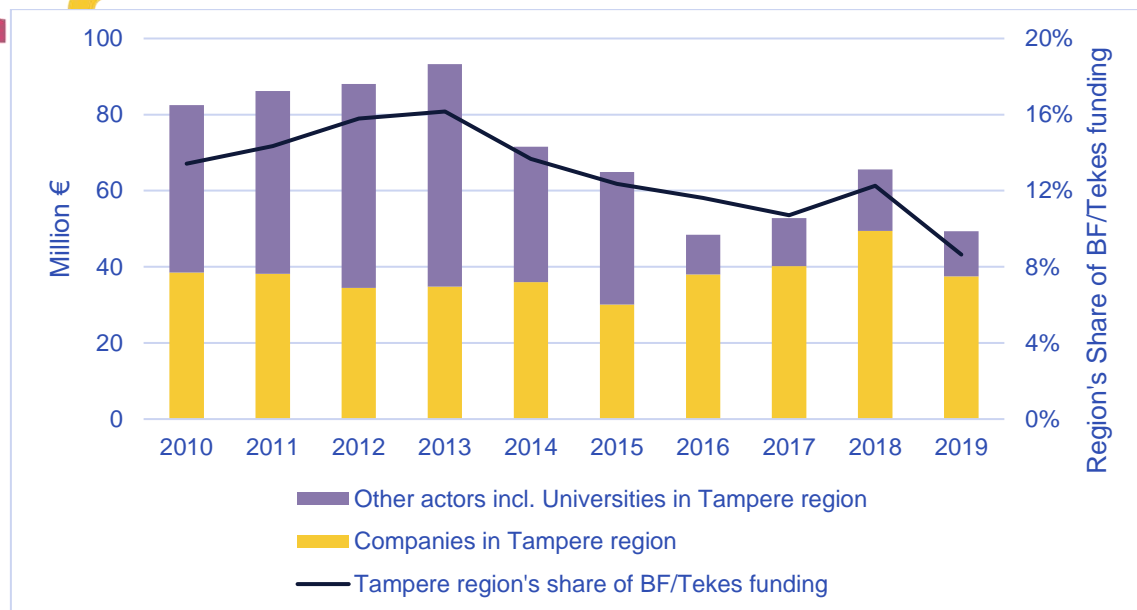
<sup>62</sup> Further information: <https://business tampere.com/smartphone-giant-xiaomi-opens-rd-office-in-tampere-finland-for-smartphone-cameras/>

<sup>63</sup> Further information: <https://www.hmdglobal.com/press-releases/new-centre-of-excellence>

<sup>64</sup> <https://resources.m-files.com/press-release-en/m-files-secures-80m-growth-investment-bregal-milestone>

sizeable amount of people. Science and technology-based start-ups work for example in cleantech, nanotechnology, life Sciences and ICT.<sup>65</sup>

Figure 4. Business Finland / former Tekes funding granted to the Tampere Region 2010–2019. (Source: Business Finland funding statistics, own calculations)



R&D funding granted by Business Finland and its predecessor Tekes to the actors locating in Tampere Region during 2010–2019 is presented in Figure 4. Business Finland is the primary national public agency providing funding for RDI in Finland. The agency's funds in the government R&D funding were cut markedly starting from 2014/15 until 2017 and focus of funding was at the same time channeled more towards company R&D. This shows clearly in the figures of funding granted to R&D projects of actors in the Tampere region.<sup>66</sup>

Regarding patenting activity, the Tampere Region has consistently ranked nationally 2<sup>nd</sup> most active region in number of patent applications filed with the Finnish Patent and Registration Office in 2012 – 2020 (Table 1 below). The region's share of all the patents applications filed annually has also been remarkably constant over the period being circa 8% per year.

Table 1. Patent applications filed with the Finnish Patent and Registration Office<sup>67</sup>

Region / Year	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Finland: Number of filings</b>	1702	1599	1420	1287	1257	1339	1336	1323	1588
<b>Tampere Region: Number of filings</b>	138	145	118	110	99	110	112	110	119

<sup>65</sup> Companies, Labour Market and Internationality in the Tampere City Region. Status 31<sup>st</sup> December 2020. Business Tampere.

<sup>66</sup> Official Statistics of Finland (OSF): Government R&D funding in the state budget [e-publication]. 2020. Helsinki: Statistics Finland [referred: 18.3.2021]. Available: [http://www.stat.fi/til/tkker/2020/tkker\\_2020\\_2020-02-20\\_tie\\_001\\_en.html](http://www.stat.fi/til/tkker/2020/tkker_2020_2020-02-20_tie_001_en.html)

<sup>67</sup> Data source: [https://www.prh.fi/en/patentit/Tilastoja/patent\\_applications\\_by\\_region.html](https://www.prh.fi/en/patentit/Tilastoja/patent_applications_by_region.html)

Tampere Region: Share of filings	8%	9%	8%	9%	8%	8%	8%	8%	7%
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### 3.2.4 Intermediaries and co-creation platforms

Depending on the viewpoint, there are a wide range of intermediaries associated with the territorial research and innovation system in Tampere region. In this case, intermediaries and co-creation platforms refer to the supporting services and partner organizations and communities which operate in the region. The number and diversity of these supporting and partnering actors may be a positive consequence of the region's traditional co-creation culture. The following examples are not exhaustive list of supporting and partnering actors, but these organizations are the most visible and important to this mapping report and analysis.

From the perspective of business, competitiveness and companies in the region, one of the most visible actors is **Business Tampere**, which is the economic development agency of the Tampere region. It promotes investments and creates an attractive environment for sustainable business in the region. Business Tampere operates within the Tampere city region economic development strategy and offers expertise on business service development, business environment, investments, and internationalization opportunities.

Additionally, **Tampere Chamber of Commerce and Industry (CCI)** is a leading business organisation in the Tampere Region. It represents over 2 000 companies and members from the private sector, ranging from industry to services and companies of all sizes, and provides support for networking and strengthening local economy.

To facilitate innovation, Tampere hosts a vibrant scene of innovation platforms, communities and networks linking actors from different spheres together. Such innovation hubs are needed to transfer science and technology knowledge produced in academia to innovation pilots, service concepts, demos and prototypes, and finally to market. In Tampere, these functions of fostering innovation culture can be divided roughly into two: 1) actors who aim to strengthen industry-academia collaboration; 2) platforms that aim to foster entrepreneurial (start-up) innovation culture.

In reality, many actors and platforms successfully combine characteristics of both, of which **Demola**<sup>68</sup> is a good example. Demola aims to pair companies with visionary students to develop a solution to company's genuine challenge. Demola calls itself as innovation challenge platform that combines a multidisciplinary team of university students and company's experts who work together in an innovation challenge for a fixed period of time.

This initiative has greatly contributed to innovation culture in Tampere, and Demola concept is one of the few initiatives that is internationally disseminated to 18 countries and proves to be working well in Finland and abroad. Besides solving challenges in the multidisciplinary environment, it promotes diversity intending to bring international talent together in Tampere.

If Demola is an example of fostering start-up innovation culture, a traditional example of academia-research organization-industry innovation platform initiative is

<sup>68</sup> Further information (in Finnish): <https://www.demola.net/>

**DIMECC**<sup>69</sup>, which originates from strategic knowledge cluster concept (SHOK) adopted in Finnish innovation policy around 2010s (2008-2015). SHOKs in turn mimic European Technology Platforms whose aim is to steer Joint Technology Initiative -projects. Given that DIMECC includes very strong regional network of manufacturing companies and links to research actors in Tampere, it was able to maintain its activities after SHOKS were officially terminated in 2015.

Intermediary activities linking research and industry in the region have developed gradually during the past decades. Technology transfer company **Tamlink Oy** was founded in 1986 and presents a first of its kind in Finland. Tamlink serves both companies and research community, and its services range from company specific R&D project to consortium projects and further to services for university start-ups. The company also collaborates with the university in implementation of the doctoral school for industrial innovation. Owners of Tamlink include e.g. Tampere University, the City of Tampere and VTT.<sup>70</sup>

Tamlink has an active role in operation of several network-based operations either directly or through its daughter company (New Factory). One of these ecosystems is **Forum for Intelligent Machines, FIMA** which has been operating since 2006. FIMA brings together mobile machines manufacturers, specialists, systems integrators, and research actors and promotes applied research in precompetitive phase in the field relevant for its member organisations<sup>71</sup>

Tamlink is also involved in **SMACC, Smart Machines and Manufacturing Competence Centre**. SMACC is a hybrid arrangement by VTT and Tampere Universities founded in 2015. Its mission is to support renewal and digitalisation of the Finnish manufacturing industry by offering research and development services. In practice, SMACC is a platform, which combines the competences and expertise, RDI infrastructures and networks of the background organisations and partners participating in the SMACC community. The competence centre locates in Tampere and several industrial partners from the region are on board, but it gathers for manufacturing companies across the country, as well as foreign companies interested in business in Finland.<sup>72</sup>

In order to strengthen operating environment for entrepreneurship and start-ups, there was launched a new support activity called **Platform 6** in Tampere in autumn 2020. The Platform 6 was set up by the city of Tampere and aim is to spur start-up ecosystem development. In addition to physical facilities, there is available support to different stages of new venture development. Activities are operated by a non-profit organisation, Tampere Startup Hub.<sup>73</sup>

The city of Tampere is also part of several national and international smart city networks.<sup>74</sup> For instance, **6Aika, also known as the Six City Strategy**, is an entity which aims to boost sustainable urban development, employment and

<sup>69</sup> Further information: <https://www.dimecc.com/>

<sup>70</sup> Further information: <https://www.tamlink.fi/?lang=en>

<sup>71</sup> Further information: <https://www.fima.fi/>

<sup>72</sup> Further information: <https://www.smacc.fi/?lang=en>

<sup>73</sup> Further information: <https://platform6.fi/>

<sup>74</sup> Further information: [Smart Tampereesta - Smarttampere](#)

competencies. With these projects, the Six Cities solve development challenges together with each other and companies, residents and RDI organisations. It is arrayed in three large-scale spearhead projects: Open data and interfaces, open participation and customership, and open innovation platforms.<sup>75</sup>

### 3.2.5 The Public sector and the Governance structure

Regional development and governance are carried out in co-operation with the regional governing bodies. A constant dialogue with the EU representative's office and the appropriate ministry is crucial in regional development and foresight. The Ministry of Economic affairs and Employment is frequently consulted in all matters relating to the territorial research and innovation system. Equally important are the ongoing dialogues with different stakeholder groups. In general, the engagement between the private-, science- and the public sector especially in regional development has been actively maintained. The main governance bodies of regions in Finland are the Regional Councils that are established by law and focuses on funding, regional development, and urban planning.<sup>76</sup>

#### *Regional governing & coordination bodies*

The innovation governance and especially regional innovation system development takes place in a collaboration between the Council of Tampere Region, City of Tampere, Tampere City Region, Business Tampere and Tampere Chamber of Commerce and Industry. Each organization governs a different part of the regional innovation system. The regional innovation governance is carried out in strong collaboration. Stakeholder partnerships are encouraged as each organization has a different character and approach.

The main regional governance body is the **Council of Tampere Region**, which operates as a regional development and -planning authority. The Council works as a representative of the 23 municipalities, inhabitants and businesses and promotes their interests and development nationally and internationally. Efficient co-operation in foresight is one of the key success factors of an innovative region. Traditionally the Council has been seen as a coordinating body or facilitator for cooperation and networking between various actors within the region. The Council emphasizes vision- and strategic matters on regional planning and development and publishes reports, analyses, and strategies.<sup>77</sup> The Council of Tampere region develops and publishes e.g. the *Situational Picture of Innovation*, the *Regional Strategy*<sup>78</sup>, the region's *Smart Specialization Strategy* and *Land Use Plan*.

Additionally, Tampere region was one of the first regions in Finland to send its regional EU representative office to Brussels. The **Tampere region's office in Brussels** lobbies regional interests, monitors EU programs and funding opportunities, seeks suitable project partnership opportunities thus,

<sup>75</sup> Further information: [Tampere - 6Aika](#)

<sup>76</sup> The Council of Tampere Region: Regional info: <https://www.pirkanmaa.fi/en/>

<sup>77</sup> The Council of Tampere Region: <https://www.pirkanmaa.fi/en/>

<sup>78</sup> TEM: <https://tem.fi/en/regional-councils>



strengthening the brand of the region in front of its peers. EU policies and politics matter at every level of regional policy planning, decision making, promoting, and building networks. Building a competitive region is a communal effort including a wide selection of stakeholder representatives.

The region of Tampere consists of 23 municipalities, but its largest center is the city of Tampere. As a governmental body, the **City of Tampere** is responsible for issues related to housing, employment, finance, transportation, health care, education etc. Like most of the other cities in Finland, Tampere has an active economic development policy. Tampere also acts as a local funding partner in many projects initiated by national or European measures.

### *National governing & coordination bodies*

Regional development does not take place in a void but is influenced by decisions and activities of actors operating on national and EU levels. In the field of RDI policies, besides ministries, there are agencies allocating funding for research and innovation as well as other public actors which through investments and other type of support aim to advance renewal and wellbeing of Finnish society across the country. Influence is, however, not unidirectional as the actors from the Tampere Region are in constant dialogue with agencies and departments at national level. This type of dialogue and interaction between actors on different levels is important for idea sharing and policy-making at all levels.

One national actor and important coordination body especially for the economic development and industry is **Business Finland**, formerly known as Finnish Funding Agency for Technology and Innovation (Tekes). It is the Finnish innovation funding, trade, investment, and travel promotion organization. Business Finland promotes *“the competitiveness of Finnish industry and the service sector by assisting in the creation of world-class technology and technological know-how”*.<sup>79</sup>

At the national level, a significant scientific research actor is **Academy of Finland**. It is a governmental funding body and operates under Ministry of Education and culture. Academy of Finland promotes and provides funding for academic and basic research in Finland and acts as an expert body in the national and international scientific networks. The Academy have stated that its guiding values are openness, transparency, reliability, and equality.

One national progressive development actor is **Sitra**, the **Finnish Innovation Fund**, which an independent public foundation that operates under the supervision of the Finnish Parliament. However, it is not answerable to the government and does not depend on the state budget; instead, its operations are funded with the profits of its endowment and the profits of its operations. Currently, Sitra drives sustainable and fair development by acting as a think tank, investment company and facilitator for co-creation and development.<sup>80</sup>

Different ministries interact with the regional development. One of them is the **Ministry of Economic Affairs and Employment (MEAE)**. It is responsible for

<sup>79</sup> Business Finland: <https://www.businessfinland.fi/en/for-finnish-customers/about-us/in-brief>

<sup>80</sup> SITRA: <https://www.sitra.fi/en/themes/about-sitra/>

industrial policy, and innovation and technology policy, functioning of markets, employment and work environment issues, regional development and co-operation of the regional councils, administrative steering of Centres for Economic Development, Transport and the Environment as well as energy policy and coordination and preparation of climate policy. MEAE steers innovation funding to the regional levels via **Centre for Economic Development, Transport, and the Environment (ELY-Centre)**. The ELY Centre is an important regional developer and distributor of EU funding. Unlike the other organizations presented here, it is a governmental institution and cooperates closely with the Regional Council and other agencies in the region in question.<sup>81</sup>

### 3.2.6 Priorities and strategies

There are number of strategies, initiatives and projects in the region. In this report only the most important ones for the mapping are mentioned and presented.

#### *Regional strategies and priorities*

The most significant strategic guideline published by the Council of Tampere Region is the **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, recognises 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. A new Regional Strategy is in preparation and will be published by the end of 2021.

Another important publication is the **Smart Specialisation in Tampere Region** which is drafted in accordance with the regional Program. 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. The smart specializations strategy of Tampere region will be updated during 2021 in accordance with the regional strategy.

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<sup>81</sup> ELY-centre: <https://www.ely-keskus.fi/web/ely-en/business-and-industry>

In 2020, the Council of Tampere Region together with the local Centre for Economic Development, Transport and the Environment developed the **Roadmap for the Carbon-Neutral region of Tampere 2030**. The roadmap offers a toolbox for region's municipalities to tackle climate change e.g. in the field of construction, energy, traffic, business, forest-and land-use.<sup>82</sup>

As the biggest population center in the region and a major city in Finland, the City of Tampere also has an important and influential position regionally. The **Tampere City Strategy**<sup>83</sup> outlines vision and the direction of development during the period of each City Council and beyond. In 2013 was published the Tampere City Strategy for 2025: *Joint Tampere - city of views*. The strategy acknowledges e.g. the importance of the co-creation as well as sustainability values. The strategy was formulated during turbulent times affected by the economic downturn, and it contained five strategic objectives: acting together, prevention and decrease in the imbalance of well-being, vitality and competitiveness, sustainable society, and balanced economy and renewable organisation. In 2017 was published a new strategy for 2030: *Tampere - the Best for You*<sup>84</sup> which consists of four strategic focus areas defined as follows: collaborative and humane, a leader in education and know-how, creative and innovative, and urban and sustainably growing. According to the strategy its implementation is emphasised importance to work together, to act responsibly and openly with courage.

Additionally, the City of Tampere has committed to the **Smart Tampere program** which is all about innovative development and creation of smart city solutions in the Tampere Region. Smart Tampere brings together the parties that develop digital services, products and processes, and the people that use them. Aim of the Smart Tampere is to open the needs of the cities and municipalities in the Tampere Region for co-creation and to provide companies testing grounds. The smart city solutions are developed mainly under the following seven themes: Smart Mobility, Smart Health, Smart Industry, Smart Government & Citizen, Smart Buildings, Smart Infrastructure and Smart Education.<sup>85</sup> Smart Tampere program has sub-programs which are **Tampere's digitalization program**, **ecosystem program**<sup>86</sup> and **Sustainable Tampere 2030 program**. The latter also includes **Carbon Neutral Tampere 2030 program**.<sup>87</sup>

### *Alignment with superior innovation strategies*

Finland's Ministry of Economic Affairs and Employment (MEAE) has developed and published the **Agenda for Sustainable Growth**<sup>88</sup> which is an over governmental strategical agenda for growth and development. In accordance

<sup>82</sup> Further information (in Finnish): [Hiilineutraali Pirkanmaa 2030 -tiekartta tarjoaa työkaluja ilmastotyöhön - Pirkanmaan liitto](#)

<sup>83</sup> Further information (in Finnish): [DK TRE strategia suomi kevyt.pdf \(tampere.fi\)](#)

<sup>84</sup> [https://www.tampere.fi/tiedostot/s/bGk985LuH/Tampere\\_City\\_Strategy\\_2030\\_Final.pdf](https://www.tampere.fi/tiedostot/s/bGk985LuH/Tampere_City_Strategy_2030_Final.pdf)

<sup>85</sup> Smart Tampere: [smart tampere.fi](#)

<sup>86</sup> [Smart Tampere \[Tampereen kaupunki\]](#)

<sup>87</sup> [Kestävä Tampere 2030 -ohjelma \[Tampereen kaupunki - Smart Tampere\]](#)

<sup>88</sup> Further information: [Agenda for Sustainable Growth - Ministry of Economic Affairs and Employment \(tem.fi\)](#)



with the agenda, the MEAE also has e.g. the **National Roadmap for Research, Development and Innovation** which has been prepared to promote sustainability<sup>89</sup> and a **Roadmap of financing models that support the United Nations' Sustainable Development Goals**.<sup>90</sup> MEAE's Agenda for Sustainable Growth influences various national sub-strategies and guides e.g. state-city partnerships from the point of view of innovation policy. Sustainability have embedded into various strategies by different actors. For instance, Business Finland launched its **Sustainable Manufacturing Finland** program which aims to renew business models and increase productivity, as well as seeks solutions to the challenges of the climate change.<sup>91</sup>

The Agenda for Sustainable Growth as well as other national sub-strategies and roadmaps have an influential connection to the region of Tampere and its development too, emphasizing the themes of sustainable development and co-development in regional development and funding of RDI projects. Accordingly, Agenda for Sustainable Growth acts as a guiding instrument for **Finland Fit for Digital** (Älyvalmis Suomi in Finnish) initiative which also has international connections as a counterpart to the EU's **Europe Fit for Digital Age** work.

Finland Fit for Digital initiative aims to create a national over-governmental strategy for sustainability of the industrial sector in Finland.<sup>92</sup> **Sustainable Industry X** (SIX) initiative aims to implement this national non-governmental strategy. The SIX will develop a unifying vision, roadmap and agenda for industrial renewal together with the industry, research, and public sector. Development work will be implemented by industry-driven clusters, e.g. intelligent mobile working machines. Even though the SIX is a national initiative, it has strong linkages to the region of Tampere due to the great importance of the region for the industrial sector and manufacturing industry.<sup>93</sup> The SIX is also one of the eight Finland's candidates for the **European Digital Innovation Hubs** (EDIH) of which many have in fact close connections to the region of Tampere. The EDIHs are part of the EU's new Digital Europe Program. They function as service points that boost digital investment and, in particular, the digitalisation of SMEs.<sup>94</sup>

Additionally, **Vanguard Initiative** is an initiative that is driven by a political commitment of regions to use smart specialization strategy for boosting new growth through bottom-up entrepreneurial innovation and industrial renewal in

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<sup>89</sup> Further information: [The National Roadmap for Research, Development and Innovation - Ministry of Economic Affairs and Employment \(tem.fi\)](#)

<sup>90</sup> Further information: [Developing Finland's Sustainable Finance Ecosystems - Ministry of Economic Affairs and Employment](#)

<sup>91</sup> Further information: [Sustainable Manufacturing Finland - Business Finland](#)

<sup>92</sup> Further information: [Hallituksen Toimet Innovaatiopolitiikassa Mika Pikkarainen TEM Sekesseminaari](#)

<sup>93</sup> Further information: [SIX | Sustainable Industry X](#)

<sup>94</sup> Further information: [Designation of Finnish candidates for European Digital Innovation Hubs - Ministry of Economic Affairs and Employment \(tem.fi\)](#)

European priority areas. Tampere region was one of the initiators and is a regional partner of the initiative amongst 30 other European regions. The smart specialization Vanguard Initiative seeks to lead by example in developing interregional cooperation and multi-level governance for supporting clusters and regional eco-systems to focus on smart specializations in these priority areas for transforming and emerging industries.<sup>95</sup>

### 3.3 Aspects of RRI in the region

#### 3.3.1 Status in the implementation of the RRI agenda: overview

The implementation of the RRI agenda is on its way regionally. Region's strong co-operation culture is taking steps towards new forms of cooperation and former cluster politics are shifting towards diversity and ecosystem thinking. However, before the aspects of RRI or sustainability pierce through all the levels of the regional innovation system there is still work to be done. The work is underway and new connections, relationships and attitude shifts happen daily. Sometimes these require a little push, but nevertheless systemic change is shaping the territorial innovation and research system.

