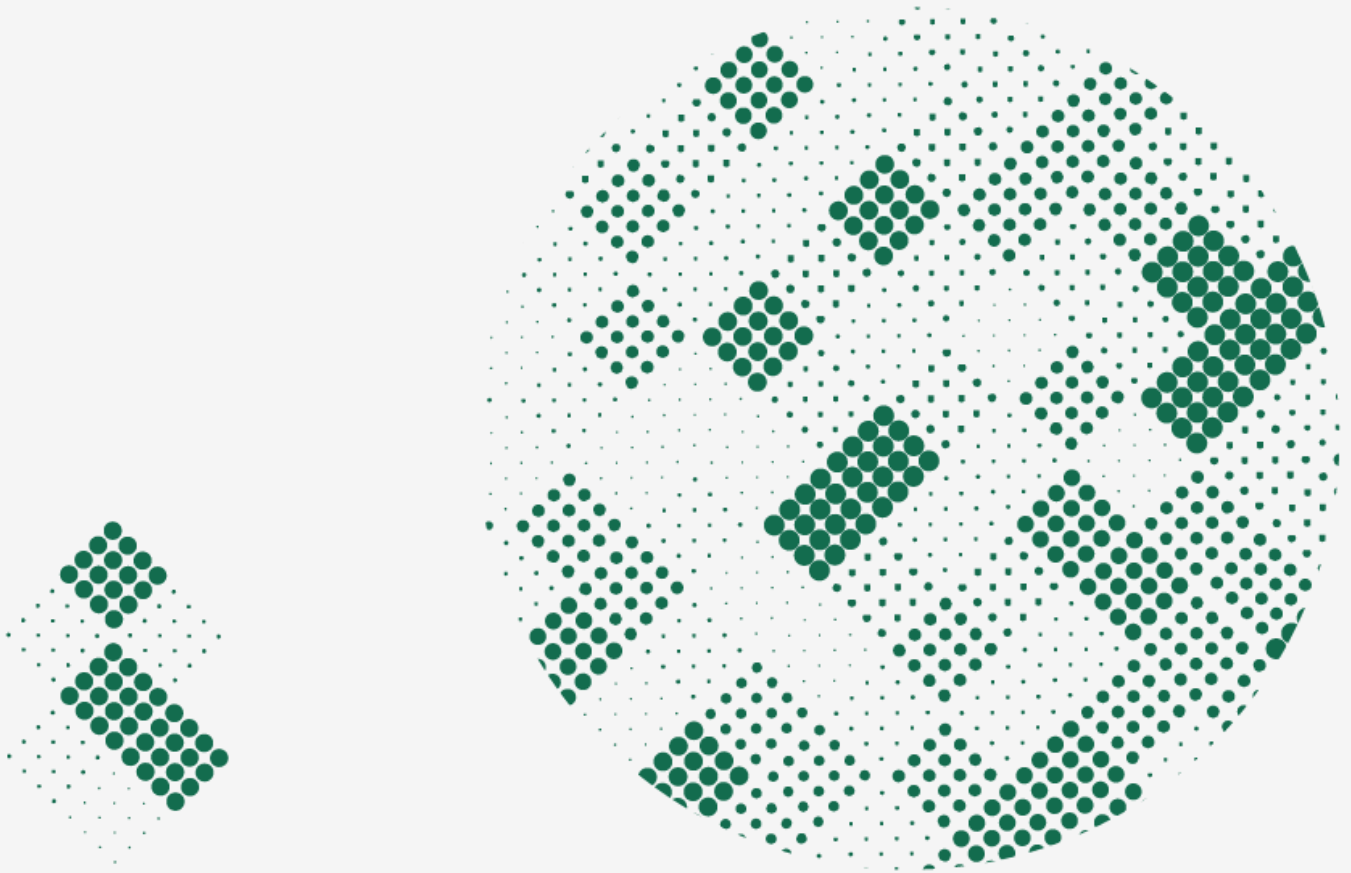




RESPONSIBLE
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RRI AUDIT REPORT

City of Sabadell and Catalonia



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List of acronyms/abbreviations used in this document

- AIRR – Anticipation, Inclusiveness, Reflexivity, Responsiveness
- FCRI – Fundació Catalana per a la Recerca i la Innovació (Catalan Foundation for Research and Innovation)
- MFF – European Union's Multiannual Financial Framework
- NGEU – Next Generation Europe Recovery Plan
- PECT-Vallès - Territorial Smart Specialisation in the Vallès area
- PES – Promoció Econòmica de Sabadell (Economic Promotion of Sabadell)
- R&I – Research and Innovation
- RELOS3 - From Regional to Local: successful deployment of the Smart Specialisation Strategies
- RIS3CAT – Research and Innovation Strategy for Smart Specialisation in Catalonia
- RRI - Responsible Research and Innovation
- SDGs – United Nations Sustainable Development Goals
- SWOT & TOWS – Strengths, Weaknesses, Opportunities, Threats