From the national perspective, Finland has been associated in almost forty EU funded RRI projects.<sup>96</sup> Tampere region has been associated in quite a few projects as well. The variety has been vast and has ranged from responsible research projects executed by the science sector to regional development projects implemented by the governance sector of the region. The Tampere region has been associated with the following projects in the regional implementation of the RRI-agenda<sup>97</sup>:

**TetRRIS** project aims to promote and integrate RRI practices and aspects into regional research, development and innovation system by influencing regional projects and organizations.

**MARIE** project aims to improve regional public policy that supports delivery of RRI to enterprises' product, process and service design, production and distribution by including integration of RRI criteria into e.g. policy instruments or strategic focuses.<sup>98</sup>

**Co-Change** project aims to generate transformative capacity in local Co-Change Labs for institutional change in terms of RRI. As an end result, the outcomes will be analysed to produce a toolbox for RRI-related institutional changes.<sup>99</sup>

<sup>95</sup> European Commission: <https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/link/vanguard-initiative>

<sup>96</sup> Annex 1 of this document lists these projects.

<sup>97</sup> Sourced from: <https://www.tiedejatutkimus.fi/fi/results/fundings/RRI>

<sup>98</sup> MARIE-project: <https://keep.eu/projects/18816/MAinstreaming-Responsible-I-EN/>

<sup>99</sup> Co-Change project: <https://cochangeproject.eu/>



**New HoRRizon** project aims at further integrating RRI in the research and innovation systems on national and international levels. A first big step was the operationalisation of RRI into the following six key elements ethics, gender equality, governance, public engagement, science education and open access.<sup>100</sup>

**SEIS: Scaling Up Educational Innovations in Schools** (Tampere University) project aims to reinforce innovation research in education by supporting a partnership of the Centre of Excellence in Educational Innovation (CEEI) in Tallinn with its partners from Finland and Norway.

**I AM RRI: Web of Innovation and Value Chains of Additive manufacturing** investigates the AM innovation network in order to facilitate a better understanding and the modelling of the dynamics of its complex web of innovation value chains including openings for RRI.

**MULTI-ACT** (Tampere University) creates a Collective Research Impact Framework and multi-variate models to foster the true engagement of actors and stakeholders in Health Research and Innovation.

### 3.3.2 Role of the grand challenges of sustainability in the region

The “grand challenge” of sustainability plays an important role in innovation and development policy and practice in Tampere. The region of Tampere has taken proactive and progressive steps towards more sustainable and responsible regional society. To an increasing extent, most of the major public actors in the region are taking sustainability and responsibility into the account in their operations, policymaking and strategies. In addition, also companies have acknowledged these issues and are willing to explore opportunities to develop. However, progress in this matter needs much support, such as tools and initiatives and favorable systemic structural and cultural shift. Generally, among region’s actors, sustainability and responsibility issues often stay at the metalevel and are vaguely represented only in strategies and policy plans without practical implementation. The importance of these issues is acknowledged by different actors, but practical know-how and tools to foster sustainability in regenerative ways is still inadequate. The same characteristics can be seen in different contexts and relations in the innovation system. However, each of the experts interviewed for this report noted a clear change in attitudes and culture in this matter. The tone of the conversations around these topics have changed substantially during the last years.

In summary, sustainability and responsibility are well acknowledged and different sectors and actors have indicated their interests in the region. However, there is a great need to link and coordinate all the numerous projects addressing responsibility and sustainability issues. 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

<sup>100</sup> NewHoRRizon Project: <https://newhorizon.eu/>

casting defects and inefficiencies. Additionally, especially companies are facing challenges to identify and take part in the projects which are the most significant and noteworthy. 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.

### *Sustainability and responsibility in regional development*

■ Sustainability is addressed in the prevailing **Regional Strategy**<sup>101</sup>. Furthermore, sustainability themes, such as circular economy, inclusion and wellbeing, are part of the region's **Smart Specialization Strategy** which acts as a tool for steering European structural and investment funds<sup>102</sup>. Recently, an RRI-based taxonomy initiative, **MARIE project**<sup>103</sup>, promoting a responsibility criterion for the steering of funds in the regional innovation system is also executed by the Council of Tampere Region<sup>104</sup>. Additionally, an important signal is also provided by the regularly updated **Situational Picture of Innovation**, including sustainability in its core approaches<sup>105</sup>.

A topical issue is that the Council of Tampere Region has examined the **Doughnut Economy Model** and intends to apply it to regional development. The Doughnut model was devised by British economist Kate Raworth. It addresses the social and planetary boundaries within which the economy can operate to create welfare in its broadest sense – socially, culturally, economically and environmentally.<sup>106</sup> At the moment, the Tampere region is the only region in Finland addressing themes of the Doughnut Model, and most likely the second one in Europe besides the city of Amsterdam<sup>107</sup>.

As a dominating actor in the region, the City of Tampere has a great power but also a great responsibility to determine the direction of the regional development. It has a remarkable influence over the other municipalities of the region. According to the interviewed regional development experts, other municipalities in the region have a very favorable attitude towards the city of Tampere. There are no tensions, and on the contrary, other municipalities see Tampere as an important part of bringing vitality to them as well. Thus, the City of Tampere can act as an important influencer in sustainability issues for other municipalities. In the strategical level, the City of Tampere has taken a proactive role in this matter

<sup>101</sup> Regional Strategy of the Tampere Region 2018–2021. (2017). The Council of Tampere Region. (in Finnish) [Pirkanmaan liiton aineistopankki \(mediafiles.fi\)](https://mediafiles.fi/pirkanmaan-liiton-aineistopankki)

<sup>102</sup> Further information (in Finnish): [Pirkanmaan älykkään erikoistumisen strategia - Pirkanmaan liitto](https://pirkanmaan-alykkään-erikoistumisen-strategia-pirkanmaan-liitto)

<sup>103</sup> Further information: <https://keep.eu/projects/18816/MAstreaming-Responsible-I-EN/>

<sup>104</sup> Further information (in Finnish): [MARIE - Vastuullisen tutkimus- ja innovaatiotoiminnan hyödyntämiseksi aluekehittämisessä - Pirkanmaan liitto](https://marie-vastuullisen-tutkimus-ja-innovaatiotoiminnan-hyodyntamiseksi-aluekehittamisessä-pirkanmaan-liitto)

<sup>105</sup> Further information: <https://tieto.pirkanmaa.fi/inno/>

<sup>106</sup> Further information: [Doughnut | Kate Raworth](https://doughnut.kate-raworth.com/)

<sup>107</sup> Further information: [Amsterdam to embrace 'doughnut' model to mend post-coronavirus economy | Netherlands | The Guardian](https://www.theguardian.com/global-development/2020/04/21/amsterdam-embrace-doughnut-model-mend-post-coronavirus-economy-netherlands)

and included broadly cultural, social, environmental and economic values as well as citizen inclusion and engagement in its **Tampere City Strategy**<sup>108</sup>.

Additionally, sustainability related issues have been addressed in different strategic instruments. For instance, the Region of Tampere has the **Roadmap for Carbon-Neutral Tampere Region 2030**. Additionally, the City of Tampere has developed and committed to the **Sustainable Tampere 2030 Program** and the **Carbon Neutral 2030 Roadmap**, and started to operationalize these strategies in different areas, e.g. urban planning, carbon-binding construction, urban nature habitats, transport system, energy.<sup>109</sup> The **Economic development strategy of Tampere City Region**<sup>110</sup>, prepared in a process coordinated by Business Tampere, promotes business renewal, sustainable growth and diversified economic structure. Regarding opportunities of sustainable development, the strategy identifies social responsibility and circular economy as cross-cutting competitive factors, critical for existing and new business in the city region.

The region has visions and efforts made for creating more and more inclusive RDI networks and joint activities to boost such themes as sustainability, co-creation, inclusiveness and safe and ethical digitalization. For instance, at an initiative and project level, there has been individual projects addressing e.g. the ethical issues on AI<sup>111</sup>, robotics<sup>112</sup>, and other digitalization related issues. Recently, the Regional Council of Tampere, VTT and Tampere University established an ERDF funded **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.<sup>113</sup>

Furthermore, citizen inclusion and engagement have long been part of urban development. There has been for example urban development projects which have had a strong emphasis on involving and engaging especially the citizen but also local universities and VTT. Innovative **Hiedanranta**<sup>114</sup> is a good example of City of Tampere's vision to create a smart and sustainable city district and encourage different stakeholders, companies and people living in the new area to collaborate and come up with new innovative ideas supporting the development towards a CO<sub>2</sub> negative district. Hiedanranta provides a development environment and a cooperation platform for smart and sustainable urban development projects and experiments. Other similar examples are

<sup>108</sup> Further information (in Finnish): [Tampereen strategia 2030.pdf](#)

<sup>109</sup> Further information (in Finnish): [Kestävä Tampere 2030 -ohjelma \[Tampereen kaupunki - Smart Tampere\]](#)

<sup>110</sup> Further information: [Economic development strategy of the Tampere city region - Business Tampere](#)

<sup>111</sup> e.g. Tampere AI ecosystem, further information: [Tampere.ai](#), and ethical AI project KITE, further information (in Finnish): [Kehitteillä: eettisesti kestävä tekoäly | Tampereen korkeakouluyhteisö \(tuni.fi\)](#)

<sup>112</sup> e.g. Trinity DIH, further information: [TRINITY | Cognitive Robotics with Tampere University | Tampere Universities](#)

<sup>113</sup> Further information (in Finnish): [Pirkanmaan ekologinen transito | Tampereen korkeakouluyhteisö \(tuni.fi\)](#)

<sup>114</sup> Further information (in Finnish): <https://hiedanranta.fi/en/>

developing communality and well-being at **Tesoma**<sup>115</sup>, **Kolmenkulma**<sup>116</sup> eco-industrial park (together with the cities of Nokia and Ylöjärvi) and **Rantatunneli**<sup>117</sup> which aims to provide both jobs and income to the citizen and act as platforms for new growth for businesses and other stakeholders in the region.<sup>118</sup>

Many of the experts interviewed for this report highlighted that the region has a long history and cultural base in citizen inclusion, public engagement, and cross-sectoral co-operation. The importance of the co-creation and innovation activities have been acknowledged, and supported by institutionalization. Co-operation culture has traditionally included local public actors, universities, other scientific organizations and industry actors. The right state of mind and co-operation culture between different actors in the region create a fertile base for sustainable development since sustainability challenges require collective changes and solutions.

Generally, the shared aim in the region of Tampere is to create the ground for innovation, development and research in which responsibility and sustainability are built-in elements. It can be seen that favorable atmosphere and momentum for this is constantly evolving. From the point of view of a regional development expert, all executed activities, projects and initiatives have raised awareness among actors and highlighted the importance of sustainability and responsibility aspects. The concept of mission-oriented innovation policy has already been acknowledged regionally, offering a potential basis to put sustainability at the core of the mission-orientation approach. However, practical know-how and implementation of strategies to a practical level are needed among public sector actors, too.

### *Sustainability and responsibility in the industrial sector and ecosystems*

Among industrial sector there are remarkable platforms and initiatives promoting co-creation, such as Smart Machines and Manufacturing Competence Centre (SMACC)<sup>119</sup>, Smart Manufacturing Hub (SMH)<sup>120</sup> and Sustainable Industry X (SIX)<sup>121</sup> which are aiming to bring different actors together, foster ecosystemic thinking and network and build shared vision for the industrial sector in the region. Even though e.g. **Sustainable Industry X** is a national project, it has strong linkages to the region of Tampere due to the great importance of the region for the industrial sector and manufacturing industry.

<sup>115</sup> Further information (in Finnish): [Tesoma kehittyy – Tesoma \(matesoma.net\)](https://matesoma.net)

<sup>116</sup> Further information: <http://kolmenkulma.fi/en>

<sup>117</sup> Further information: [http://www.tampere.fi/en/city-of-tampere/info/current-issues/2015/05/28082015\\_3.html](http://www.tampere.fi/en/city-of-tampere/info/current-issues/2015/05/28082015_3.html)

<sup>118</sup> European Commission: <https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/organisation/laansi-suomi/city-tampere>

<sup>119</sup> Further information: [Valmistus | SMACC | Älykkäät koneet | Suomi](#)

<sup>120</sup> Further information (in Finnish): [Pirkanmaa kehittää yhteistyöllä älykkään valmistavan teollisuuden TKI-keskusta - Pirkanmaan liitto](#)

<sup>121</sup> Further information (in Finnish): [Pirkanmaasta valmistavan teollisuuden paras paikka kehittyä - Business Tampere Magazine](#)

The SIX aims to respond to the need of the national Industrial Strategy. According to the expert of regional economic and industry development, there has been a lack of a national long-term industrial strategy in Finland. Industrial RDI, at least from a sustainability perspective, has not been sufficiently supported and funded in the past. The national longer-term industrial strategy would be needed for industry actors to create stable foundations for investments and provide commonly agreed vision of the industrial sector's future. However, the expert representing the field of commerce and industry stated that Finnish actors have started to embrace a green transition and fair digitalisation, familiar from the EU's strategic guidelines. These values are found in different strategies and funding programs. Their effects extend to the region of Tampere. For instance, Business Finland recently launched its **Sustainable Manufacturing Finland program**<sup>122</sup>.

In this context, a noteworthy initiative in the region is recently launched **Six Manufacturing Hub (SMH)** which aims to boost co-development and make the region of Tampere as a smart and sustainable center 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.<sup>123</sup>

According to the interviewed industrial experts, the linkage between competitiveness and sustainability have been recognized in the industrial sector. Moreover, conversation around ecosystems, their benefits and functions has increased, as views of linear supply chains have shifted to value network perspectives and actors are about to understand reliance on others as a vital factor for the resilience and competitive advantage. For instance, network-level information sharing, breaking companies' business-as-usual boundaries and cross-sectoral protocols are present in topical discussions, but it is still recognized that these issues require extensive co-development and ecosystems between actors to make them come true. Two interviewed experts brought up that regarding sustainability in the industrial sector, cross-industry ecosystems are vitally beneficial and can be used to create the necessary systemic solutions across industry sectors. However, on the other hand companies may struggle to find common ground to develop cross-industry collaboration. The challenge is cultural differences between industries and companies. For instance, traditional manufacturing companies, especially SMEs, are struggling to keep up with the digitalization demands and constantly evolving business culture. Traditional companies may struggle to co-operate with innovative and agile companies, such as ICT companies. Nonetheless, ICT-industry has a cross-sectoral role in digitalization and prevailing development.

As previously mentioned, the region of Tampere has a significant number of local SMEs, but also large international manufacturing companies. SMEs in the region are a heterogenous group and generalizations are difficult. According to some of the industrial experts, traditional corporate social responsibility (CSR) aspects, such as labor well-being and labor rights, safety, or resource efficiency are

<sup>122</sup> Further information (in Finnish): [Sustainable Manufacturing Finland - Business Finland](#)

<sup>123</sup> [Pirkanmaa kehittää yhteistyöllä älykkään valmistavan teollisuuden TKI-keskusta - Pirkanmaan liitto](#)



typically an established part of the business among local manufacturing SMEs. However, wider acknowledgement of the sustainability, externalities and impacts are not as recognized. This can be explained e.g. by limited resources and a lack of expertise or incentives to tackle these issues. For SMEs, especially at B2B side, there are no real incentives to consider these issues, unless required by the supply network's head organization. For this reason, most of the SMEs need public sector's support to network and evolve favorable conditions to even consider whether to participate RDI ecosystems.

Large international manufacturing companies are relatively advanced with awareness of the sustainability challenges related to their business but also to society at large. Larger companies often face more pressure from customers and other stakeholders regarding sustainability and responsibility issues. Therefore, these issues are present at least in larger companies' reporting and, on a case-by-case basis, in strategical and operational levels as well. On the one hand, larger companies are leading the ecosystemic development and their example is needed in the region to pave the way and point the direction for SMEs. On the other hand, large companies themselves need each other's support to develop solutions and shared will-power and vision to address sustainability challenges. However, large companies will-power is not sufficient alone, but public actors are crucially needed as enablers by creating preconditions and platforms for conversation and networking. Just like any other actors, larger companies need incentives and push to expand networks and break traditional business boundaries, for example to include competitors in business-as-usual practices.

Many of the interviewed industry experts stressed that the manufacturing industry has always been fundamentally interested in issues related to sustainability, like resource efficiency. Thus, to some extent industry actors have been developing their products and processes for long in a way that can be seen to address the challenges of ecological sustainability. As awareness of sustainability has grown, things are just discussed in different words. For example, resource optimization has been identified and re-branded as eco-efficiency. Alongside ecological issues, the labor well-being and rights are seen important in an established way.

According to an interviewed expert, sustainability is still seen as a separate part of the core business model. In fact, sustainability is often referred to product development, but there are signs that it might become as an integrated part of the business logic. However, a diverse and broad understanding of sustainability and responsibility (e.g. multidisciplinary perspective of impacts, transition thinking and broad well-being) is still under progress. Additionally, RDI practitioners and manufacturing companies are lacking practical know-how in sustainability and are incapable to implement wider sustainability aspects into companies' actions and RDI projects and realize these issues in their business models.

Many of the manufacturing companies in Finland are struggling with a shortage of experts and skilled employees. Old experts are retiring and there are not enough new experts available as much as would be needed to respond new challenges and changing business environment. Traditional technical fields and manufacturing industry are no longer at the top of the list of interests for young generations and future experts. One of interviewed experts indicated that younger generations see impact and purpose driven careers more and more important. Others interviewed also pointed out that sufficient labor well-being and

labor rights alone are no longer enough. Instead, the values, impact and purpose of the work is becoming ever more important for new generations' experts. Thus, a companies' sustainability handprint may weigh even more in the future to get the employees with the right competence.

To conclude with, the interest and motivation towards increasing integration of sustainability and responsibility into the core of the companies have been raising. Whereas the current Covid-19 pandemic drew attention and resources away directly from sustainability for a moment, the global pandemic has also emphasized the importance of sustainability, responsibility and, in particular, competency in resilience.

### 3.3.3 Status of different RRI elements

From the perspective of regional development and RDI networks in the industrial sectors, we have identified six RRI themes that are of particular importance in the region, on the basis of executed desk research, interviews and analysis. These themes are anticipation: impact and risk assessment and management, openness: open innovation and open science, gender and diversity, stakeholder inclusion and public engagement, transparency and communication of RDI activities, and last, reflexivity and responsiveness.

#### *Anticipation: Impact and risk assessment and management*

Impact and risk assessment can be approached by anticipation, which involves systemic thinking of possible direct and indirect impacts of the RDI activities and outcomes.<sup>124</sup> In order to be able to identify and assess different impacts more multidimensionally, the diversity of perspectives should be maximized in order to detect unrecognised risks and impacts. Actors in the region of Tampere generally have an established mindset for foresight in the context of impacts and risks. However, the scope, depth and diversity of different impacts and risks included in foresight practices should be further developed. The impacts and risks are understood mainly technically and economically by different actors that emphasises a need to increase systematic and multidimensional understanding.

Whereas the region is very technically oriented, the understanding of the impacts and risks is often very technical, direct and tangible. Thus, the understanding and valuing of intangible and indirect risks and impacts should be promoted. In this context, multidisciplinary understanding and know-how would be beneficial in this context too. Central actors of the region's RDI networks are often the same established set of people. Therefore, broadening and ensuring the diversity of people and multidisciplinary perspectives would be beneficial for region's RDI activities to improve quality and responsibility of the RDI processes and outcomes.

#### *Openness: Open innovation and open science*

As mentioned, co-creation culture and multi-sector and multi-actor co-operation have a long history and cultural base in the region. There is strong trust among the various actors. Thus, new joint-initiatives seem to be easy to take under

<sup>124</sup> Stilgoe, Jack; Owen, Richard; Macnaghten, Phil (2013): Developing a framework for responsible innovation, Research Policy 42 (9), S. 1568–1580. DOI: 10.1016/j.respol.2013.05.00

development, and regional development actors have executed open innovation practices for long. Similarly, among industry actors open innovation is an established mindset for approaching opportunities and challenges. Generally, also citizens have been taken into consideration in the regional development, like inclusivity too. Thus, co-creation and inclusivity can be seen as a built-in characteristic of the region of Tampere.

■ According to the interviewees, there have also been multiple individual initiatives and projects with an aim to strengthen these dimensions and increase open innovation and open science aspects. For example, **Demola** has been a progressive co-operation platform of its time and is still boosting co-creation and development in unique way by bringing innovative and international university students together with companies, and public actors. Demola is also an intermediating actor in communicating new generations' representatives' worldview to the companies and public sector. Another example is **InnoHEIs** initiative which aims to strengthen the connection between companies and education institutions' innovation platforms<sup>125</sup>.

Industrial actors are familiar with RDI co-projects with research organizations, universities and public sector. However, recently the amount of the co-operation especially with universities has decreased overall in Finland<sup>126</sup>, but also in the region of Tampere which had been well-known for cooperation between industry and universities especially in the field of technology.

Openness is considered to generate significant benefits and to improve outcomes and returns of the RDI process. Open science refers to sharing research outcomes and data, making it freely available and encouraging its reuse and dissemination. Open innovation advocates that the innovation processes should be opened up to all relevant stakeholders along and across sectors and value chains.<sup>127</sup> Even though, the region of Tampere has a strong co-creation culture and actors are very open to embrace it, there is still work to be done increasing and integrating proper and broad open innovation and science practices.

For instance, long historical roots and traditions in networking in the region do not have only positive aspects and upsides. Pre-established groups of actors and people who are familiar with each other and used to co-operate together may limit the access of new actors. When there is same group of actors 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 is likely to be essential 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 part of industrial RDI activities, should be developed towards more eco-systemic network approach and cross-sectoral co-

<sup>125</sup> Further information (in Finnish): [Innovaatioiden Pirkanmaa syntyy yhdessä - Pirkanmaan liitto](#)

<sup>126</sup> Further information (in Finnish): [vaikuttavuussaatio\\_selvitys.pdf](#)

<sup>127</sup> Stilgoe, Jack; Owen, Richard; Macnaghten, Phil (2013): Developing a framework for responsible innovation, Research Policy 42 (9), S. 1568–1580. DOI: 10.1016/j.respol.2013.05.00

operation regenerating solutions. Additionally, it should also be analyzed whether completely new actors, people, perspectives, and know-how can be brought into this development, alongside traditional and self-evident industrial actors. This would increase cross-fertilization between actors by sharing knowledge, knowledge, know-how and experiences.

Although the region is traditionally oriented to co-operation, it can be seen that this does not extend beyond the region on the same scale. Local actors prefer to co-operate with other local partners (e.g. local universities, local companies or local research organizations) but especially international co-operation is relatively scarce compared to interest towards local co-operation. Despite the fact that internationalization is seen as an important and interesting opportunity, in the end, the benefits of geographical proximity and the trust created by a shared culture seem to be more attractive. Therefore, new approaches should be developed, and ecosystems' focus expanded to address these issues. For example, previously mentioned SIX and SMH initiatives are currently addressing these concerns related to co-operation in the industrial sector in local, national and international levels. At the same time, the importance of geographical proximity, existing trust and shared culture, in co-learning should not be underestimated but acknowledged and supported.

Further, in the context of open innovation the differences between large companies and SMEs are relevant. Open innovation ecosystems often depend on the larger companies, and SMEs are following the example. However, SMEs might not have required business-relations to the right actors or enough resources, trust, incentives or motivation to participate in ecosystems. As manufacturing SMEs are often in the upstream of the supply chain, they are under principal company's interest and desires. According to the expert of regional economic and industry development, especially local manufacturing SMEs need further support connecting and creating networks to address demands and opportunities related to digitalization, automation and sustainability. Peer support, benchmarking and sharing of experiences for addressing these issues are needed. For instance, Technology industries of Finland has approached this issue and started to create foundations for establishing a **technology and innovation network for the Finnish manufacturing industry**<sup>128</sup>.

For the renewal of industrial companies in the region, one topical possibility is to pave more way for start-ups to take part into networks and co-development. For SMEs, startups may offer opportunities in developing old business models, adopting innovative technologies, and creating novel solutions, but also even generating new business ideas replacing the old ones. Additionally, there are a punch of startups e.g., in the ICT sector providing valuable competence for large companies as well as SMEs. Tampere has not had an established and functioning platform to bring together start-ups and established companies. However, just recently networking forum and space, **Platform6**, has been created together with public actors and local non-profit organizations for this need. It is hoped for future that larger companies will find ways to co-operate more

<sup>128</sup> Further information (in Finnish): [Finnish Advanced Manufacturing Network -webinaari 29.1.2021 | Teknologiateollisuus](#)



extensively with start-ups and that they will dare to adapt their business models taking advantage of the opportunities that start-ups have to offer.<sup>129</sup>

### *Gender and Diversity*

The Region of Tampere has favorable 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. Therefore, diversity issues should be considered not only in RDI teams, decision-making and advisory bodies, but also in systematically addressing the variation of the perspectives and needs of diverse groups and consequences of these variations for project design, use-cases, and outcomes.

According to Wilsdon and Willis (2004)<sup>130</sup> and Guston (2011)<sup>131</sup>, traditionally engaged groups of RDI practitioner profiles, such as (predominantly male) senior researchers, entrepreneurs, policy makers and funders, should be examined and the diversity of the actor profile expanded. Minor groups in RDI activities are often women, ethnic minorities, and people from disadvantaged socio-economic backgrounds. Also, the possibility and benefits of involving citizens and NGOs should be assessed.

The diversity of the groups and practitioners is not enough, but RDI practitioners should give greater attention to the power structures between groups and people involved – whose voice will be heard and to whom the questions will be asked. A diverse group of people and perspectives in RDI activities produce better quality RDI processes and outcomes as well as impacts that are more positive.<sup>132</sup>

Especially in the field of industrial RDI, the nature of the industry sector and the history of the region leads on the challenges in diversity. Industrial sector as well as RDI field are traditionally dominated by men and older generations. The history of the region, national pride Nokia and its technological success story in the past, has left behind an established group of top professionals who continue to have a strong influence in the fields of industry, technology and RDI. From the perspective of diversity, it is challenging that these groups represent a certain age group and gender. 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,

<sup>129</sup> For further information: [Platform6 - The one stop for all things startup in Tampere](#)

<sup>130</sup> Wilsdon, J., Willis, R. (2004): See through Science. Why Public Engagement Needs to Move Upstream. London

<sup>131</sup> Guston, D.H. (2011): Participating Despite Questions: Toward a More Confident Participatory Technology Assessment. In: Sci Eng Ethics 17(4), S. 691–697

<sup>132</sup> Stilgoe, Jack; Owen, Richard; Macnaghten, Phil (2013): Developing a framework for responsible innovation, Research Policy 42 (9), S. 1568–1580. DOI: 10.1016/j.respol.2013.05.00



technology and RDI.<sup>133</sup> However, for example the number of women in higher education is currently higher than that of men in Finland nowadays<sup>134</sup>.

According to regional development experts, for instance initiatives regarding attraction and retention of international experts and students have taken place in the region. One of the communities contributing to innovation diversity is **International Talent community**, which builds around activities and services Business Tampere develops to attract international highly skilled talent to migrate and reside in the Tampere region.<sup>135</sup> Similarly, initiatives are under development in relation to gender issues in RDI activities. The Council of Tampere Region for example co-operated with **NordWit initiative** to advance gender equality between researchers and regional agencies<sup>136</sup>.

However, there is a lot of systematic and long-term work ahead regarding diversity issues. Interviewed people from different fields of expertise estimated that although diversity issues are seen especially important, there have been no systematic interventions to assess, identify or assure diversity issues. Diversity issues related to, for example age, gender, or ethnic background, are structural challenges and deeply embedded in the culture, making their identification challenging without systematic assessment.

### *Stakeholder inclusion and public engagement*

Stakeholder inclusion is close to open innovation and diversity issues. In this case, stakeholder inclusion addresses systemic activities broadening the scope of groups involved and expanding value chains and networks beyond obvious. It is about mapping of all potential stakeholders, engaging in a dynamic dialogue with them and taking into account the insights, opinions and values observed as an ongoing process all along the RDI processes. Public engagement in turn refers to co-creation and dynamic dialogue with citizens and civil society organizations.

In the region, stakeholder inclusion is a frequently addressed aspect among regional public actors and RDI practitioners and it is an integral part of region's co-creation culture. For instance, in the urban development projects civil society and citizens have been actively included to the process. Stakeholder inclusion and public engagement are well considered in many regional development processes, but the range of stakeholders could be further expanded. Additionally, it would be valuable to assess the current ways of engaging in dialogue and, above all, to assess how different perspectives gained through the dialogue are taken into account in the processes and projects.

As previously stated, in some contexts and established groups of actors, inclusion may be limited in certain stakeholder groups. The interviews point out that in the industrial ecosystems' stakeholder inclusion includes traditional industrial and

<sup>133</sup> Further information (in Finnish): [Alle viidennes opiskeli joista opinnoissa joissa tasaisesti naisia ja miehiä – koulutusalojen eriytyminen jatkuu | Tieto&trendit \(stat.fi\)](#)

<sup>134</sup> Further information (in Finnish): [Tilastokeskus - Korkeakouluissa opiskelevat naiset valmistuvat miehiä todennäköisemmin ja nopeammin](#)

<sup>135</sup> Further information (in Finnish): <https://internationaltampere.fi/>

<sup>136</sup> Further information: [Advancing gender equality through collaboration between researchers and regional agencies – NORDWIT](#)

RDI practitioners, whereas e.g. NGOs and civil society have not found their influential role and voice yet. Various ideas and conclusions can be derived from this. As such, it is logical for the nature of the sector that, for example, individual citizens are not involved in practical and technology oriented RDI projects in industry. However, increasing the amount and usability of different living labs for piloting, testing and prototyping would be important to validate e.g., the user-perspective in RDI processes. Living labs are one option to include civil society members. Furthermore, the closer we get to sustainability issues, the more interfaces can be found here. Citizens, civil society organizations, NPOs and NGOs, could be interested in at least hearing what is happening in industrial RDI and understanding it better. This could also arouse young people's interest in the industrial and RDI sector as a career option.

### *Transparency and communication of RDI activities and science education*

It was mentioned above that communication on industrial RDI activities could be beneficial for example in increasing the interest of young people towards industrial field and RDI work by making it more attractive. This is also an aspect of the RRI Key of "science education", which stresses the need to raise the attractiveness of scientific careers for young people (as well as the importance of raising the science literacy of the population more broadly, and involving ordinary citizens directly in the RDI process (citizen science)).

In any case, in the field of regional development, the importance of broad and transparent communication is essential. This can be justified at the overarching level of regional development activities since they are often more directly linked to different levels of society and individuals. In addition, regional development projects are often in more general and collective level, which makes communication even more important in order to increase citizens' awareness and understanding of different projects, initiatives, and strategies.

Transparency can be promoted through open communication, but the scope for disseminating information and targeting it to all relevant groups should be considered to realize transparency in practice. In most cases, information on public projects can always be found on the websites of RDI practitioners, and projects may even have their own websites. However, it may be difficult for groups and individuals outside the field of RDI and regional development to become aware of these activities and projects and thus participate in them. According to the interviewees, for example universities in the region have long organized various events for citizens to make science and RDI more familiar and closer to "ordinary citizens". More broadly, of course, as centers of tertiary education, the universities in the region play a central role in regional (and indeed, national) science education. However, any other systematic interventions related to these themes did not emerge in the interviews by other actors.

### *Reflexivity and responsiveness*

A value base can be seen as a result of the previous themes – anticipation, impact and risks assessment, systematic stakeholder inclusion, open and transparent communication about the RDI activities, addressing diversity issues and opening the innovation processes. All these dimensions are important to gain legitimation for the common values and acceptance of the RDI actions. Reflexivity is about

examining one's cognitive and normative frames, e.g. own assumptions, knowledge bases, biases, motives and values. Practitioners' should assess their own cognitive and normative frames ensuring that they are not dominating the RDI processes and outcomes. Furthermore, responsiveness is about reacting to the gained new insights and taking them into account when executing the project. Being reflexive and responsive are on-going processes which should be constantly re-evaluated and developed.

■ In particular, responsiveness refers to the impact and risk management. When potential or realized previously unrecognized impacts and risks are identified, the aim is to react and manage them, i.e., to be responsive. Responsiveness requires RDI projects have flexibility in their schedules and resources to take the findings into account, but also that RDI practitioners are prepared to change their original plans and take the new findings into account on a practical level.

The point in gaining more diverse insight by broadening the perspectives and the range of participants is to be able to take action to respond to them. 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 the gained insight and new understanding. 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.

### 3.4 Challenges related to the implementation of RRI in the region

#### 3.4.1 Systemic and cultural hindrances

As mentioned earlier, the city of Tampere is a single dominating actor in the Region of Tampere. It has a great power but also a great responsibility to be a role model for other municipalities in the region and to lead the development in the right direction. However, the municipalities in the area differ from each other, especially compared to the city of Tampere. Small neighboring municipalities are very different RDI environments than the city of Tampere - not to mention more further away areas in the region. The special characteristics of municipalities must be taken into account in regional development work.

Additionally, according to a few of the experts representing regional development, the City of Tampere has act proactively in the sustainability issues, but other municipalities may not be as advantageous in sustainability aspects. Smaller municipalities may not have the practical skills or multidimensional understanding in sustainability at all. At the same time, smaller municipalities do not have enough resources or similar kind of strategic power as the City of Tampere, whereas the City of Tampere is even developing its own sustainability and carbon neutrality programs. However, the experts interviewed see that also in smaller municipalities, attitudes are turning to be more favorable for sustainability issues.

Also, 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 number of industrial companies is by no means 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.

■ The opportunities and potential related to different ecosystems have been acknowledged by different actors, but support and favorable shift in various levels are needed to accelerate the creation of more ecosystemic way of working and culture. Especially from the viewpoint of the industry experts, public actors should act as an enabler and leave the stage for other actors to bring their needs and challenges at the center of ecosystem. RDI practitioners in ecosystems' development should also strive to pay more attention to the practical level, implementation and long-term vision of the ecosystem in order to make the purpose of the ecosystem tangible.

The region of Tampere has an established co-operation culture and well institutionalized systems and practices for joint actions. The region further has many different public institutions and public-private platforms to support co-operation relations. Strong institutions are certainly a strength of the region, but it would be beneficial to assess whether there are situations when strong institutions and actors dominate the RDI field too much. It would be useful to assess in more detail how smaller or invisible actors are perceived and included and how their voices are heard.

### 3.4.2 Funding and incentives

There has been a message from both regional development and industry that higher-level strategies and perseverance have been lacking in local and national coordination. Short-sightedness makes it difficult for actors to commit to change and invest in development. In addition, due to short-term goals and separate individual projects, major changes and achievements will not be realized. Recently, it has been seen that, 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. In addition, for example industry-led initiatives are aiming to compensate the lack of a long-term vision.

However, 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.

The regional development expert noted that the role of regional funding instruments as an incentive is relatively small. Thus, national and international support is needed to enable and fund the right kind of development. Once again, national strategies that guide funding would be needed in this matter. Interviewees also pointed out that the requirements towards responsibility of RDI activities as well as the sustainability impact of RDI project outcomes should be reflected in national funding criteria by public institutions. For instance, Business Finland emphasises 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 right sustainability impacts of RDI projects is nominal. The funding criteria should be more concrete and sustainability implementation in different projects thoroughly measured and tracked. However, this kind of verification and monitoring requires a lot more resources.

The users of various funding instruments are also largely established, couple of the interviewees noted. 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. Moreover, according to experts representing industrial sector, national public funding has not so far sufficiently supported SMEs in their RDI activities and networking. On the other hand, when funding goes to large companies, funds eventually descend towards the upstream chain – to SMEs, which often are e.g., suppliers and subcontractors of larger companies. However, the funding field would require wider stakeholder inclusion and communication. Additionally, individual companies and entrepreneurs should be further educated on the various funding opportunities.

While funding instruments have been adopted only by an established group of actors, there also seems to be an established group of actors participating in the RDI co-operation with the universities as well. One of the industry experts also pointed out that cooperation possibilities with universities are still limited only to relatively restricted number of companies. Opportunities to collaborate with universities should be more feasible for a wider range of companies.

Recently the extent of the co-operation between business and research have decreased, overall in Finland.<sup>137</sup> but also, in the region of Tampere which has been known for cooperation between industry and universities especially in the field of technology. There may be many reasons for this, but the funding of industrial RDI activities has been rather weak from the public side lately, and companies have too been less interested in funding co-operative RDI with universities<sup>138</sup>. 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,<sup>139</sup> which are often the opposite of business collaboration and “commercial” research.

<sup>137</sup> Source and further information: [vaikuttavuussaatio\\_selvitys.pdf](#)

<sup>138</sup> Source and further information: [vaikuttavuussaatio\\_selvitys.pdf](#)

<sup>139</sup> Further information: <https://www.tuni.fi/sites/default/files/2020-04/tampere-university-strategy-2030.pdf>



Some of the interviewed experts noted, that support is needed to increase the amount of co-operative RDI between companies and universities. Funding research projects is one key factor but supporting the generation of favorable attitudes and motivation of the actors is essential to create thriving circumstances for co-operation. Public and semi-public actors are needed as facilitators and funders. However, nor can there be good commercial research unless companies themselves show interest and support its emergence by co-funding. Thus, due to the lack of funding, universities have not been able to adequately respond to the companies' growing and changing needs for top-level professionals and research, says an expert representing regional economic development.

### 3.4.3 Acceptance and values

Quoting one of the interviewees, Tampere is a "small big place". This suggests that Tampere is so small that things are not thought as very diverse and ideas can saturate, and prevailing biases persist. Among region actors, there is relatively little competing ideas and regenerative movement compared to large urban centers.

Additionally, pre-established groups of actors and people who are familiar with each other and used to co-operate together may limit the access of new actors and 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, should be developed towards more eco-systemic network approach and cross-sectoral co-operation to create new solutions. Additionally, it should also be analyzed whether completely new actors, perspectives and know-how could be brought into this development alongside traditional and self-evident actors.

One key challenge is the understanding of responsible RDI and sustainability by different actors in different contexts. The dimensions of sustainability require multidisciplinary and extensive expertise in its own area. In addition, depending on the context and use-case, sustainability knowledge should be integrated to each field's special features. For instance, integrating sustainability aspects into the manufacturing industry demands a broad understanding of both, industrial and sustainability sides.

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 if it is needed to diversify and deepen the knowledge and views of cooperation and ecosystems. Sustainability and responsibility are often seen as these "softer" things.

Based on the interviews, it can be identified that the understanding of sustainability by different parties is often incomplete and narrow. In addition, while understanding the importance of responsible RDI activities is incomplete, its significance and benefits cannot yet be seen in its value. Different actors may be insufficiently motivated to address sustainability and responsibility issues due to the fact that the benefits are not known.

### 3.5 Overview and conclusions

Based on the executed desk research and expert interviews, we have identified six most important RRI themes in the regional development and industrial RDI networks. The themes are (1) anticipation: impact and risk assessment and management, (2) openness: open innovation and open science, (3) gender and diversity, (4) stakeholder inclusion and public engagement, (5) transparency and communication of RDI activities, including science education, and (6) reflexivity and responsiveness. In addition to these six themes, we have identified one key factor for all the six themes. The key factor is increasing and broadening practitioners' and other actors' multidimensional understanding of sustainability.

From the perspective of industrial and public actors, and other RDI practitioners, it is important to deepen the understanding of sustainability so that practitioners can integrate it extensively into development work, implement the know-how to a practical level, create new innovative ideas and spread the understanding forward. Additionally, deeper and wider understanding of these issues create motivation to address them. It is important that benefits and impacts will be made visible in concrete and understandable way. Thereby different actors see the importance of addressing responsibility and sustainability issues and invest time and resources in them.

For industrial actors, this may create a greater motivation to get involved in different ecosystems and collaborate with multiple and new actors. Eventually, this may mean more motivation to develop current business-as-usual business models towards regenerating sustainability assets and leaving positive impacts behind them. From the perspective of the regional public actors, sustainability could be included more broadly, multidimensionally and in depth in regional development. In addition, the ability to translate strategies into practical operations may be increased, which would contribute to sustainable development in the region. Public actors could also provide more credible and impactful platform for interaction between different actors and sectors, and therefore thriving co-operative sustainability.

**For industrial actors and related RDI practitioners,** three RRI themes were identified as most important. These three themes were (1) open innovation & open science, (2) risk & impact assessment (anticipation), and (3) diversity perspectives. As stated earlier, industrial actors and RDI practitioners still have room for improvement in the openness of RDI activities and pitfalls to tackle. Furthermore, while openness and co-operation are important for sustainable development, we see that open innovation and open science are essential to address and develop further. Additionally, from a sustainable development perspective, co-creation and ecosystems are important for creating required collective solutions and systemic change. Jointly determined actions, policies,

protocols, and vision are needed to encourage companies to invest in sustainability and build trust and foundations for sharing resources, information and even business models and value networks. Secondly, industrial companies need each other to respond to increasing requirements set by digitalization. Shared visions are vital in this matter as well and companies need each other for learning, benchmarking, and changing experiences, making investments, and creating novel solutions and business models together.

■ Regarding impact and risk assessment, we consider that it would be useful for industrial actors and RDI practitioners to broaden understanding of different risks and impacts, and to bring into use broader and more systematic tools for assessment and management. The impacts and risks are understood mainly technically and economically on behalf of the different actors. More systematic and multidisciplinary understanding, including sustainability, humanities, and social sciences, would be needed.

In turn, we identified diversity issues as an important theme due to the lack of systematic interventions to assess, identify or assure diversity issues even though interviewed people from different fields saw diversity issues especially important. Diverse groups of people in RDI activities would produce better quality RDI processes and outcomes as well as more positive impacts.

**For regional development and related RDI practitioners,** three RRI themes were identified as most important, namely (1) systematic stakeholder inclusion & public engagement, (2) reflexivity & responsiveness, and (3) communication & transparency. With the wider stakeholder inclusion, regional development actors could involve new unrecognized actors in the development work and thus gather more diverse perspectives that would further improve public engagement through dialogue with a wide range of stakeholders.

Reflexivity and responsiveness would be important in the sense that when new and diverse perspectives are observed, systemic tools are developed to address them in regional development processes. It should be feasible to react to unrecognized issues. Additionally, processes and projects should have enough flexibility in the matter of time and resources to take them into account. Finally, RDI practitioners' own prejudices and bias should be reflected so that they do not affect the direction and content of regional development.