Executive Summary

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

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

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

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

Introduction

About the RRI Audit Report

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

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

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

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

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

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

Methodology

This review included the following tasks, which are ordered chronologically:

1. Interviews with 17 stakeholders from the research/academic, business, policymaking and civil society sectors (quadruple helix) between 25 March and 17 April 2021. The stakeholders filled in an online questionnaire about their knowledge of and practical experience with RRI keys and AIRR dimensions. The aim of this questionnaire was to identify opportunities for integrating RRI keys and AIRR dimensions in participants' organisations.
2. An online focus workshop, carried out on 25th April 2021 with 12 stakeholders from research/academia, policy making, civil society and business, with the aim of further exploring the findings from the analysis of the previous interviews.
3. Analysis in June 2021 of the following policy documents regarding Smart Specialisation issues in Catalonia and Sabadell city:
 - *Strategy for the Smart Specialisation of Catalonia* (RIS3CAT)¹, the research and innovation (R&I) actions and programmes framework established by the Catalan Government for the period 2014-2020² to provide support for the generation and development of innovative projects.
 - *Specialisation and Territorial Competitiveness Project "Vallès Industrial"* (PECT Vallès Industrial³), which "aims to promote this territory as a benchmark in the specialisation domain of industrial systems and to become a centre for innovation and design in this field". To this end, the city council of Sabadell is collaborating with several agents from the local and regional innovation ecosystem, such as universities, business associations, technological centres and other municipalities, on Circular Economy, Active Ageing and Intelligent Design applied to Industry.
 - Interreg current Project *RELOS3: From Regional to Local: Successful deployment of the Smart Specialisation Strategies*⁴, which seeks to implement regional Smart Specialisation Strategies (RIS3) in the local context by actively involving local authorities, innovation agents and companies. This project is led by PES-Sabadell.
 - *National Agreement for the Knowledge Society*⁵, a result of the collaboration between the major quadruple helix actors to foster Catalonia's knowledge transfer towards the productive fabric in the interest of society.
4. Participatory workshop in July 2021 with 10 stakeholders from organisations other than those involved in the interviews and focus workshop, to examine the perceptions of territorial stakeholders with regard to responsibility (in research and innovation), the RRI keys and AIRR dimensions, and their relevance to the overall development policy in the territory.
5. Analysis of the post-COVID recovery plan proposed by Next Generation Catalonia⁶ to activate "... *ambitious recovery programs which serve to make structural transformations and increase*

¹ http://catalunya2020.gencat.cat/web/.content/00_catalunya2020/Documents/angles/fitxers/pla-accio-ris3cat-2018-en.pdf

² Due to the COVID-19 crisis, at the time of writing of this report, the new plan has not yet been fully developed and RIS3CAT 2014-2020 is still in force.

³ <https://web.sabadell.cat/pect/que-es>

⁴ [RELOS3 | Interreg Europe](#)

⁵ <http://empresa.gencat.cat/ca/intern/pnsc>

⁶ http://economia.gencat.cat/web/.content/20_departament_gabinet_tecnic/arxiu/pla-recuperacio-europa/next-generation-catalonia.pdf

resilience...”, and which affects the three policy foci of Circular Economy, Active Ageing and Intelligent Design in Industry.

6. Analytical review of the territorial findings of the previous tasks, including a SWOT and TOWS matrix, in October 2021.
7. Four focus groups organised with representatives from research, business, policy making and civil society separately, to comment and reflect on the analytical review.
8. Inclusion of the focus group participants’ views in the final document, “Catalonia and Sabadell RRI Audit Report”.

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

Policy areas

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

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

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

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

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

- Reducing carbon footprint by implementing clean energy systems, and developing Circular Economy projects with the quadruple helix stakeholders (companies, research/academia, local administration and citizens, who will have to be advised and guided by R+I agents).
- Highlighting the capacities, experience and potential of people over the age of 55, thus promoting research and innovation in products and services adapted to their needs.

- Placing industry and services to industry at a higher level of competence through innovation, design and technology, with the active support of the universities near Sabadell.

The following challenges have been identified:

Research and academia

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

Civil society

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

Business

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

Synthesis of experiences related to RRI-AIRR

Keys

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

Ethics

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

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

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

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

Gender equality

Gender perspective is important in the policy foci of Active Ageing and Intelligent Design in Industry. Regarding Active Ageing, women constitute the majority of the elderly population, owing to their higher life expectancy⁷, and also the vast majority of caregivers⁸. Consequently, female perspectives must be taken into account in any plan or action to be put into practice. In contrast, the industrial sector has traditionally involved more men⁹. Women's involvement must be encouraged as part of Intelligent Design in Industry.