Communication and transparency are way to ensure stakeholder inclusion and public engagement. When dissemination regarding regional development projects and processes is broad and transparent, new actors are more aware of the issues that interest them and can take part in regional development. By accessible and transparent communication, the acceptance of the regional development emphasis will be publicly assessed. Additionally, all the previous RRI themes mentioned increases the credibility and validity of the value base behind regional development and decision making.

## ANNEX

List of the RRI-projects in Finland. Past and present. Not directly associated with the Tampere Region's Research and Innovation System<sup>140</sup>:

1. FIT4RRI
2. RESPONSIBLE INDUSTRY
3. ARK OF INQUIRY
4. Critical Making
5. RIPEET
6. OSOS
7. EQUAL-IST
8. RAISD
9. GREAT: Governance of Responsible innovation
10. PandeVITA
11. NExtGENProteins
12. BODEGA BOrdDErGuArd
13. ROBUST
14. COASTAL
15. ENERI
16. CIMULACT
17. PROTREIN
18. CSI-COP
19. CREATIONS
20. CIRCLE
21. FRANCIS
22. MultiCO
23. RURALIZATION
24. SySTEM 2020
25. ALLINTERACT
26. PoliRural
27. DIOGENES
28. IRRESISTIBLE
29. CS-Track
30. FEDORA
31. ONLINE-S3
32. CoM\_n\_Play

<sup>140</sup>Sourced:

[https://cordis.europa.eu/search?q=\(%2Farticle%2Frelations%2Fcategories%2Fcollection%2Fcode%3Dbrief%20OR%20\(%2Fresult%2Frelations%2Fcategories%2Fcollection%2Fcode%3Deliverable%2C'publication'%20OR%20\(%2Fresult%2Frelations%2Fcategories%2Fcollection%2Fcode%3Dpubsum'%20OR%20contenttype%3Dproject'\)\)%20AND%20relatedRegion%2Fregion%2FeuCode%3DFI'%20AND%20\('RRI'\)&p=3&num=10&srt=Relevance:decreasing](https://cordis.europa.eu/search?q=(%2Farticle%2Frelations%2Fcategories%2Fcollection%2Fcode%3Dbrief%20OR%20(%2Fresult%2Frelations%2Fcategories%2Fcollection%2Fcode%3Deliverable%2C'publication'%20OR%20(%2Fresult%2Frelations%2Fcategories%2Fcollection%2Fcode%3Dpubsum'%20OR%20contenttype%3Dproject'))%20AND%20relatedRegion%2Fregion%2FeuCode%3DFI'%20AND%20('RRI')&p=3&num=10&srt=Relevance:decreasing)

## Karlsruhe Technology Region

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Author(s): Nicholas Martin, Thomas Stahlecker, Hendrik Hansmeier, Nils Heyen, Petra Jung-Erceg, Lukas Kurzmann

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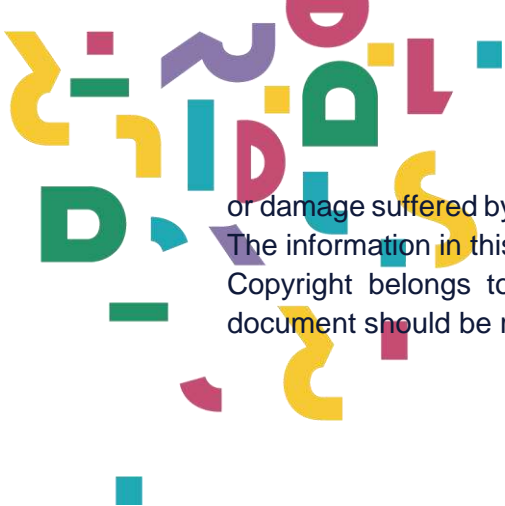
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## 4.1 Abstract

This Report describes the structure of the innovation system in the Karlsruhe Technology Region, and analyses the degree to which the ideas and principles of Responsible Research and Innovation (RRI) are practiced by local innovation actors. The Karlsruhe Technology Region is found to have a well-established and densely populated innovation system featuring an array of leading universities and extra-university research institutes, a strong industrial base made up of a mix of large multinational companies, SMEs and startups, and public administrations. Particular industrial and scientific strengths of the region lie in the fields of transport and mobility, energy, and information and communications technology (ICT). Crucial governance and orchestration functions for the innovation system are provided by the structure of the Karlsruhe Technology Region GmbH (TRK GmbH). 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.

Many of the core underlying ideas and concerns motivating RRI have disseminated widely into the culture and society of the Karlsruhe Technology Region. Accordingly, quite high levels of de-facto RRI can be observed to be practiced by innovation actors, even though the technical RRI terminology is not widely known among them.

## 4.2 Structure and organisation of the regional innovation system

The Karlsruhe Technology Region is located in the upper Rhine valley, in the south-west of Germany and northern Alsace, and close to the major metropolitan areas of Stuttgart and Mannheim. It 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 strong cooperative relationships and linkages between them. With a total size of almost 6000 km<sup>2</sup> and about 1,7 million inhabitants, the region includes parts of the federal states of Baden-Württemberg and Rhineland-Palatinate in Germany as well as the region of Alsace in France (Figure 1). Thus, the regional innovation system Karlsruhe is structured both inter-regionally and cross-nationally. The diversity of actors, institutional and cultural frameworks, as well as their interconnections, shape the knowledge and learning processes in the region and contribute directly to the emergence, diffusion and use of innovation. As a result, the region has established itself as a centre for research and innovation. [Figure 2](#) illustrates the innovation system of the Karlsruhe Technology Region with the specific actors that contribute to innovation input (researchers, mediators, capital providers, educators) and innovation supply and demand (business, social and public sector actors), both being influenced by supportive innovation frameworks (institutions, infrastructure,

policies, socio-cultural context). These individual elements/actors are examined in more detail below.

Figure 1: The Karlsruhe Technology Region

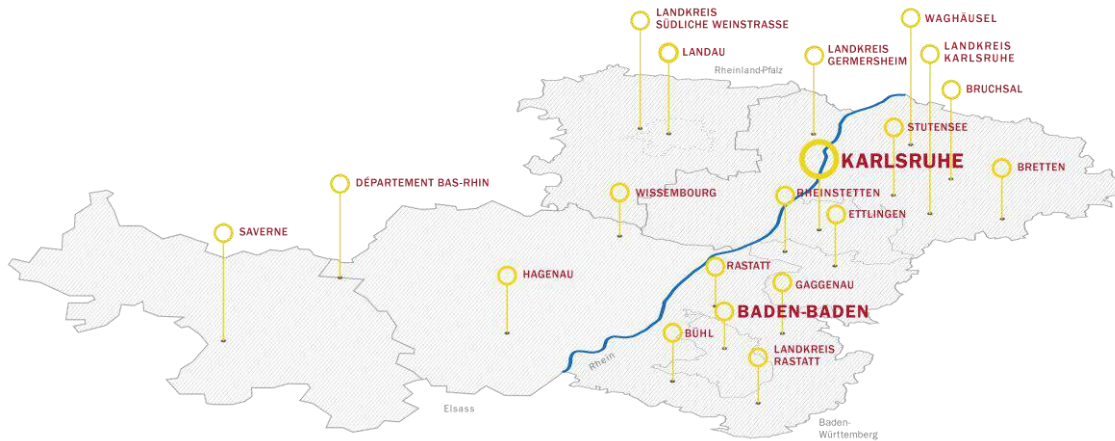
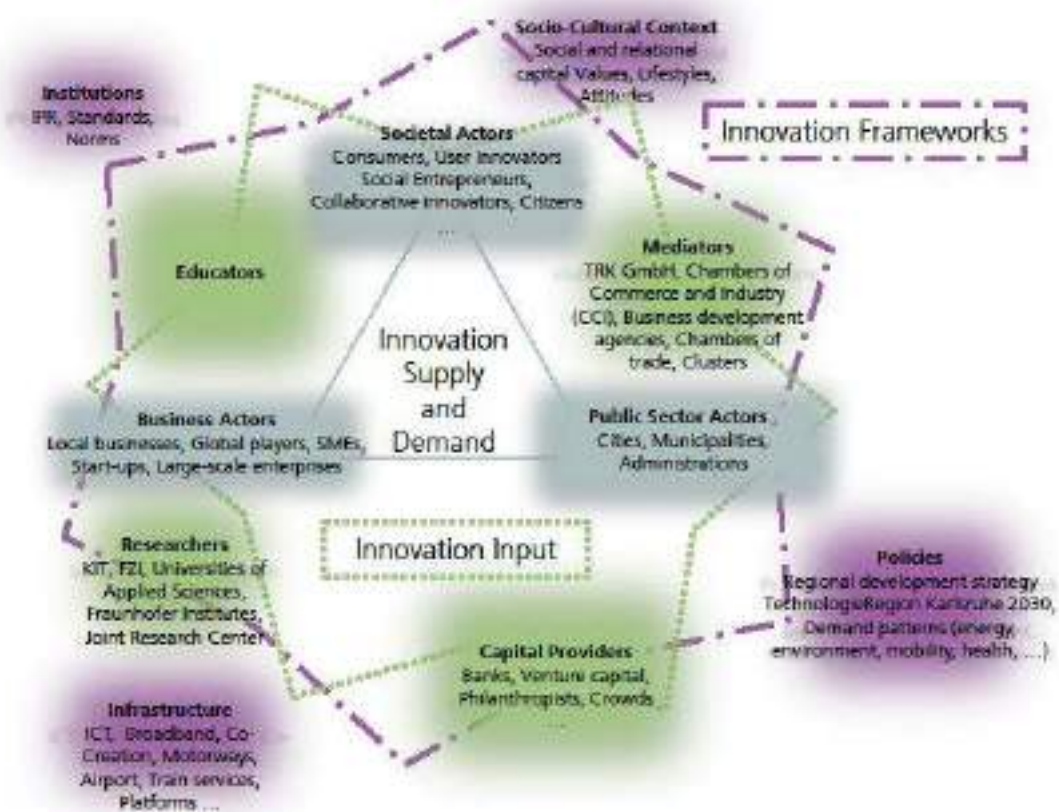


Figure 2: Innovation system framework of the Karlsruhe Technology Region



Source: Adjusted (Warnke et al. 2016)

#### 4.2.1 Industry structure (actors, priorities and dynamic)

The industry structure of the Karlsruhe Technology Region features a mix of multinationals, global players, start-ups and SMEs. In addition to the availability of skilled workers, the physical and digital infrastructure, consisting of major transport links (airport, Rhine ports, train stations, motorways) and ICT/fibre-optic internet solutions, is an important location factor for the economy. The fact that the region is an important business location becomes clear when looking at economic figures. The regional gross domestic product (GDP) per capita, to which the private sector significantly contributes, was around 43,000 EUR in 2016<sup>141</sup>. Compared to 2008, this means an increase of almost 18 percent. At the same time, the GDP per capita is significantly above the German average of around 38,000€ (TRK & Fraunhofer ISI 2019). Moreover, the unemployment rate in 2019 was historically low at around 3.2% (Germany 5%), indicating a strong regional labour market and above-average purchasing power (Wirtschaftsspiegel 2020).

The dynamic development of the regional economy is also evident from the employment data (see. [Table 1](#)). Between 2013 and 2019, the number of employees has increased by almost 12% to around 570,000. Relatively strongest increases were recorded in the following sectors: “transportation and storage” (+34%), “real estate activities / professional, scientific and technical activities” (+34%), “construction” (+25%), “accommodation and food service activities” (+22%) and “administrative and support service activities” (+21%). Together they now account for about a quarter of all employees. The sectors “education”, “financial and insurance activities” and “mining and quarrying / energy / waste supply, sewerage, waste management and remediation activities”, on the other hand, recorded single-digit percentage declines in employment over the same period. With more than 200,000 employees, “manufacturing” and “wholesale and retail trade; repair of motor vehicles and motorcycles” continue to be the most important sectors, even if these two areas have developed less dynamically than average.

With regard to the performance of the manufacturing sector, the share of employees in cutting-edge and high-value technology industries provides information on the importance and development of technology-oriented activities. Although an overall shift towards service-related sectors is evident in the region, the share of employees in cutting-edge technology sectors amounted in 2018 to just under 2%, which corresponds to around 11,000 employees (not depicted). The cutting-edge technology sector includes industries such as pharmaceuticals, electronic components, hardware, telecommunications equipment, measurement and control technology, medical equipment and medical devices as well as the

<sup>141</sup> As the French department has only been part of the region since 2019, all numbers and figures only refer to the German parts of the Karlsruhe Technology Region.

aerospace industry. In contrast, the high-value technology sector combines a significantly higher share of employees (12.5%) in the Karlsruhe Technology Region in 2018. High-value technology sectors include, for example, the chemical industry, the automotive industry and mechanical engineering. In a direct comparison with the German average, these industries have a significantly higher weight in the Karlsruhe Technology Region. (TRK & Fraunhofer ISI 2019).

Table 1: Development of employees by sector in the Karlsruhe Technology Region

Economic sector	Employees 2013	Employees 2019	Change (%)
AGRICULTURE, FORESTRY AND FISHING	2,634	2,892	9.79
MINING AND QUARRYING / ENERGY / WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT AND REMEDIATION ACTIVITIES	8,532	8,141	-4.58
MANUFACTURING	134,974	138,432	2.56
CONSTRUCTION	23,959	29,804	24.40
WHOLESALE AND RETAIL TRADE; REPAIR OF MOTOR VEHICLES AND MOTORCYCLES	71,262	76,508	7.36
TRANSPORTATION AND STORAGE	22,272	29,870	34.11
ACCOMMODATION AND FOOD SERVICE ACTIVITIES	13,011	15,884	22.08
INFORMATION AND COMMUNICATION	25,603	29,618	15.68
FINANCIAL AND INSURANCE ACTIVITIES	18,799	17,292	-8.02
REAL ESTATE ACTIVITIES / PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES	36,931	49,419	33.81
ADMINISTRATIVE AND SUPPORT SERVICE ACTIVITIES	18,741	22,746	21.37
PUBLIC ADMINISTRATION AND DEFENCE; COMPULSORY SOCIAL SECURITY / ACTIVITIES OF EXTRATERRITORIAL ORGANISATIONS AND BODIES	27,811	31,463	13.13
EDUCATION	19,855	18,920	-4.71
HUMAN HEALTH SERVICES	30,110	36,048	19.72
RESIDENTIAL CARE ACTIVITIES / SOCIAL WORK ACTIVITIES WITHOUT ACCOMODATION	26,326	31,520	19.73
OTHER SERVICES	15,530	17,491	12.63
<b>TOTAL</b>	<b>512,893</b>	<b>572,730</b>	<b>11.67</b>

Source: Authors' own calculation based on Federal Employment Agency (2021)

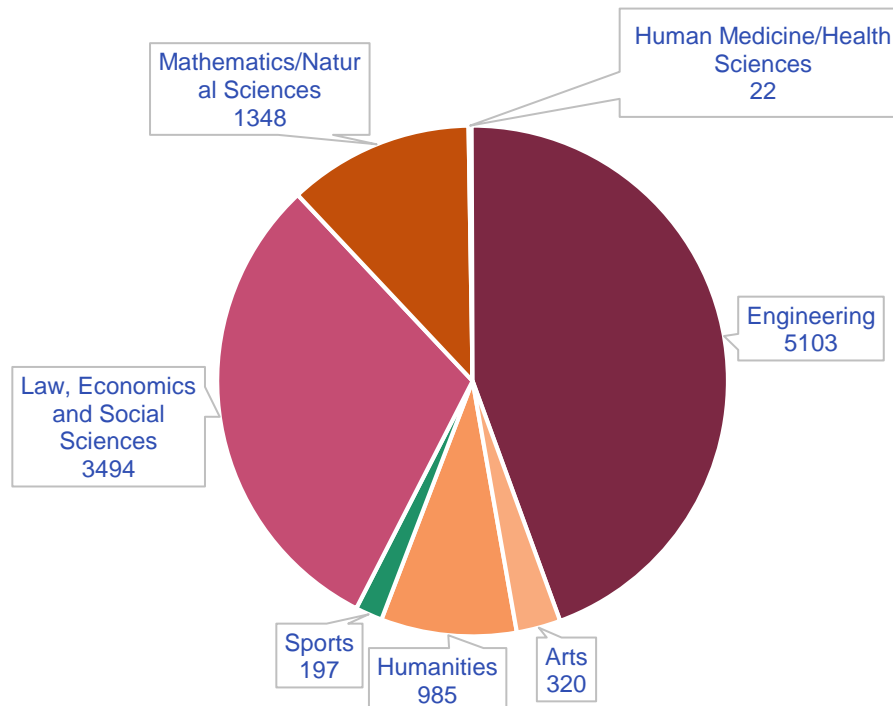
#### 4.2.2 Science sector (actors, scientific priorities and dynamic)

The scientific priorities of the region largely reflect the above-mentioned economic specialisation, thus creating synergies between the science and business sectors. As such, numerous university and non-university research institutions, mainly in the fields of natural sciences and engineering, characterize the regional science sector. From the higher education sector, these include above all the renowned Karlsruhe Institute of Technology (KIT) and the Karlsruhe University of Applied Sciences. As important public research and educational institutions, they scientifically contribute to the topics energy, mobility, ICT, materials, physics, technology, intelligent system and climate and environment.



Especially the KIT, as a leading technical universities in Germany – awarded "Universities of Excellence"-status together with ten other German universities in 2019 – attracts students and researchers from all over the world. The international character of the university (and the region) is characterized by the fact that one fifth of the students come from abroad. With about 25,000 students, 9500 employees and a budget of 1 billion EUR, the KIT significantly stimulates the regional innovative capacities. (Annual Report KIT 2019). In this regard, the region benefits in particular from the knowledge embodied in human capital and the numerous research alliances and collaborations with both the public and private sector aiming at developing new technologies and innovative products. [Figure 3](#) highlights the importance of the research fields mathematics/natural sciences and engineering, which together account for more than 50% (~6,500) of university graduates in 2016.

Figure 3: Number of university graduates by subject group in the Karlsruhe Technology Region 2016 (n=11,469)



Source: Authors' own calculation based on Federal Statistical Office (2018)

Efforts around research and technology transfer are also promoted in the region by the FZI Research Center for Information Technology, a non-profit institution for applied research. For more than 30 years, this institution has supported companies and public institutions in translating new findings from information technology in the fields of computer science, engineering and economics into innovative products, services, business and production processes. For example, FZI researchers work in interdisciplinary teams with partners from industry, healthcare and social care to develop technologies and service concepts that support independent living in old age. With a living lab, the FZI also offers SMEs

the opportunity to do interdisciplinary research and development. Therefore, the FZI House of Living Labs provides a platform for the exchange and the generation of new ideas, but also for development, integration, investigation, and testing.

Others actors from applied research include three Institutes of the Fraunhofer Society, which is the biggest organization for applied research and development in Europe, with 28,000 employees. While the Fraunhofer ICT and Fraunhofer IOSB institutes have a focus in the area of chemical technologies (chemical processes, energy systems, explosives technology, new drive systems, plastics technology and composite materials) and optronics, system engineering and image evaluation, the Fraunhofer ISI institute (to which the authors of this report belong) is a more policy-focused institution. Fraunhofer ISI analyses the emergence and impact of innovative solutions at the interface of business, government and society. The Max-Rubner-Institute (MRI), a Federal Research Institute for nutrition and food, which conducts research on consumer health protection in the nutrition sector, and the EU Joint Research Centre Karlsruhe Site for Nuclear Safety and Security, supplement the portfolio of non-university research institutions in the natural and technical sciences in the Karlsruhe Technology Region.

#### **4.2.3 Innovation activities and technological profiles (priorities and dynamics)**

As the description of the regional industry and research structures clearly shows, innovation activities in the region are focused primarily in the engineering and natural sciences fields. More specifically, 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. In addition to a holistic development of the locale and promoting social cohesion and quality of life, these three fields should contribute to the following (TRK & Fraunhofer ISI 2019):

1. Mobility
  - Network and harmonise transport services
  - Offer regenerative (sustainable), efficient and affordable mobility services
  - Region as an innovative reference point for national and international professional audiences
  - Jointly and profitably commercialise innovative mobility solutions to the outside world
2. Energy
  - Achieve the goals of the Paris Agreement on climate change by 2030

- Develop more innovative energy production technologies
- Develop sustainable synthetic fuels

### 3. Digitalisation

- Provide excellent IT infrastructure to support digitalisation across the region
- Make a significant contribution to value creation through digitalisation
- Visualise and communicate progress in the expansion of the digital infrastructure

As part of these goals, various fields of action and measures were defined, some of which have already been implemented while others are still being planned (see section 4.2.7.). Although the Karlsruhe Technology Region is a pioneer in energy technologies, mobility solutions as well as information technologies, the focus is still on promoting continued openness to new technology and further enhancing competitiveness in order to place the region's innovative capacity on a broad basis and secure it in the long term. The active promotion of start-ups and accelerator programmes, which actively support start-ups and innovative ideas, should also be understood in this context (Wirtschaftsspiegel 2020).

#### 4.2.4 Intermediaries related to regional innovation

Innovation systems benefit in particular from mediators or intermediaries, 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. Typically, intermediaries play a central role in the diffusion of innovation and technology transfer, innovation management, institutional bridging and service activities (Howells 2006). In the German context (and also in Karlsruhe), these are mostly the Chambers of Commerce and Industry (CCI), Chambers of Trade, public business development agencies and cluster (management) organisations. Since 2017, the TechnologieRegion Karlsruhe GmbH (TRK GmbH) has also existed as an overarching alliance of companies, chambers, scientific institutions and municipalities, which is described in more detail in section 4.2.6. The TRK GmbH performs crucial functions in the governance of the region's innovation system.

While clusters include individual sectors, industries or branches – in the Karlsruhe Technology Region for example the “EnergyForum Karlsruhe” or the “K<sup>3</sup> - Cultural and Creative Industries Office Karlsruhe” – the chambers and business development agencies usually focus on general economic and innovation activities in the region. In this regard, regions are mostly administrative territorial units above the local but below the federal level. At this meso-level, intermediaries support economic actors with administrative procedures, contacts to sources of funding and technology transfer offices, choices of location etc. Hence, they (in-)directly influence the innovation input in the region. Currently, in

In addition to advising companies during the coronavirus pandemic, intermediaries are especially aiming at fostering innovative activities and concepts of and between established companies and start-ups that are important for the economic development of the Karlsruhe Technology Region but also contribute to grand societal challenges such as climate change or social cohesion (Wirtschaftsspiegel 2020). Some examples of relevant network structures are described in more detail:

- On the research side, the “Science Office” designs projects that market Karlsruhe as a science and technology location beyond the region, in order to make the region more attractive to students and scientists and increase its creative and innovation potential (City of Karlsruhe 2021).
- The regional innovation management project “TRK Innogator NETZ” serves to make the innovation actors and their activities in the entire Karlsruhe Technology Region transparent and known to each other, and create a joint network. The project intends to support SMEs in particular and to open up further innovation topics and cross-sectoral issues, thus supporting the development of promising value chains in the region as a whole and in the sub-regions (TRK 2021)
- The “Innovation Alliance” of the Karlsruhe chamber of commerce and industry arranges expert contacts for innovation projects in six participating research institutions of the Karlsruhe Technology Region via a central access point (CCI Karlsruhe 2021).

#### 4.2.5 Innovation culture

The innovation culture of the Karlsruhe Technology Region, as reflected in the cooperation and networking activities between business, science, politics/administration and society, can be seen quite positive. As described above, not only are all relevant innovation actors located in the region, but also conducive innovation framework conditions exist in form of the relevant institutions and an overarching innovation policy is manifested in the regional development strategy 2030. At the same time, intra- and interregional relations have strengthened over the years, which is not least due to the creation of a superior governance structure in the form of the “TechnologieRegion Karlsruhe GmbH” in 2017 and the inclusion of the French region North Alsace in 2019 (see below). Various networks, cooperation structures and joint projects (see. 4.2.7) along relevant innovation topics demonstrate that the regional innovation system Karlsruhe is agile and adaptable, and that a culture of innovation in business, science and administration is correspondingly pronounced.

#### 4.2.6 Governance structure

TechnologieRegion Karlsruhe GmbH (TRK GmbH), founded in 2017, is a cross-regional and a trans-national regional development and marketing organisation. The overall aim of TRK GmbH is to strengthening and promoting the region as a hub for business, science, research and innovation. It provides crucial intermediary and governance functions for the regional innovation system. Thematically, special emphasis is placed on mobility, energy and IT, which constitute the profile of the region – both as regards specific challenges and as regards research and industry specialisation.

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. TRK GmbH acts as a platform to manage the various actors and contributes towards co-funding. The results of the cooperation projects are visible in the national and international context (i.e. the outputs are a part of the public services provided by the different towns and municipalities; see below for the stakeholders of TRK GmbH). In addition, the TRK GmbH also plays an active role representing the interests of the region and its players towards decision-makers at federal state, federal government, European and international levels.

As was pointed out above, the Karlsruhe Technology Region is a part of Europe's leading business and innovation regions (with the federal state of Baden-Wuerttemberg representing the largest area of the Karlsruhe Technology Region ). It features a mix of multinationals, world leading scientific institutions, innovative SMEs and start-ups, along with a well-balanced cross-section of sectors with a high proportion of next-generation technologies. So-called "soft factors" of the location in terms of overall amenities and living conditions (e.g. climate, natural landscape, work-live balance, size of the region and reachability) contribute to the attractiveness, both for business firms, investors, talents and students).

On an organizational level, TechnologieRegion Karlsruhe GmbH is a private company with 29 shareholders from the public sector (local authorities), industry and science sector. Geographically, the Karlsruhe Technology Region stretches across two federal states of Germany (Baden-Wuerttemberg and Rhineland-Palatinate) and one region of France (region Alsace). The *local authorities* (cities, towns and administrative districts) are the most important shareholders, with the following actors:

- Cities: Karlsruhe, Baden-Baden,
- Towns: Bretten, Bruchsal, Bühl, Ettlingen, Gaggenau, Landau in der Pfalz, Raststatt, Rheinstetten, Stutensee, Waghäusel,





- Administrative Districts: Karlsruhe, Germersheim, Rastatt, Südliche Weinstrasse, Collectivité européenne d'Alsace ,
- Regional Planning Association Middle Upper Rhine.

In addition, the following regional companies are included in the group of shareholders: 4L Vision GmbH, Badischer Gemeinde-Versicherungs-Verband, Netze BW GmbH/EnBW AG , evohaus GmbH, GRENKE AG, MiRO Mineralölraffinerie Oberrhein GmbH & Co. KG, and SEW-Eurodrive GmbH & Co. KG. Furthermore, two chambers of industry and commerce (Karlsruhe Chamber of Crafts, Karlsruhe Chamber of Industry and Commerce) and two research institutions (FZI Research Centre for Information and Karlsruhe Institute of Technology (KIT)) are included.

### *Governing and coordination bodies*

As pointed out, TRK GmbH is both a network and platform for regional policy coordination (providing strategy support for policy makers, agenda setting, project acquisition and implementation support), and, in terms of its legal and organisational structure, a private company, that is however largely owned by the regional public authorities. Against this background, TRK GmbH's main governing and coordination bodies are manifold and include the following boards: the shareholders, the supervisory board, the TRK GmbH management and different loosely coupled partner organizations.

Furthermore, TRK GmbH is represented in the so-called Regional Conference, which promotes interdisciplinary cooperation between politics/public administration, business, education and culture in the Karlsruhe Technology Region. The Regional Conference consists of legal representatives of the partners and at least 20 other members of social groups, mainly from the business, scientific and cultural communities. The chair of the the supervisory board of the TRK GmbH is the Lord Mayor of the City of Karlsruhe.

As for the management of TRK GmbH, a special office has been founded with a managing director and a staff of 9 persons responsible for the daily coordination activities. Apart from the resources in terms of staff, the TRK GmbH office has only limited resources to finance specific innovation projects. It is not so much a funding organisation, as a platform and network through which the regional actors can strategise innovation and development activities. Concrete innovation projects are usually funded either through existing budgetary resources of the actors involved, or through contributions from higher- (state, national or EU-) level

funding bodies, that the actors can apply to as part of the regular national and European funding mechanisms (e.g. EFRE or Horizon funds).<sup>142</sup>

*Tasks, priorities and strategy (incl. consultative process, see questions v and vi of the guidelines)*

A recently elaborated regional development strategy for Karlsruhe Technology Region through to 2030 describes the vision in terms of a desired development of the region in three core areas:

- Technological focus in the three areas of mobility, digitalization and energy;
- Integration, cooperation and way of life: quality of living and self-image;
- Regional development: industry and skilled personnel.

Based on these three areas of development, the strategy includes a roadmap with selected strategic objective, fields of action/priorities and measures. Special emphasis is on the following fields of action or priorities:

- Mobility offerings for the whole region
- Karlsruhe Technology Region as a pilot region for solutions in mobility
- Digitalization or digital shift
- Sustainability and energy management
- Passenger traffic in the whole region
- Living environment and housing space
- Cooperation and participation of citizens
- Business companies and employment
- Innovation and competitiveness
- Recruiting of talents/high potentials and qualified labour force
- Place marketing

Given the size of the TRK GmbH as an organization, it becomes obvious that most of these priorities can solely be implemented within the network of different partner institutions within the region and with the help of external funds. So the specific role of TRK GmbH vis-à-vis the priority areas can either be to function as an initiator, moderator or broker of specific projects or actions, as project coordinator, as fundraiser or on a higher level as a strategic sparring-partner for regional policy-makers (regional policy-makers belong to the TRK GmbH's

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<sup>142</sup> Note that the TRK GmbH may itself act as a consortium partner in an innovation project (such as, for instance, in the TetRRIS or Innogator NETZ projects). In these cases, the TRK GmbH has of course as much say in determining the shape of that particular innovation project as the other consortium partners in that project.

shareholders). Therefore, the scope of action in a given time period is always subject to a successful fundraising from external sources or funding programmes (e.g. the federal state of Baden-Wuerttemberg, the German Federal Government or the European Union). When it comes to concrete innovation projects initiated and carried out by regional firms or scientific institutions, TRK GmbH often supports those activities by helping to improve the framework conditions within the region (by communicating with policy makers, when it comes to permissions or related to possible users and the society as a whole).

Regarding concrete measures, the following have been or are planned to be implemented within the context of single projects (list incomplete):

- Establishment of a liaison office "UITP-Karlsruhe Mobility Innovation Partnership"
- Action plan "Mobility PAMINA". Development and implementation of a mobility concept for the PAMINA region"
- Region-wide implementation of the "regiomove" mobility system and its mobility portals
- Region wide extension of a broadband network
- Further development of an information- and communication platform for energy
- Improvement of the mobility and traffic quality by initiating further lighthouse projects
- Feasibility study for fast bicycle lanes
- Integration of adolescents in activities to strengthen their identification with the Karlsruhe Technology Region
- Integration of all national and cross-border areas of the Karlsruhe Technology Region and development of a "binational" mentality
- Coordination and improvement regarding intercommunal industrial real estate activities
- Establishment of an "Innovation Hub" in the south of the region to exploit new innovation fields
- Improvement of the visibility of TRK GmbH's competencies and support measures for SMEs
- Program and assistance of international visitor groups by "Incoming Service"

As was pointed out above, several of these project/measures are either technology/innovation related (e.g. the regiomove system and its mobility portals), support ongoing infrastructure measures within the region (e.g. extension of the regional broadband network, Innovation Hub) or focus on additional/complementary objectives (e.g. visibility of TRK GmbH, integration of adolescence).

### Alignment with higher-level innovation strategies

Regarding the relevance of higher-level innovation strategies, the Regional Innovation Strategy (RIS) for the federal state of Baden-Wuerttemberg provides the basis for TRK GmbH – as is the case for any other regional development agency in the state as well. The RIS for Baden-Wuerttemberg has been updated recently and is the pre-condition for funding from the European Regional Structure Policy or the European Regional Development Fund (ERDF). Several growth sectors have been identified which will be a priority in the funding phase 2021-2027: digitalization, artificial intelligence and Industry 4.0, sustainable mobility, health economy, resource efficiency, and renewable energy as well as bio-economy. The Regional Innovation Strategy of Baden-Wuerttemberg is related to several thematic strategies, which had been developed earlier:

- Digitalization strategy "digital@bw"
- Federal Government "Artificial Intelligence"-strategy
- Strategy for sustainability
- Federal Government "Efficient Resources"-strategy
- Federal Government "Bio-Economy"-strategy

However, despite the strategic relevance of the RIS for the technology and innovation policy of Baden-Wuerttemberg, a steering impact for TRK GmbH in the narrow sense exists only indirectly. Initially the Karlsruhe Technology Region innovation strategy was elaborated with a strong focus on the region and regional challenges rather than with a view to available funding resources from superior levels. In the next step selected regional project ideas have been further developed in order to apply for the funding resources. Due to the policy mandate of TRK GmbH and its shareholder structure, the priorities reflect mainly a bottom-up process, in terms of specific challenges and needs within the cities and towns of the Karlsruhe Technology Region. On the other side, the RIS leaves – despite its focus on the various specialisation fields – room for the support or funding of concrete projects apart from the specialisation fields. Nevertheless, the two areas *renewable energy* and *sustainable mobility* are an important element of the TRK GmbH's strategy as well as of the RIS of Baden-Wuerttemberg as a whole.

#### 4.2.7 R&D&I priority projects in the region

The TRK GmbH not only acts as an intermediary institution in terms of being a (policy) network-broker between the different spheres, but – in line with the strategic priorities determined by its shareholders and discussed above – it also initiates concrete R&D and innovation projects, raises funds and supports the implementation of these projects.

TRK GmbH is the regional platform that integrates the most diverse mobility skills and activities in a targeted and synergy-oriented manner and ensures transparency, the exchange of experiences and the initiation of joint strategic projects in this area. 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. As pointed out above, mobility, energy and digitalisation are the strategy priorities of TRK GmbH. With regard to sustainable mobility, there are a variety of different project types, which are presented further below.

### *Cluster 1: R&D and technology oriented projects*

Disruptive technology projects are those R&D and innovation projects, which are not only significantly new for the region, but also constitute radical innovations with the potential to create new markets and new application fields. They are typically science or at least research-based, thus including both private companies and scientific institutions. Within the Karlsruhe Technology Region, the so-called “efeucampus<sup>143</sup>” for instance aims at setting up a regional innovation center in the field of sustainable urban freight mobility. Future-oriented systems for energy-efficient and autonomous supply and disposal of urban districts are being developed there. These will be designed and tested in a unique reference area. The aim is to create emissions-free local freight transport that is economically viable.

Another example of a disruptive technology project is the “EVA-Shuttle<sup>144</sup>” project. This project is conceived as an addition to the existing system of public transport. Networked and autonomously driving mini-buses are being developed for the last mile from the bus stop to the front door. The research project is the development of a public transport mobility concept, which is to be trialled through an overall system-oriented fleet test under real conditions on the Test Area Autonomous Driving Baden-Württemberg<sup>145</sup>.

The project Volocopter<sup>146</sup> is carried out by a regionally-based company of the same name. Volocopter is building the world's first sustainable and scalable urban air mobility business to establish affordable air taxi services in the world's megacities. With innovative technologies, products and services, cities will be

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<sup>143</sup> Cf. <https://efeucampus-bruchsal.de/>

<sup>144</sup> Cf. [www.eva-shuttle.de](http://www.eva-shuttle.de)

<sup>145</sup> Cf. <https://taf-bw.de/en/>

<sup>146</sup> Cf. <https://www.volocopter.com/en/>



supported in the future in making their mobility concepts successful and sustainable with air taxis. The business model of Volocopter not only includes the aircraft, but also take-off and landing infrastructure through integration into air traffic management systems for the entire ecosystem.

Finally, “eWayBW<sup>147</sup>” is a pilot project to research electrically powered hybrid overhead line trucks. The operation of hybrid overhead line trucks is being investigated in a three-year living-lab pilot. Scientific research accompanies the project. The technology that is to be tested under real conditions as part of “eWayBW” is known by the abbreviation “eHighway”.

*Cluster 2: Innovation and socio-technical projects with a local application (e.g. addressing regional challenges, smart city concepts etc.)*

A second cluster includes those projects, which are mainly innovation oriented with a regional application. These projects typically address regional challenges, offer a technical solution and are supply-oriented. One example is the Karlsruhe Technology Region Mobility Portal<sup>148</sup> (TRK-Mobilitätsportal), which bundles all available information on mobility in the Karlsruhe Technology Region under one surface, prepares it and visualizes it in a modern, user-friendly way. Some of the data obtained will be passed on to the regiomove<sup>149</sup> project for further use. The mobility portal of the Karlsruhe Technology Region is growing continuously. The cities of Germersheim, Wörth, Bruchsal, Rastatt and the so-called “southern wine route” (*südliche Weinstraße*) are also participating. With the French region of Alsace, the mobility portal of the Karlsruhe Technology Region has been expanded across the border to France. With their database, the service offer of a region, which is unique in Germany, is now even more extensive and efficient. The online platform is now populated by the cities in the districts of the Karlsruhe Technology Region and thus reaches almost two million people. Another major innovation is the complete integration of all public transport connections (rail and bus) with all associated stops in the Karlsruhe Technology Region.

Another project within the cluster is called “regioKArgo”. The main goal of the project is that goods should be delivered by local trams in order to relieve the logistics system. By shifting to rail and making the already challenging last mile emission-free, the number of courier express parcel service vehicles can be reduced considerably. Converted trams supply the city centers from non-industrial warehouses. In the cities, the goods are then delivered using electric vehicles or cargo bikes. During peak times in public transport, the converted regioKArgo trams are used to transport people.

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<sup>147</sup> Cf. <https://ewaybw.de/>

<sup>148</sup> Cf. <https://mobil.trk.de/>

<sup>149</sup> Cf. [www.regiomove.de](http://www.regiomove.de)

### Cluster 3: Infrastructure related projects

Infrastructure projects put emphasis either on the improvement of the technical networks or on testing infrastructures. One example is the consortium project “Autonomous Driving Test Area Baden-Württemberg”, which, in cooperation with the cities of Karlsruhe, Bruchsal and Heilbronn, aims to promote autonomous driving, especially in complicated urban traffic. The project is one of the many lighthouse projects in the mobility network.

Another example within this group of projects is the Karlsruhe tram-train system which consists of tram/light rail trains and commuter/regional rail trains running on the same set of tracks, generally between or outside of urban areas. It was initially developed and implemented in the city of Karlsruhe by the local transit authority, Karlsruher Verkehrsverbund (KVV).

A related lighthouse project is regiomove<sup>150</sup>, whose purpose is to strengthen mobility in the region. Regiomove is run by a group of companies and institutions associated under the umbrella of the Karlsruhe Technology Region. In regiomove, various mobility offers (e.g. trams, bike- and car-sharing, private cars and bikes, etc.) are to be bundled at hubs - so-called "ports" - in the coming years. At these "ports" at selected locations, passengers will in future be able to choose and change between different means of transport in an uncomplicated and as comfortable way as possible.

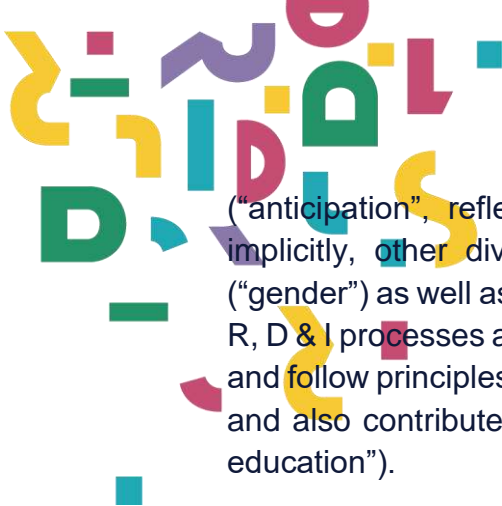
Finally, the above mentioned eWayBW pilot project can also be described as an infrastructure project, as the aim is to research electrically powered hybrid overhead line trucks.

## 4.3 Aspects of RRI in regional innovation policy

### 4.3.1 Status in the implementation of the RRI agenda: overview

As laid out in more detail in the TetRRIS Deliverable 2.1: Mapping and Analysis Framework, the concept of “Responsible Research and Innovation” (RRI) has both substantive and processual dimensions. Substantively, RRI proposes that Research, Development and Innovation (R, D & I) activities should be oriented towards addressing societal grand challenges (e.g. climate change, demographic change associated with ageing societies, etc.). Processually, RRI proposes that R, D & I activities should be conducted in ways that engage the wider public in the innovation process (“inclusion”/“public engagement”), that seek to anticipate the direct and indirect – including possible negative – impacts and risks of an innovation while self-critically reflecting on one’s own cognitive frames and biases

<sup>150</sup> Cf. [www.regiomove.de](http://www.regiomove.de)

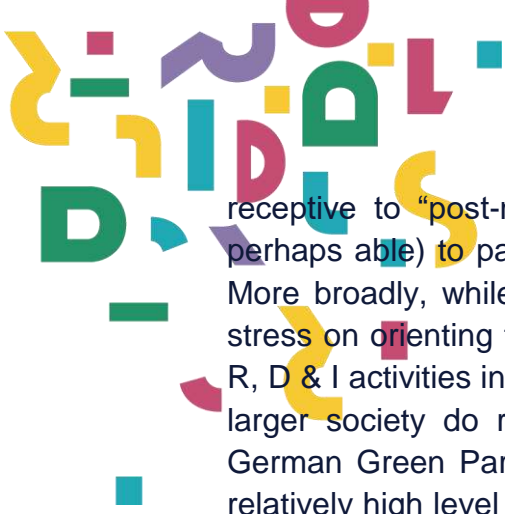


(“anticipation”, reflexivity”), that give due attention to possible gender (and, implicitly, other diversity) dimensions of the R, D & I process and outputs (“gender”) as well as to their ethical implications and dimensions (“ethics”). Finally, R, D & I processes and outputs should provide for open access to data and results and follow principles of open innovation where feasible and sensible (“openness”), and also contribute to the general scientific literacy of the population (“science education”).

As discussed in this chapter, while they rarely use the term “RRI”, and are often unfamiliar with it, innovation practitioners in the Karlsruhe Technology Region often already follow these ideas in practice, a phenomenon known as “de facto RRI” (Randles et al. 2016). Local innovation and smart-specialisation activities are strongly oriented to addressing grand challenges. Considerable emphasis is often put on inclusion/public engagement and science education. The RRI dimensions of gender (or more broadly, diversity), ethics and openness are also commonly addressed in some form, and there is effort to act in anticipatory and reflexive ways. De facto RRI is, in other words, already practiced to a relatively high degree in the region.

One factor giving particular relevance to RRI practices in the Karlsruhe Technology Region is the growing number of living labs (*Reallabore*) in the region. These are innovation projects where genuinely new-to-the-world technologies and applications (e.g. autonomous vehicles) are trialled in a real-world setting. “Reallabore”, or living labs, have received much interest from German policy makers. However, they pose particular and highly RRI-relevant governance challenges as often no overarching regulatory structure yet exists to deal with these technologies’ potential risks, and their very novelty may undercut public acceptance. On the other hand, without practical trial, it is often impossible to fully assess either the risks or the benefits of these technologies, design appropriate regulations, or enable the public to come to an informed opinion on their benefits and drawbacks. RRI practices can help to manage this process of real-world trialling of new technologies in a responsible manner. Indeed, the high level of de-facto RRI observed in the Karlsruhe Technology Region is often related to the implementation of living labs.

The overall relatively high level of existing de-facto RRI practices in Karlsruhe may also reflect an overarching social and political environment particularly open to the concerns encapsulated by the RRI concept. Thus, Karlsruhe is home to two research institutes that have played important roles in shaping the European discourse on RRI and its antecedents, such as that on Technology Assessment (the Fraunhofer Institute for System and Innovation Research ISI, and the Institute for Technology Assessment and Systems Analysis ITAS at Karlsruhe Institute of Technology). As described above, the region is home to numerous universities and research institutes, a thriving technology sector and a relatively highly educated and affluent population that is likely to be both comparatively



receptive to “post-materialist” concerns such as RRI, and more eager (and perhaps able) to participate in RRI-related activities (e.g. public consultations). More broadly, while RRI does not have a party-political coloration per se, its stress on orienting technological development to human needs and conducting R, D & I activities in ways sensitive to risks, possible biases, and inclusive of the larger society do resonate in particular with the intellectual leanings of the German Green Party. Thus it is perhaps not surprising that we should see a relatively high level of de facto RRI practiced in the city and federal state where this party was founded and is today the hegemonic political force.

#### **4.3.2 Role of the "grand challenges" in the region**

Innovation and development work in the Karlsruhe Technology Region is quite heavily focused on addressing the “grand challenges” of climate change and sustainability. Many solutions developed (or under development) also factor in the challenge of an ageing society. This focus on climate change/sustainability seems not, for the most part, to have come about through some kind of centralised, top-down push from the local or regional authorities. Rather, the urgency of these challenges appears to have encouraged diverse actors within the innovation system (i.e., researchers, entrepreneurs, city authorities, etc.) to focus their resources and innovation efforts on these issues. At the same time, they were undoubtedly incentivised to do so by a larger external pressure and opportunity structure beyond their (or the region’s) control: in particular, funding priorities determined by federal-state, national and EU-level bodies, which support such a focus, and (in the case of city authorities) demands for stronger local action on climate change emanating from the local citizenry as far back as 2009. The latter culminated in an ambitious and highly detailed package of measures agreed in 2012 and reiterated in 2018, to achieve climate neutrality for the city of Karlsruhe by 2050 (Stadt Karlsruhe 2016; Karlsruher Stadtzeitung 2012).

In terms of practical focus, a substantial amount of this grand challenge-oriented innovation activity has focused on various aspects of urban and regional mobility and transportation systems, as well as on energy technology. One reason for the focus on mobility/transport are the strong pre-existing competencies in the Karlsruhe Technology Region in this field. Several global suppliers of mobility systems and components are headquartered or have production or research facilities in Karlsruhe (e.g., INIT, Siemens, Michelin), and local universities and research institutes too have longer-standing strengths in this area. The region also has important strengths in the increasingly closely-related field of digital technology. Another, more practical reason is that urban and suburban transport and mobility systems are one of the comparatively few climate/sustainability-related policy areas where local authorities have direct planning and rule-making competencies.

Personal mobility is a need all human beings have, however, the specific requirements that mobility systems need to fulfill can vary substantially across different population groups and, in particular, across different age groups. Efforts to innovate and deploy new mobility systems to address the grand challenge of climate change thus automatically intersect with the further grand challenge of designing systems appropriate to ageing societies. Unsurprisingly, mobility/transport-related innovation projects in the Karlsruhe Technology Region thus also commonly seek to develop systems that help solve for this challenge.

#### 4.3.3 Status of different RRI elements

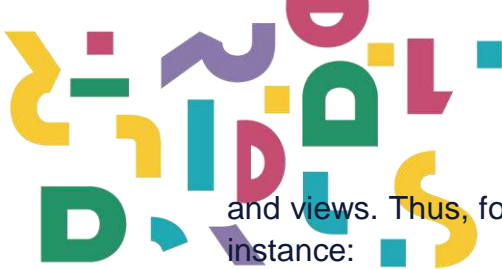
To understand better how and to what extent different elements of RRI are practiced in the Karlsruhe Technology Region, we examined a series of innovation projects related to urban and rural mobility. For this, we undertook desk research on individual projects and conducted ten structured background interviews with project officers, researchers, and local-government officials. The focus on mobility/transport was justified due to the importance this field assumes in the region's development strategy and the number of actors and initiatives involved. It was also justified on account of the potential this field to offer for further deepening RRI activity, as identified during scoping talks in the proposal and initiation phases of TetRRIS. At the same time, this focus may introduce certain biases. For instance, issues of public engagement/inclusion may loom particularly large in mobility/transport-related projects, as these often directly impact the lived experience of citizens (e.g., in the form of infrastructural changes, new types of vehicles travelling through town quarters, etc.).

##### *Inclusion and Public Engagement*

This RRI element refers to the “inclusion” dimension of Stilgoe et al. (2013) and to the Commission's RRI key “public engagement” (EC n.d.), as described in more detail in deliverable 2.1 (Martin et al. 2021). In short, it is about both engaging the wider public (in terms of ordinary citizens and non-professional interest groups) and including a wide diversity of actors or stakeholders in R, D & I processes.

Overall, it seems that most of the R, D & I actors in the Karlsruhe Technology Region are aware of the high importance the public in general and specific stakeholders in particular have for their activities, especially with respect to trust and acceptance. This applies in particular to R, D & I activities in the mobility sector, since the wider public in this sector represents not only those affected, but also the key end user groups that the innovation aims at. However, for various reasons, this does not mean that all R, D & I projects always try to achieve a high participation level in terms of involving citizens or stakeholders in design and decision processes. Sometimes projects limit public engagement mainly to information provision, or to the collection and analysis of data on public needs



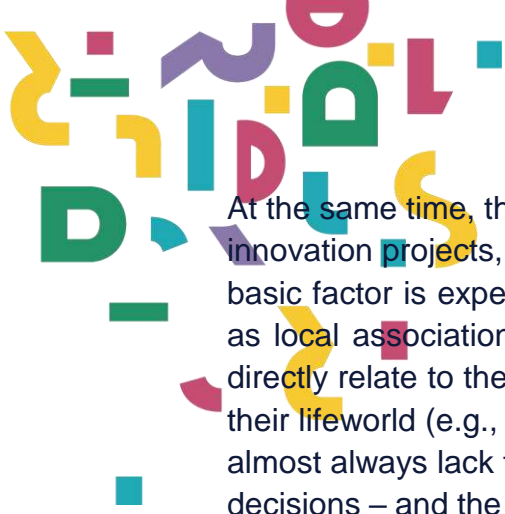


and views. Thus, formats and levels of public engagement vary and include, for instance:

- public information sessions open to the entire public, sometimes being whole-day and highly developed affairs where the details of the R, D & I project are presented by the project manager, and people can ask questions and discuss concerns or needs with project staff, collect information materials, and even virtually experience the planned innovations in show rooms and exhibitions featuring prototypes and small-scale models of the planned system;
- analysis of data about citizens' or users' actual behavior (e.g. their usage of public transport and mobility patterns), with needs inferred from this;
- public surveys or interviews with selected stakeholders in order to create a knowledge base on their requirements, attitudes, perspectives, critiques, or fears regarding the R, D & I project and context;
- more intensive involvement of citizens or stakeholders in the conceptualisation, design or planning of specific aspects of the R, D & I project (e.g. identifying stops for autonomous busses, appropriate spots for logistics hubs, or particular local needs such as those of handicapped children or of senior citizens).

The reported experiences with these public engagement activities are generally quite positive. Local R, D & I actors recognise that obtaining a deep understanding of the intended users' needs and perspectives is essential if their innovations are to enjoy significant levels of adoption by users. They also recognise that their innovation work – especially in the case of living labs – will proceed smoothly only if it enjoys widespread public support and acceptance. Importantly, in background conversations local innovation actors generally credited the public-engagement processes they undertook with actively helping to build this public support (as well as with generating valuable feedback).

In-person events and information sessions as well as more substantive engagement in design choices, in particular, were seen as a useful means for counteracting online misinformation, polemics and fear-mongering, which have occasionally erupted around certain projects. In the few cases when problems and conflicts have occurred in context of participative processes in the region, these appear to have been driven less by the involvement of ordinary citizens, than by local political factions with electoral interests in heightening conflict around particular projects. Ironically, involvement of ordinary citizens seems to have helped overcome such problems by returning the matter at hand to more factually-focused and less politicised discussions about the concrete issues, benefits and possible drawbacks or risks of a project.



At the same time, there are limits to the practical involvement of citizens in many innovation projects, especially those with strong technological components. One basic factor is expertise and time. While citizens (or their representatives, such as local associations) can provide very useful inputs for design decisions that directly relate to their needs as users or to the way that a system intersects with their lifeworld (e.g., where to site a stopping place for an autonomous bus), they almost always lack the scientific expertise to contribute to more technical design decisions – and the time and inclination to contribute larger amounts of voluntary labour, as this would require. “Participation fatigue” has at times also been observed with regard to the involvement of more institutional actors, such as local businesses. These have at times been reluctant to participate in projects that do not offer immediate pay-offs (even if there may be more longer term or indirect benefits).

A further factor imposing limits on citizen and stakeholder inclusion is the (funding) structure of project-based innovation work itself. “Inclusion”/“public engagement” in the fullest sense of RRI implies involving citizens or other stakeholders in basic decisions over the direction of the innovation effort – what is to be innovated, to which purpose. But to a large extent, these decisions can only be taken during the proposal stage of a project, while its basic nature is still being conceptualised – at least as long as funders expect project proposals to feature detailed and very concrete work plans with tight implementation schedules. Under these conditions there is simply no room, usually, to “open up” an already-approved project to basic (re-) deliberation over its content and goals. Conversely, there are few institutionalised structures to solicit citizen feedback or participation in the conceptualisation of projects at the proposal stage – and innovation actors can be understandably reluctant to “go public” with early-stage ideas or proposals that might not get funded after all.

To sum up, R, D & I actors in the Karlsruhe Technology Region seem to be quite aware of the importance and potentials of public participation and engagement, and have a nuanced appreciation of the potentials and drawbacks of different kinds of participation formats. Thus, projects frequently involve some form of public engagement. This is especially true for projects in the field of transport and mobility, though the exact levels of involvement do vary between projects. It is also clear that substantial amounts of – often tacit – expertise about public engagement have been built up, though at present there seems limited exchange and knowledge/experience-sharing between actors and institutions in the local innovation system about this.

### *Anticipation and Reflexivity*

Jack Stilgoe, Richard Owen and Phil Macnaghten first conceptualised anticipation and reflexivity as dimensions of RRI by (Martin et al. 2020). Anticipation is fundamentally about systematically thinking through the possible

direct and indirect, positive and negative effects of the R, D & I process and outputs. Reflexivity is closely related to anticipation, but foregrounds the innovators' personal stance. It is about clarifying and critically interrogating their own beliefs, perspectives and behavior as they relate to the R, D & I process and outputs, in order to figure out whether there might be (normatively and functionally) better alternatives to the chosen approach and objectives (Martin et al. 2020).

In terms of practical innovation work, anticipation and reflexivity may take place especially at three different points in the project lifecycle:

- 1) Anticipation and identification of possible risks and problems that the project may create or run into, and development of mitigation measures, including the possibility of substantial changes to project design, in the **proposal and early project stages**;
- 2) Reflection and possible adjustment of the project during **run time**;
- 3) Reflection, learning of lessons and knowledge management **after project completion**.

Of these three, the first, *anticipation during proposal creation and early project implementation*, is often done in at least an implicit, de-facto manner (i.e., without calling it "RRI"), as part of good project preparation – in the form of literature reviews, stakeholder analyses, human and animal subject reviews, formal risk assessment and mitigation planning, or data protection impact assessments (DPIAs) and the creation of data management plans. These kinds of de-facto enactments of anticipation are in practice often necessary to produce competitive proposals. Depending on the funding body, some of these may also be a formal requirement (e.g. risk assessment and mitigation planning in Horizon-2020 proposals), and in some cases – e.g. DPIAs, human/animal subject review – they can also be a legal requirement. How large and how formalised the identification of unanticipated "bad" consequences looms in these exercises no doubt varies from project to project. It is likely that they loom largest in the case of living labs involving new and obviously "risky" technologies (e.g. autonomous vehicles, geothermal energy).

The second – *reflexivity during project run time* – is also often practiced in the form stock-taking workshops at defined milestones in the course of the project, meetings of steering committees and through dialogue with external advisory boards. Some projects also include systematic measures to generate user feedback, including user surveys, feedback forms and analysis of usage patterns.

The third – *reflexivity after project completion* – seems to be practiced to much more varying degrees. Especially some of the larger and more institutionalised innovation actors on the Karlsruhe Technology Region have systematic, quite highly developed – and sometimes even ISO-certified – processes for drawing

lessons from their completed projects, even curating the knowledge gained in own (internal) handbooks and other documents. In the case of smaller and less institutionalised actors, it is likely that this happens less often, and learnings from the past are preserved more as tacit knowledge with individual persons. More broadly, the highly flexible, dynamic and network-based structure of the local innovation system may itself somewhat militate against developing *systematic and institutionalised* lesson-learning capabilities: As few overarching, cross-institutional structures exist to collect, analyse and disseminate project experiences, opportunities for systematic lesson-learning may quickly vanish with project end, as partners disperse to join new projects in new actor constellations.

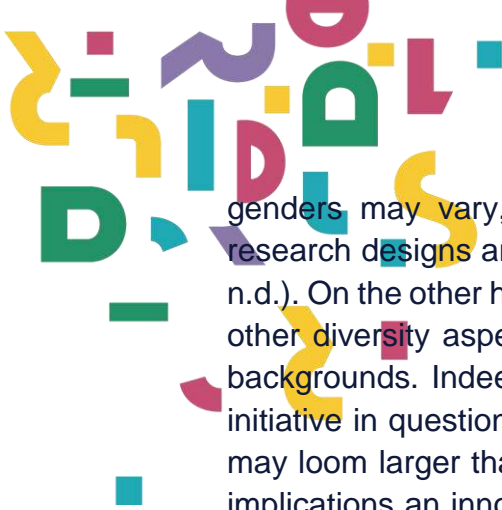
The processes and formats for enacting anticipation and reflexivity just described mainly take place at the project level. Thus, their focus, commonly, is on ensuring smooth project implementation and avoidance of failure. Conversely, the scope for reflexive deliberation on larger questions surrounding whether or not particular lines of R, D & I should continue to be pursued at all or whether more fundamental changes may be desirable may in part be more limited.

At the level of the Karlsruhe Technology Region's overall governance and development strategy, such reflexive deliberation on larger questions certainly does take place (at least as they pertain to the further development of the Region), and structures to facilitate this deliberation exist in the form of the various political bodies that make up the local governance authorities (e.g. elected local parliaments and mayoralities, inter-locality steering bodies that bring individual mayors and other stakeholders together, etc.). There are also some sectoral advisory bodies (e.g. for energy).

Integrating scope for more fundamental deliberation at the project level, however, seems to often be constrained by the tight funding formats and time-tables that funders impose: the highly developed – and very time and resource-intensive – stage-gating process that Stilgoe and colleagues describe in their landmark essay (Stilgoe et al. 2013) is hard if not impossible to replicate under these conditions; and the high level of uncertainty it introduces into a project (after all, the outcome of deliberation over “go”/“no-go” questions can be “no-go”, half-way through a project!) is unlikely to be acceptable to funding bodies that expect project proposals to specify in detail the work expected to be undertaken several years into the future. However, enabling stronger anticipatory and reflexive elements – with more room for mid-project course corrections – may be particularly helpful for living labs working with risk technologies, as part of the challenge for successfully conducting such projects is the de-facto need to often define regulatory rules from scratch.

### *Gender and Diversity*

On the one hand, this RRI element refers to the Commission's RRI key “gender”, pointing to the fact that needs, behaviours and attitudes of people of different



genders may vary, and that these variations might have consequences for research designs and results and for how innovations are used or not used (EC n.d.). On the other hand, the scope of this RRI element can be widened to include other diversity aspects such as age and different educational, social or ethnic backgrounds. Indeed, depending on the specifics of the field and the R, D & I initiative in question, differences related to non-gender aspects of human being may loom larger than gender aspects. To anticipate and reflect on the different implications an innovation may have for different social sub-groups, is a central aspect of the “anticipation” and the “reflexivity” dimension of Stilgoe et al. (2013) and might be also relevant for the “inclusion”/public engagement dimension (cf. Martin et al. 2021).

In the Karlsruhe Technology Region, there seems to be quite a high level of sensitivity to issues surrounding gender and diversity. With regard to R, D & I activities in the mobility/transport field, however, age appears to often be regarded as the more salient cleavage than gender. At least in part, this seems reasonable since the differences in mobility needs are (presumably) much higher between younger and older people than between women and men. Other diversity aspects tackled in some projects include people in different stages of their working life, families with small children, people with disabilities, and also migration and varying levels of familiarity with the German language.

### *Science Education*

The Commission construes the “science education”-RRI key in terms of making scientific careers more attractive to young people, raising the level of scientific literacy in the population, and involving citizens more directly in the R, D & I process as citizen-scientists (Martin et al. 2020).

Within the Karlsruhe Technology Region, these aspects are practiced in a variety of ways. By virtue of its numerous universities and strong technology sector, Karlsruhe is somewhat by default a center for university-based science education. Actual promotion of scientific careers and ensuring that employment conditions remain attractive to junior scientific staff though mostly falls outside of local and regional authorities’ competency, and resides rather with state, national and to a lesser extent EU levels (as well as with the universities and research institutes themselves, which however again are governed by bodies above the region). This aspect is therefore also somewhat outside of the scope of the TetRRIS project, given its focus on RRI in local and regional R, D & I systems.

Local innovation projects do often seek to (also) contribute to raising scientific literacy in the general population as part of their inclusion and public-engagement activities. As noted above, these often feature highly developed public information sessions, sometimes including show rooms and exhibitions, where the project, the research objectives and (expected) results are presented and discussed with the public. The local universities also often have regular series of





public lectures and debates on current scientific and technological developments and their intersection with larger societal and political questions.

As noted above, substantive involvement of citizens (or other stakeholders beyond the project partners themselves) in the R, D & I process usually remains quite limited, however, for the practical reasons that citizens tend not to have the leisure or desire to devote substantial amounts of their time to (unremunerated) research and innovation activity, and also lack the expertise to contribute to the often highly technical problems at stake. An exception to this are projects where the focus of the research/innovation interest lies on citizen participation and co-creation – where these, in other words, are the *object* of the research itself, rather than being a *method* to produce functionally or normatively superior innovation outputs.

### *Openness: Open Innovation and Open Science*

The “Openness”-RRI key in the European Commission’s construal of RRI originally referred mainly to *open science*, both in the sense of making data and research results freely available (open access), and in that of fostering enhanced collaboration between researchers, and researchers and the general public. The key was subsequently broadened to include a stronger stress on *open innovation* (that is, opening the innovation process up to participation by end users and outside third parties) (Martin et al. 2020).

The practice of *open science* has generally increased, not least because funding bodies increasingly demand – and also subsidise – it (e.g. by paying for open-access publication). As noted above, innovation projects in the Karlsruhe Technology Region often include relatively extensive public outreach and information measures and sometimes even citizen science.

The framework of project funding seems automatically to compell a certain amount of openness in innovation practices, in as far as it encourages R, D & I actors to regularly seek out new project partners in order to develop competitive proposals or expand and develop existing streams of R, D & I work.

The structure of the Karlsruhe Technology Region – a dense web of networks orchestrated and continually renewed by the institution of the TRK GmbH as an intermediary – plays an invaluable role in supporting, or even making possible, this regular opening and reconfiguration of project consortia to new actors. It does so by building the necessary networks, connections and social capital between the actors. At the same time, these processes of opening and reconfiguration seem to have a certain – perhaps irreducible – ad-hoc and idiosyncratic quality to them. Whether, when and how projects open up to new actors is determined by the actions, needs and not least, interest and initiative, of individual project managers. This may be inevitable in as far as project- and consortium-based innovation work necessarily has both a strongly idiosyncratic quality to it (every

project is different), and is greatly driven – and dependant upon – individual initiative. While in theory desirable, it may be hard to “standardise” or “regularise” open innovation processes to a greater extent. There is also the issue of timing and tight project frameworks: “opening” necessarily means reconceptualising a project to some extent. But a project also must be implemented and completed at some point, which necessarily requires closure: defining a stable group of partners with defined tasks.

### *Ethics*

As discussed in Martin et al. (2020), the “Ethics”-Key in the Commission’s construal of RRI relates primarily to compliance with research ethics and integrity rules and frameworks (e.g. use of human and animal subjects, adherence to privacy and data protection rules, avoidance of fabrication or falsification of data or plagiarism).

Within the quite practically-oriented innovation projects we examined in the Karlsruhe Technology Region, compliance with data protection rules is the perhaps the most prominent aspect of “ethics” in the RRI sense, as well as adherence to research-integrity standards. For both, there now increasingly exist common procedures and responsibilities (e.g., designated data protection officers, documents setting out data governance policies). Especially in the context of living labs where autonomous vehicles are deployed in live settings (e.g., as part of public transport solutions), preventing risks to passengers and other road users is a further important aspect of ethics. This is addressed by ensuring that dependable risk-assessment and mitigation measures are followed (e.g. having human personnel on board authorised and able to intervene in the case of an emergency).

## **4.4 Challenges related to the implementation of RRI in the Region**

In summary it can be concluded that the integration of RRI concepts and practices into the practices of R, D & I actors in the Karlsruhe Technology Region is already relatively far advanced, though this integration represents a case of de-facto RRI: Even though the region is home to several research institutes that have played important roles in shaping the European discourse on RRI, this terminology has so far hardly penetrated the region’s wider R, D & I communities.

It should be stressed that this is not necessarily a problem. Achieving widespread adoption of a new terminology – especially a highly “academic” one like RRI that was originally developed in a foreign language (English) – is usually a laborious task. Terminological change does not automatically lead to substantive change.

If actors are already practising core concepts to some extent, albeit while using their own native terms to frame this practice, then it can make a lot of practical sense to focus attention on deepening the practice itself, without trying to also introduce them to a new conceptual vocabulary.

While the basic ideas of RRI thus seem to enjoy considerable acceptance among the local actors and appear quite compatible with the dominant social and political culture of the region, their deep implementation does face certain hindrances. As discussed above, enacting the public engagement and inclusion dimension of RRI (as well as the related aspects of the openness and science education dimensions) face the challenge that both lay citizens and more institutionalised stakeholders (e.g., businesses) often can (and will) muster only limited time, energy and interest in participating. Moreover, they often lack the expertise necessary to be able to contribute to the more technical sides of the R, D & I process (sides which naturally often loom large in projects aimed at innovating new technologies).

A further important constraint are project funding structures and the demand for tight and highly structured delivery time lines imposed by funding bodies also limit the extent to which projects can be opened up to more fundamental, reflexive deliberation over the means and ends of the innovation process, once projects have been approved for funding. Conversely, before projects have been approved and while they are still in the conceptualisation and proposal phases, actors are often understandably reluctant to “go public” about them and systematically solicit extended outside feedback and input. These constrain the enactment of both the public engagement / inclusion and the anticipation and reflexivity dimensions of RRI somewhat.

Possible means to help overcome these challenges could be the creation of stronger and more established cross-institutional structures in the region to support the collection, analysis and exchange of project experience and lesson-learning between actors, and new, possibly sectoral, structures to feed public input into the proposal conceptualisation and preparation phases.

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Contributors: Tamas Gyulai (DARINNO), Emad Yaghmaei (YAGHMA)

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## 5.1 Introduction

This document is part of Deliverable 2.2 of the TetRRIS project, funded by the European Commission under its Horizon 2020 Research and innovation program (H2020) Science with and for Society Call 14.

The document is to analyse the structures and workings of the innovation system and approaches and local innovation and development projects in the Szeged region, both to understand their structures, processes and goals, and to identify to what extent RRI is already being de facto practiced in these projects and systems, and where particular needs, challenges and problems exist on the part of the practitioners that RRI might help them address.

For the Szeged-Timisoara region, two projects have been previously defined and confirmed to link with TetRRIS:

1. TalentMagnet project
2. DIH World project

During our local analysis, we followed the steps of Deliverable 2.1, which includes a “Mapping Tool”, an extended set of questions. In December 2020 and January 2021, we conducted 10 interviews, using Questionnaire1 and Questionnaire2 of Deliverable 2.1 as follows:

Questionnaire	Affiliation	Position	Helix sector
Questionnaire 1 - regional innovation system	South Great Plain Regional Innovation Agency	Director	Civil society
	University of Szeged	Former Director of R&D&I	Academia
	Chamber of Commerce	Secretary of the Chamber	Business
Questionnaire 2 - TalentMagnet project	First Hungarian Responsible Innovation Association	President	Civil society
	Chamber of Commerce	Manager	Business
	University of Szeged	Associate professor	Academia
	DUTIREG Non-profit Kft.	Director	Business
Questionnaire 2 - DIH World	Szó-Tér Association	President	Civil society
	University "Aurel Vlaicu"	Professor	Academia
	Regional Development Agency of West region	Head of Division	Government

This document follows the structure of the document *Outline for the Mapping reports (Deliverable 2.2*, and the text is based mostly on our primary research (interviews carried out). In some chapters, insights coming from the interviews are extended with secondary research (statistical data, existing documents). In some cases, the text includes some 'quotes' from interviews and highlight them throughout the text.

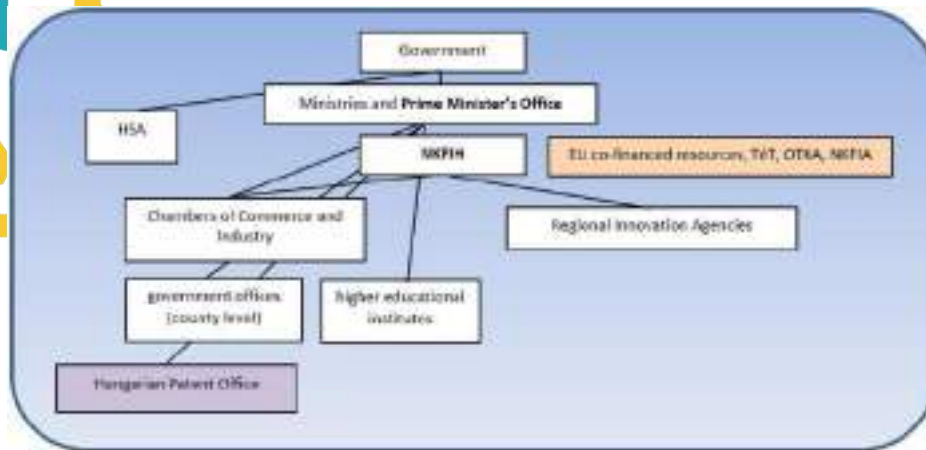
## 5.2 Structure and organisation of the regional innovation system

In 2016, Éva Gajzágó and Gergő Gajzágó published a scientific paper about the Hungarian Innovation System. In their research they stated, that the Hungarian innovation system between 1989 and 2010 was developed significantly: *"From the establishment of basic decision making and management institutions, till the structure of the founding process, the whole system was reorganized"* (Gajzágó-Gajzágó 2016, p 60.).

Several decision making board (ministries) influenced and still influence the innovation process and the management of National Innovation System (NIS) institutions. Hungarian NIS after 2010 also had problems which hindered the innovation process. Decreasing commitment of political leaders, the worldwide financial and economic crisis and drained financial support caused financial and management problems for the NIS organizations. Nowadays, the Hungarian NIS' s transformation is still in progress. Decision makers are committed to the development of the system however it became firmly centralized.

The local and regional level innovation system has changed since 2010. Many of the local and regional organizations were closed due to financial problems or because of strategical and political reasons. The sub-region we examined in our research has faced these problems too. The Technology Transfer Office of the local higher educational institute and the sub-point of the regional innovation agency were closed. The managing organization of this sub-point was bankrupted and closed down. The industrial park is not offering innovation services anymore and local financing of innovative firms has also been terminated (Gajzágó – Gajzágó 2016).

**Figure 1: Main decision makers of the Hungarian NIS after 2010**



Source: Gajzágó – Gajzágó (2016).

The interviewees highlighted that the following organisations ('actors') are central for the system: University of Szeged, the Extreme Light Infrastructure Attosecond Light Pulse Source (ELI-ALPS) research institute, Chamber of Commerce and Industry, other public and private research institutions, incubators, clusters, other sectoral associations, outstanding innovative businesses. The division of tasks among them is as follows:

- University, ELI-ALPS, and other public and private research institutions – research activities
- Incubators – advisory support, financing opportunities
- Clusters – providing its members with information gained from international partners, international projects
- Other sectoral associations, Chamber of Commerce and Industry (CCI) – supporting services (information and partnering)
- Outstanding innovative businesses – serve as role models, providing a positive impact regarding innovation which affects the whole value-chain

Concerning the region of Szeged, we have to highlight a quite strange paradox: taking the indicators of the regional competitiveness into account, both Csongrád-Csanád county (NUTS3 level) and Dél-alföldi Régió (NUTS2 level) are in the last part of the competitiveness ranking of the regions. In contrast, the Szeged region is very strong in one indicator group, namely: Research, Development, and Innovation (R&D&I). This region is leading in R&D&I in Hungary, but the results of this process are not utilized in the region, but they leave it.

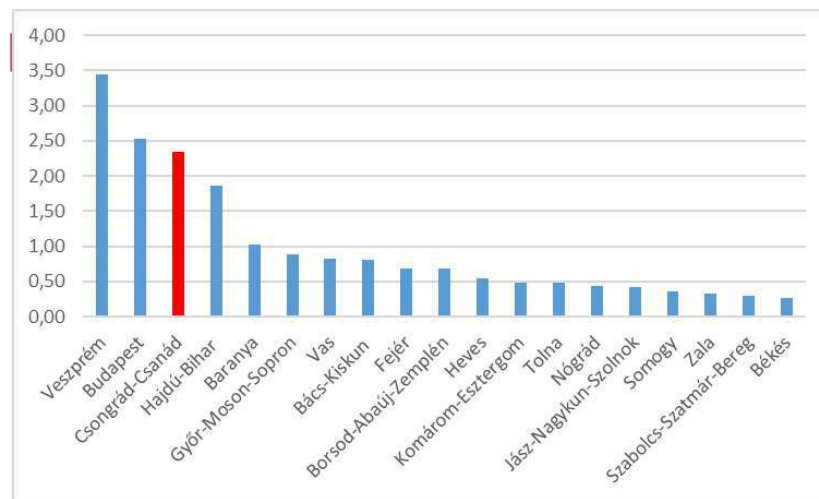
Csongrád-Csanád County stands out from the Hungarian counties in terms of research and development, and innovation. The statistical indicators used for its



measurement show that Csongrád-Csanád County is the most innovative Hungarian provincial county.

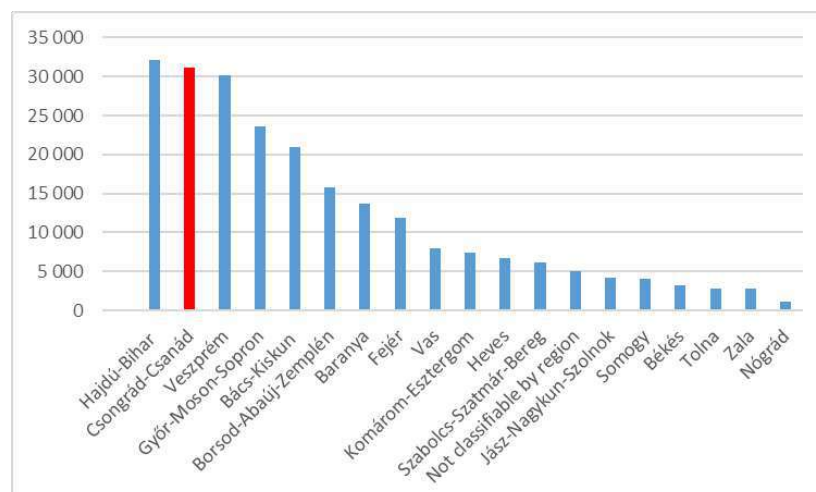


**Figure 2: Intramural R&D expenditure as a percentage of gross domestic product (GDP) in Hungarian counties (2018)**



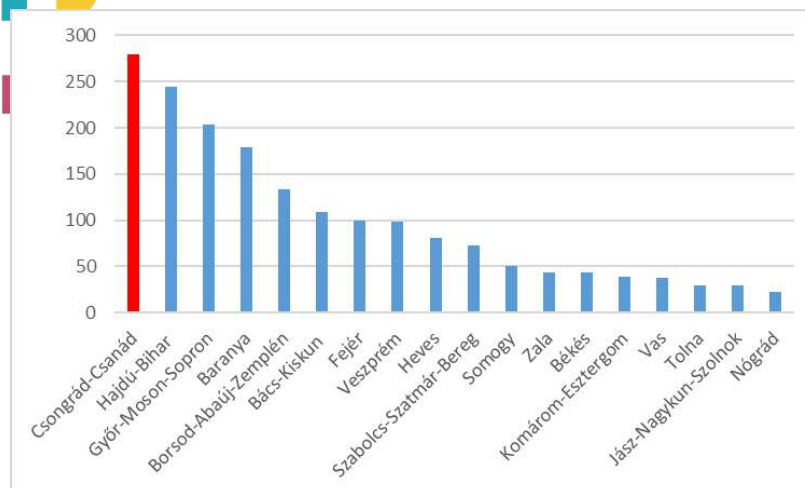
Source: Own construction based on HCSO (2021)

**Figure 3: Intramural R&D expenditure in Hungarian counties, million HUF (2019)**



Source: Own construction based on HCSO (2021)

Figure 4: Number of R&D units in Hungarian counties (2019)



Source: Own construction based on HCSO (2021)

### 5.2.1 Industry structure (actors, priorities and dynamic)

The Hungarian Central Statistical Office (2021) registered about 81,000 economic organizations based in Csongrád-Csanád County (Methodology<sup>151</sup> and meta information<sup>152</sup> available). It should be noted that this ostensibly very high number includes a very large number of self-employed (over 72%) who are registered as “economic organizations” in the official statistical classification system.<sup>153, 154</sup> “Proper” corporations were the most common in the national economic sections of trade (24%), scientific and technical (17%), and the industry and construction sector (9.8% respectively), while self-employment most frequently occurred in agriculture (46%) and real estate (12%). The size of corporations operating in Csongrád-Csanád county is similar to the national trend, the vast of these being among the smallest firms, with less than 10 employees.

The distribution of registered enterprises in the industrial sector is significantly lower than in the agriculture and service sectors. The number of foreign-owned firms, as a percentage of total firms, is expected to grow in Csongrád-Csanád County.

<sup>151</sup> <https://www.ksh.hu/docs/eng/modsz/modsz32.html>

<sup>152</sup> [https://www.ksh.hu/apps/meta.objektum?p\\_lang=EN&p\\_menu\\_id=110&p\\_ot\\_id=100&p\\_obj\\_id=BCAA](https://www.ksh.hu/apps/meta.objektum?p_lang=EN&p_menu_id=110&p_ot_id=100&p_obj_id=BCAA)

<sup>153</sup> [https://www.ksh.hu/docs/hun/xstadat/xstadat\\_evkozi/e\\_qvd024g.html](https://www.ksh.hu/docs/hun/xstadat/xstadat_evkozi/e_qvd024g.html)

**Table1: Number of registered economic organisations by sector - 31st December, 2018**

Name of the sector	Number of Economic Organisations
Agriculture, forestry, fisheries	27,846
Manufacturing	3,055
Industry	3,283
Construction	3,572
Wholesale and retail trade, repair of motor vehicles	6,688
Transport, storage	1,307
Accommodation and food service activities	1,910
Information, communication	2,054
Financial and insurance activities	1,470
Professional, scientific and technical activities	7,049
Administrative and support service activities	2,197
Education	2,430
Human health and social work activities	2,182
Arts, entertainment and recreation	1,756
Other services	2,417

Source: Own construction based on HCSO (2021)

Interviewees highlighted the following sectors as the most important ones in the region:

1. **Agriculture and Food industry:** the County has traditions reaching back several centuries in the fields of agriculture and food industry, as well as in related education and research. The County's agricultural assets are also outstanding at national level, thus it is often described as the food basket of the country. Several major companies of the Hungarian food industry started and still continue their activities in Csongrád County, such as Pick Szeged (Pick salamis, cold cuts, meat processing), Sole Mizo (wide range of dairy products), and Hungerit Zrt. (all phases of production of poultry from first processing to bake-off products). It is an extremely important factor that the County has significant R&D&I potential, both in food industry and agriculture, the following organizations all perform related R&D&I):



– Baybio: Bay Zoltán Nonprofit Ltd. for Applied Research, Division for Biotechnology in Szeged (BAY-BIO). Bay Zoltán Ltd.'s and BAY-BIO's activities form a technological bridge between the basic research and the experimental development within the biotechnological sector. Priority research and development areas: complex agro-biotechnological development (in accordance with the 'bioeconomy' concept), environmental microbiology development, biological recovery of secondary raw materials

- The Szeged Biological Research Centre (BRC), is an outstanding institution of the internationally acknowledged Hungarian biological research. The BRC employs about 260 scientists whose work is hall-marked by highly appreciated international scientific publications and patents. The research topics include several fields of molecular and cell biology from the industrial utilization of bacteria through controlled improvement of cultivated plants to the problems of human health and environmental protection. The successful activity and high-level scientific research pursued in BRC were also acknowledged by the European Union by awarding the title of "Centre of Excellence" to BRC.
- and several faculties of the University of Szeged, especially the Faculty of Agriculture and the Faculty of Engineering (former name: College of Food Industry).

The substantial innovation results of research institutions are utilised in the food industry and in agriculture.

- 2. Information and Communication Technology (ICT):** Csongrád-Csanád County's relative position in the ICT sector is favourable, as the spatial concentration of ICT enterprises and educational and research institutions is measurable (LQ-index) and strong in the county. The ICT-based R&D&I potential of the county is substantial: the Faculty of Science and Informatics of the University of Szeged is an internationally acknowledged research institute in this field, and considerable private sector research is conducted in this area.
- 3. Research activities:** In Csongrád-Csanád County, a globally unique research institute started its operation in 2019. The physical characteristics of the light pulses produced by the laser driven infrastructure of the ELI-ALPS research institute (pulse length, repetition rate, energy, etc.) represent a combination that is available in no other research institutes in

the world. The ELI is organised as a “research infrastructure” spread across four European countries, and constitutes the first civilian multisite laser research institute in the world. Its significance is huge in the field of materials science, medicine, physics, chemistry, and biology, as well as environmental protection. The research conducted here has the potential to deliver significant breakthroughs in the areas of 4D imaging, medicine, climatology and energetics, in addition, several new research fields can open in the future.

4. **Tourism:** In Csongrád-Csanád County, the offer of the sector of tourism primarily includes medical tourism, services of accommodation, as well as cultural factors, natural conditions, intellectual and cultural historical assets, ethnographic traditions. In Csongrád County, in 2018, the commercial accommodations had 356,708 guests, which equalled a total of 717,903 overnight stays according to the Hungarian Central Statistical Office’s STADAT system. This value is outstanding among the three counties of the Southern Great Plain Region. The county is characterised by the opportunities provided by spas, in addition to festivals, which cover almost the entire area of the county. Furthermore, another dynamically developing field is conference tourism.
5. **Renewable energy:** The plains landscape characterizing the area of Csongrád County is unique both at European and national level, not only because of the number of sunshine hours, but also because of the surface and ground conditions: its geothermal potential. The region has an unlimited quantity of available high-temperature geothermal supplies usable for heating, which could also enable the generation of electricity. Solar energy also plays a great role in Csongrád County, as the number of sunshine hours per year is the highest in this county, more specifically, in Szeged at national level. The number of sunshine hours per year is over 2600 hours per year.
6. **Machinery and automotive industries:** Csongrád County’s relative position in the vehicle industry sector is favourable, despite the fact that priority car industry investment has not been implemented in Csongrád County. The Kecskemét factory of Mercedes is in connection with several companies in the county as a significant car industry integrator of the region. In Csongrád County, the spatial concentration of machinery industry enterprises, as well as the vehicle industry research potential of the county’s R&D&I institutions is measurable (LQ-index) and strong.
7. **Chemical industry:** the rubber industry has a tradition going back more than 50 years in the region.



### 5.2.2 Science sector (actors, scientific priorities and dynamics)

The largest and most recognized research universities of Hungary are concentrated in the capital, Budapest. There are further recognized research universities by the Shanghai Ranking in the four largest country towns including Debrecen, Szeged, Pécs, and Miskolc.

This is the case regarding Science Centers. For instance, the Biological Research Centre, Szeged Centre of Excellence of the European Union as well as the Bay Zoltán Nonprofit Ltd. for Applied Research is present in Szeged. The latter one has institutes in the largest cities: Szeged, Miskolc, and Budapest.

There are smaller universities in smaller towns, however, their university functions decreased (e.g., they are non-research universities). In smaller towns, there are mainly affiliated departments of colleges and universities.

The current burning issue is the emigration of highly educated Hungarian professionals<sup>155</sup>. The president of the Hungarian Academy of Sciences (HAS) recognised several years ago that a large number of outstanding professionals are leaving the country. The following action can be regarded as a response to this: The Cabinet granted HUF 1.2 billion of the HAS budget to Hungarian researchers living abroad to bring them home. With this grant they intend to ensure the conditions of the returning researchers' work for a long term. The other target group consists of professionals who fluctuating between staying in Hungary and settling down here, or settling abroad. The HAS handles this phenomenon as a highlighted problem, and emphasizes that this is a typical problem of poor countries and not an issue special to Hungary alone.

Not all researchers leave the country. Many leave only the academic sphere and instead take jobs at (foreign-owned) multinational companies, because these offer much higher salaries than either academic employment, or employment in domestically-owned firms. It is important to consider this aspect as well, in as far as it could be considered a form of "internal brain-drain", since it effectively removes their talents from the domestically-owned to the foreign-owned sector of the economy.

### 5.2.3 Innovation activities and technological profile (priorities and dynamics)

The world famous research university, the University of Szeged has identified the following five fields as priority fields for R&D&I:

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<sup>155</sup> One of the selected projects TetRRIS will link to is TalentMagnet, which is addressing the same challenge.



## 1. Drug Development

- Biomimetic Systems
- Nanomedicine
- Nanotechnology

## 2. Translational Biomedicine

- Dermatology

## 3. Materials Science and Nanotechnology

## 4. Photonics and Laser Science

## 5. Smart Systems

Furthermore, the university has 10 MTA-SZTE Momentum<sup>156</sup> Research Groups, which represent highlighted research priorities:

1. MTA-SZTE Momentum Foldamer Research Group: Pharmaceutical Research;
2. MTA-SZTE Momentum Porous Nanocomposites Research Group: Development of Materials Science and Nanotechnology
3. MTA-SZTE Momentum Photoelectrochemistry Research Group: Development of Materials Science and Nanotechnology
4. MTA-SZTE Momentum Biocolloids Research Group: Development of Materials Science and Nanotechnology
5. MTA-DE Momentum Functional Analysis Research Group: SMART Systems
6. MTA-SZTE Momentum Oscillatory Neuronal Networks Research Group: Connection to Therapeutic Development and Translational Biomedicine
7. MTA-SZTE Momentum Epithelial Cell Signalling and Secretion Research Group: Connection to Therapeutic Development and Translational Biomedicine

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<sup>156</sup> Lendület Programme is a funding scheme of the President of the Hungarian Academy of Sciences (Magyar Tudományos Akadémia, MTA), which aims at a dynamic renewal of the research work going on at research institutions and universities, via attracting internationally acclaimed scientists and highly-talented young researchers either by hiring them from abroad or keeping them in Hungary.

8. MTA-SZTE Momentum Fungal Pathogenicity Mechanisms Research Group: Connection to Therapeutic Development and Translational Biomedicine
9. MTA-SZTE Momentum Translational Gastroenterology Research Group: Connection to Therapeutic Development and Translational Biomedicine
10. MTA-SZTE Momentum Federal Markets Research Group

#### 5.2.4 Innovation culture

At this point we separate innovation activities: activities done from their own motivation in response to the market demand (whose content – what is being innovated – is determined by market demand), and grant-driven innovation, i.e. projects funded by national or EU contributions, whose orientation and content is determined, in broad strokes, by the funding bodies. One interviewee highlighted: *“local innovation actors highly depend on national funding and support system, administrative constraints in the field of innovation”*.

In the former case, obviously, there is no political influence, but in case of the Hungarian Economic Development Operational Programme (2007–2013) and the Economic Development and Innovation Operational Programme (2014–2020) we can assume the presence of political influence (content of calls for tenders, tender evaluation, protracted decision-making processes, changing the resources available, and the number of winners).

The following socio-cultural factors have helped shape the local innovation culture:

1. **Lack of trust:** 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 last ones 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, VINOP) are designed to promote cooperation. This has borne some success. For example, many research groups are involved in these grants, and they have 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 has had 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.

### 5.2.5 Intermediaries related to regional innovation

The University of Szeged's Directorate for R&D and Innovation works as an interface between the academic community of Szeged and external collaborators in both the public and private sectors. The objective of the Office is to stimulate the creation of intellectual property and manage the resulting assets in support of the mission of the University of Szeged: to provide the best possible educational experience for our students through excellence in teaching, research and creative activity, and service to the state and society. Its main activities are:

- Business relationship management: support the cooperation between industrial actors and academics, thus providing services for both groups in a single-window approach within the university.
- Generating new R&D&I projects
- Prior art search: The investigation of the invention's novelty using international databases of patents and scientific literature.
- Investigation of patentability: The investigation of requirements for a patentable invention based on the patent law.
- Freedom-to-operate search: The investigation of valid intellectual property rights of others in a given region or country in order to avoid possible infringement of laws.



- IP protection consultancy: Consultancy service on general or specific questions related to intellectual property protection.
- Commercialisability report: Analysis of inventions according to their commercial potential. The analysis consists of technical and business evaluation as well.
- Market research: Investigation of possible market applications of the technology and market analysis based on specific databases.
- Business planning: Assisting start-up companies in business planning.
- Marketing planning: Preparing marketing plan of innovative technologies, including brand building and development of sales strategy.

DARINNO, the Regional Innovation Agency (RIA) of the Southern Great Plain is a bridging institution in order to help the work of the actors of the regional innovation system. Its main task is to increase the competitiveness of the region while taking into account the principle of sustainable development. More specifically, DARINNO focuses on improving the region's international competitiveness, strengthening innovation capacities and continuous improvement in enterprises with a particular focus on the knowledge economy, and managing and organising the various regional stakeholders in order to promote cooperation and new innovation activities. A further objective of DARINNO is strengthening the attractiveness of rural areas in the region, both for their current inhabitants and for outside entrepreneurs as sites of investment and places to set up business activities. Finally, DARINNO also seeks to strengthen local awareness of the importance and the possibilities for scientific careers and education, and for innovative thinking in general.

The First Hungarian Responsible Innovation Association is headquartered in the Region (Szeged). This is an RRI specialist organization. The aim of the First Hungarian Responsible Innovation Association is to help the European Union's effort to spread the idea of responsible innovation, to use it practical and to introduce it in the member states. The specific aim of the First Hungarian Responsible Innovation Association is to make responsible innovation known to the Hungarian innovative actors, stakeholders and decision makers, and to implement actions, by which the innovation activities take place proactively and along a certified commitment to protect the future, it could be achieved by managing science and innovation responsible.

#### **5.2.6 Governance structure**

As regards stimulating innovation activity in the Szeged region, governmental financial support (grants and tenders, including EU financial contributions) sometimes plays a greater role in stimulating innovation activities than direct



market demand. Companies often face a severe lack of funds, leading to a certain indiscriminateness in the application for funding. Simply put, they will apply for whatever is “out there” and available at a given time. If there are grants available for purchasing forklifts, they will apply for these; if innovation funds are available, they will apply for those.

If there are no available grants, there are (1) no people who could do the operative work, (2) no source to pay for the rooms, laboratories, water, and electricity bills. Therefore, they apply for any grants they can, whether these are innovative projects, or not.

In business environment, they need to carry out innovative projects, otherwise they fail. A large number of companies apply for EU co-financed financial resources to carry out innovation activities. Beyond what is described in the preceding paragraph, it is also true that only a small portion of businesses commence innovation activities. The clear majority of them reduces the risk via applying for grants, financial resources.

### 5.3 Aspects of RRI in regional innovation policy

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 measured 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.

In Csongrád county there is no strategical conscious RRI-awareness in general: the strategic documents does 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.

To analyze the aspects of Responsible Research and Innovation (RRI) or/and Responsible Innovation (RI) in the regional innovation policy, we examined three innovation policy document (national and regional level), these are:

- Spatial Development Programme of Csongrád-Csanád county
- Smart Specialization Strategy of Hungary
- Economic Development and Innovation Operational Programme of Hungary.

During our research, we investigated regional innovation policy documents, where both directly and indirectly mentioning “Responsible Innovation”, “Responsible Research and Innovation”, “RRI”, and some of their elements and principles. We further investigated the regional policy agenda by conducting interviews with regional actors and completed these results with the findings of the regional interviews.

### 5.3.1 Status in the implementation of the RRI agenda: overview

Before analyzing the regional documents, it is very important to understand, that spatial planning has been modified in Hungary after the programming period 2007–2013. According to the CCXVI. Act of 2013, the main level of spatial development became the NUTS3 level (counties), responsible organizations the county municipalities. Financial initiatives are handled by national ministries.

Before the change, bottom-up approach was much more dominant on regional level with 7 independent regional operational programmes on NUTS2 level, with own financial initiatives and regional institutions and decision rights. This was the last NUTS2 level regional operational program of the region<sup>157</sup>.

The consequence of this institutional change is that spatial planning takes place in two different levels in Hungary: on national level and on NUTS3 level. The

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<sup>157</sup> [https://ec.europa.eu/regional\\_policy/en/atlas/programmes/2007-2013/hungary/operational-programme-south-great-plain](https://ec.europa.eu/regional_policy/en/atlas/programmes/2007-2013/hungary/operational-programme-south-great-plain)

spatial planning lost some part from its bottom-up character, and in main focus areas, regional documents follow the logic of national priorities.

The status in the implementation of the RRI agenda in the analyzed three innovation policy documents is as follows:

1. **Spatial Development Programme of Csongrád-Csanád County:** The concept of Responsible Research and Innovation (RRI) explicitly appears in the Spatial Development Programme of Csongrád County<sup>158</sup> (2014–2020). The term itself is mentioned 21 times. As a planner and coordinating public body for developments in the period 2014–2020, the County Government of Csongrád defined the main directions and goals of development in this document, in the form of 11 regional and strategic goals. However, of these 11 goals, only one includes RRI: priority no. 5 (Strengthening knowledge base and innovation in the county).

In this document they aim to spread the notion of (R)RI in the county, as a horizontal issue similarly to sustainability. Based on the special features of the county, setting-up a Csongrád county responsible innovation model was planned. For this, about 300,000 euros were to be allocated in the planning phase in the spatial development program. The target group were to be public bodies, businesses and civil society. But unfortunately, this plan went largely unimplemented, so the concept of Responsible Innovation remained at document level in Csongrád-Csanád county.

During the planning of the Spatial Development Programme in 2012 and 2013, experts of the University of Szeged were members of the advisory group. They argued for including responsible innovation in the document and they also worked out the text of the RI related chapters.

Unfortunately, the 2021–27 version of the same document does not include responsible innovation anymore. Actually, in the planning work of this document, experts of the University of Szeged didn't take part. While local experts made suggestions to the Municipality of Csongrád-Csanád County to put RI back into the documents latest version, this does not seem to have been taken up so far.

2. **Smart Specialization Strategy of Hungary (S3 Strategy):** This document does not explicitly mention the term “responsible innovation” or RRI, but dedicates a whole chapter to RDI status within its analysis of the current situation in Csongrád county: Chapter 1.2.5 “Territorial characteristics of RDI” points out that Csongrád county as a region has a research-intensive university. Chapter 3.2 positions Hungarian counties in

<sup>158</sup> In this document you can find both the term “Responsible Innovation” in English but mainly its Hungarian version “felelősségteljes innováció”: [https://www.csongrad-megye.hu/onkorm/kozgyul/20140926/k01\\_1\\_mell.pdf](https://www.csongrad-megye.hu/onkorm/kozgyul/20140926/k01_1_mell.pdf)

the innovation space. According to this classification, Csongrád county is a “knowledge region” and belongs to the “smart growth” dimension of the Europe 2020 programme. The S3 strategy draws up the following vision for knowledge regions: “The knowledge regions of Hungary will become dominant players of the macro-region and Europe in the specialization directions in the selected areas, and gain a competitive advantage through the strengthening of the knowledge centres and the involvement of the business sector which raise the knowledge and the products produced in selected specialization directions to the international level. The forward effect of smart growth at the domestic level will trigger the rise of the other regions as well.”

3. **Economic Development and Innovation Operational Programme of Hungary:** The programme aims to stimulate the economies of the less developed regions in Hungary. Its most important priorities are the competitiveness of small-and medium sized enterprises, research and innovation, and employment. This document does not explicitly mention the term “responsible innovation”. Development of research and innovation is included in priority nr.2. This programme builds on the S3 strategy and its objectives.

### 5.3.2 Role of the "grand challenges" and "responsibility" in the region

Like all EU-member States, Hungary has also to deal with the “grand challenges”, but these issues are addressed mainly in top-down approach, and the initiatives are made rather on national level than on regional level. One of the eight operational programmes will deal with environment and energy on national level (similarly to the last programming period), so this issue remains important.

Concerning regional level, the period of writing this document is a transitory one in terms of the documents of the programming period 2014–20 are no longer valid, but the documents of 2021–27 are still in the preparation phase.

But from the publicly available versions, news and infos it is already visible, that climate change and climate issues in general will be highly prioritized in the future of the region – at least in the strategic documents.

A new level of regional planning has been defined by the Hungarian Government for the period 2021–27, which is higher than NUTS3 but lower than NUTS2 level. This is called the Economic Development Zone – in our region South-Great Plain Economic Development Zone, which has a Government Commissioner, who is responsible for the planning process. The strategy is ready, but not public yet.

Furthermore, planning is running in the other, also in the 2014–20 period existing levels: City level and County level (NUTS3 level).

However, larger cities in the County, like Szeged and Hódmezővásárhely, Szentes, Csongrád and also dominant institutions of the region, like University of Szeged develop their own strategies on green issues.

The largest city of the region, Szeged has set the goal of becoming the greenest city in Hungary with the purest air and the healthiest people. Szeged has already implemented several measures towards greener energy – such as isolating and providing solar panels for buildings, building a new geothermal district heating system and recycling waste. Furthermore, tens of billions are spent on modernisation of public transport, which is already over fifty percent electric.

According to the GreenMetric university world ranking, the University of Szeged is the greenest University in Hungary.

Furthermore, there are already some initiatives available which address climate change and sustainability, but all of them are national, none of them are regional:

- From 1<sup>st</sup> January 2021 a new initiative is available for families with children: half of the home development costs will be paid back by the government (limit: 20,000 euros). Many of the eligible priorities are in connection with climate change: solar panels, heat pumps, insulation etc.
- Solar panel developments are available for companies also
- There are strict regulations for newly constructed houses to use renewable energy like heat pump
- Electric cars and plug-in hybrids are also supported by the Hungarian Government

As a summary we can state that dealing with great challenges in our region is driven rather by economic interest than responsibility.

### 5.3.3 Status of different RRI elements (base: either implemented by the regional innovation agency or within single R&D&I projects)

#### *Openness*

As mentioned above, there are some **individual efforts** of regional bodies to apply some elements of RRI. One of these is the Open Access Support of the University of Szeged. Since University of Szeged is the main innovation actor of the region, this step is very significant.

The University of Szeged supports Open Access publishing but Open Access Publication Charge support is not automatically granted for the authors of the University. The Vice-Rector for Scientific Affairs and Innovation decides on the grant. The University of Szeged will cover the full Article Processing Charge. This initiative supports quality, since the journal must be ranked Q1 – Q2.



Other significant research units, like BRC and BAY-BIO make also efforts to Open Access Support of their publications, but it is mostly restricted by financial issues. Some R&D&I grants in Hungary include obligatory Open Access budget line, which is 10% of the overall budget, but this initiative is also national, not regional, but gives the opportunity of regional actors to give open access to their research results and data.

Other “good practices” can be found among the EU co-funded projects, since our regional consortium members of these projects also have to give open access to the project results at least on consortium level – depending on the rules of the given project.

In all other cases and especially on strategic level, Openness is little developed in the region.

### *Stakeholder Inclusion and Public engagement*

During the last few years, some most relevant bodies started to apply community planning in practice in Csongrád-Csanád county. Cities and city owned institutions started to involve stakeholders and citizens to the planning process: general public can vote online about urban issues, i.e. the new design of the main square (Széchenyi square) in Szeged, the new design of the new tramways in Szeged has been decided by community voting.

However, the Szeged2030 economic concept is now being designed using the community planning method. In the first round, internationally known entrepreneurs have been interviewed about their opinion, then the experts of University of Szeged created a first synthesis. The next step was a workshop at the University of Szeged, followed by other stakeholders in the region, like the Chamber of Commerce and Industry etc.

EU co-funded projects are also very beneficial in terms of stakeholder inclusion and public engagement, since many call for proposals require to involve stakeholders and general public into project implementation. Many project partners of the region form Local Stakeholder Groups (LSG) and/or Transnational Stakeholder Groups (TSG) to ensure engagement.

In all other cases and especially on strategic level, Stakeholder inclusion and public engagement is little developed in our region.

### *Gender and Diversity issues*

The interviewees working in research institutions highlighted that their organisation elaborated Plan of Equal Opportunities: everyone must be treated equally on the basis of their merits and relevant objective criteria, regardless of age, disability, ethnic or national origin, sex, race, socioeconomic background, gender, gender reassignment, pregnancy and maternity, political or religious beliefs or family circumstances including marriage and civil partnership, sexual orientation.

Many researchers are public servants in Hungary, their salaries are based on a pre-defined table, which is independent from gender and diversity issues.

### *Science Education*

Hungary has a 70 years old, really unique initiative to address science education. The National Scientific Students's Association Conference (Országos Tudományos Diákköri Konferencia, OTDK) is to make scientific career more attractive to young people by helping university students to carry out a scientific work and present it – after a successfully local round – on national level for famous scientist.

The Conference of Scientific Students' Associations is organised at most of the Hungarian universities in every academic year. University students, who would like to participate, need to write a research paper of about 20-100 pages (depending on the field of study) and prepare a presentation about it, either in Hungarian or English. Experienced supervisors help their work with guidance and professional suggestions. At these local conferences, the best performers receive a prize and a nomination for the national competition based on the evaluation of experts of the given field.

Students get peer-reviewed feedback to their written work and oral feedback to their presentation – from well-known researchers.

OTDK is organized every second year, ensuring a platform for the best talents in 16 disciplines. Usually, thousands of students, advisers, judges, sponsors and other interested people take part in the conference.

### *Anticipation, Reflexivity, Ethics*

These aspects of RRI are not directly visible and don't play significant role in the 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 growth/material issues as the region is still lagging behind (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/exposure to RRI is low. Regarding the ethical dimension interviewees' perceptions are quite broad, undefined or unclear and the general attitude is to focus on material issues.

## **5.4 Challenges related to the implementation of RRI in the region**

In our previous research, which compared Hungary and the Netherlands from RRI point of view, we detected some special features in the innovation environment in Hungary (Flipse et al 2017). These features are the following:

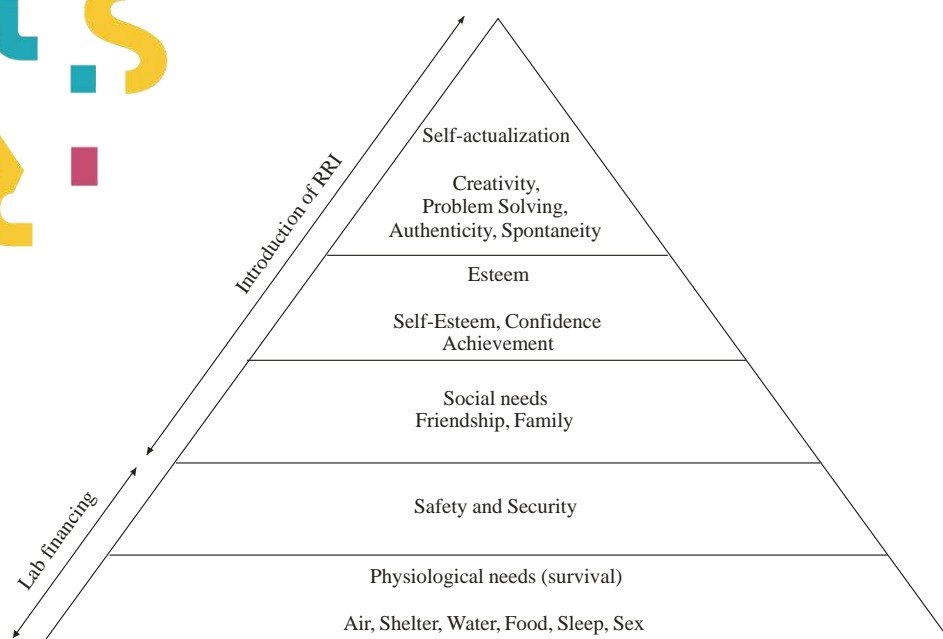
- Lack of trust

- Lack of cooperation willingness
- Importance of informal channels
- Hungarian researchers and actors in the innovation process have minimal information on RRI in general

Earlier studies conducted in developed countries (including in the Netherlands) showed that researchers understood that RRI aspects are essential for the future. Conversely, in Hungary, the research and innovation actors seem to focus primarily on the direct costs and benefits of different actions to themselves. This can be understood as a response both to the much greater material scarcity the Hungarian researchers face (i.e., a survival strategy: lack of material affluence and security compels a greater focus on immediate costs and benefits) and their socialization in a (post-) Socialist environment marked by lower levels of trust and cooperation. This has a direct impact on the implementation of RRI.

Our work will therefore be influenced by the fact that the places of research in general are under-financed: from day to day researchers in these labs have to create the financial basis for their research and this daily survival strategy may make them insensitive to the potential benefits of RRI, so they should be supported. To explain this, Maslow's theory of the "hierarchy of needs" can be used to explain researchers' receptivity to RRI. According to this theory, until a need at the bottom of the pyramid is satisfied, the satisfaction of a higher need cannot be expected. In our case this means that so long as innovation actors (including researchers) struggle for daily survival, the concept of the RRI cannot be realized completely, since it represents a higher level of need. This has the practical message that effectiveness of implementing RRI can be increased in low-financed innovation environment if the implementation is converted to lower levels of the hierarchy of the needs. In other words: faster results can be achieved if goals we want to achieve are integrated into the costs and benefits of the actors, that is, in economic sense, externalities are internalized.

*Figure 5 Hierarchy of needs and possible level of RRI in developing countries*



Source: own construction based on Maslow (1954), published in Flipse et al. (2017)

Furthermore, efforts for introducing RRI into the daily R&D&I work had promising results in the academic sector in the region (Lukovics-Fisher 2017), but it was quite impossible in the business sector. During the last years, the following projects addressed the RRI topic in Csongrád County:

- FaRIInn: 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

Main finding of these projects in business context is that rational businesses will not implement RI, unless it is economically profitable in short term. Based on that, the real break-through in the RI application of the business sector could be an economic approach.

## 5.5 Conclusion

Most of our interviewees think that the definition of RRI/RI, and the characteristics of the possibility of negative environmental, ethical and social effects of innovations are not clear for everybody even within the innovation community. The lack of attention for the negative effects was also traced back to the cost effectiveness, which is a key element of the current economic environment. The parties emphasised that if any financial support coming from EU or other sources would be available, then they are ready to help the dissemination and implementation of responsible innovation.

Regarding the cooperation between the participants of the innovation space it became clear that most of the innovation actors prefer conducting their own research and development activity in the region and their cooperation activities are limited to the other key players from their perspective. The important regional stakeholders are the SMEs, research institutions, universities or other higher education institutions. The answers showed that the university has the widest connection with the innovation actors, but it is limited to the scientific profile of the university. It means that theoretically, even the university cannot contact with all local innovation actors. The rarest are the cooperation points with the private research institutions, industrial parks, incubators and civil organizations.

To enhance the Responsible Innovation capacity, the future measures highlighted the indirect opportunities. Drawing attention to these issues by public events, media appearances, conferences or education; publicising the commitment of the key players of the innovation space to the issue; opening new discussions, debates; publishing new scientific results of RI in comprehensible forms; building it into the local development strategies as horizontal goals and creation of local or national standards, white papers were the most common ideas.

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