⁷ <https://www.idescat.cat/indicadors/?id=ue&n=10106>

⁸ <https://www.peretarres.org/premsa/sala-de-premsa/noticies/80-de-les-cuidadores-no-professionals-son-dones>

⁹ https://gpaq.upc.edu/lldades/indicador.asp?index=1_1_5

Gender equality, which is compulsory by law, is the most widely implemented RRI key in the territory. This key appears in RIS3CAT, and relevant plans have been established in all kinds of public and private sectors in the territory. In addition, women have been included and promoted in careers and places that used to include men almost exclusively. However, much work is still required to fight salary imbalance¹⁰ (which currently favours men), get more women into top jobs¹¹ and include female perspectives in studies and territorial plans. The latter aspect is crucial in the case of Active Ageing for the reasons set out above. Furthermore, parenthood still affects working women more than it does their male counterparts because of pervading cultural conditioning factors.

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

Science education

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

The science education effort is encouraged and supported by the EU and by regional and local public administrations, as seen, for example, in the Catalan Government's National Agreement for the Knowledge Society¹². This agreement is the fruit of the collaboration between the major quadruple helix actors for fostering Catalonia's knowledge transfer towards the productive fabric in the interest of society.

Science education is mostly implemented in the research and academia sector, which is to be expected, since researchers and academics are producers and disseminators of scientific knowledge. Their contribution has included organising different scientific dissemination activities aimed at Catalan schools, families and lay citizens. Some of these activities address environmental protection, recycling and healthy living, all of which are relevant to the RRI-LEADERS project. Science education in the territory is mainly aimed at young or middle-aged people, disregarding the eldest segment of the population. Given that people aged over 65 years accounted for 19% of the regional population in 2021 (according to the Statistical Institute of Catalonia¹³), steps should be taken to involve them in more science education events, not only to increase their knowledge, but also to provide social and mental stimulation, helping them to lead healthier and more meaningful lives.

A similar science education gap is found in industrial design and digitalisation. Given the complexity of these subjects, the gap encompasses people of all ages, though at the school level, robotics and programming initiatives (i.e., Scratch¹⁴) have recently appeared outside the official school curriculum. Greater collaboration with universities to improve teacher training could help to address this problem.

The main issue with science education is that no clear and common guidelines are provided to ensure its implementation in the most fruitful and innovative way. Science education is left in the hands of individual research centres and academic institutions, and its implementation sometimes depends on certain individuals' willingness and availability. It would be useful to establish common bases and spaces for creating

¹⁰ <https://www.idescat.cat/indicadors/?id=ue&n=10128>

¹¹ <https://www.eada.edu/ca/actualitat/noticies/2021/05/bretxa-salarial-i-presencia-de-la-dona-en-posicions-directives-2021>

¹² <http://empresa.gencat.cat/ca/intern/pnsc>

¹³ <https://www.idescat.cat/pub/?id=inddt&n=915>

¹⁴ <https://scratch.mit.edu/>

closer collaboration between the different interested stakeholders. For example, students, teachers, elderly people and private companies could design science education programmes together to satisfy all their needs, then subsequently participate in the evaluation and dissemination of the results.

Open access

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

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

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

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

Policymakers and public administrations are considered by the rest of the stakeholders to be the main open access promoters. Through the above-mentioned National Agreement for the Knowledge Society, the Catalan Government has set up the Catalonia Research Portal¹⁵ (Portal de la Recerca de Catalunya), with links to the European Open Science Cloud, which enables free and easy access to the research outputs produced by publicly funded organisations.

Public engagement

Although Catalonia's culture of public engagement is not generally reflected in the quadruple helix sectors, interesting examples have been implemented by each.

In the case of policymakers and public administrations, examples include the above-mentioned National Agreement for the Knowledge Society and the project led by Sabadell City Hall in the framework of the Interreg EU calls, "RELOS3: From Regional to Local. Successful deployment of the Smart Specialisation Strategies", which actively involves business, innovation and research and local authorities in Circular Economy, Active Ageing and Intelligent Design in Industry. Likewise, RIS3CAT explicitly mentions the need for public engagement.

In the research and academic sector, there are examples of indirect public engagement in cases linked to citizen science, and direct public engagement in research studies and public consultations. However, this

¹⁵ <https://portalrecerca.csuc.cat/>

engagement is mainly related to environmental¹⁶ or health issues¹⁷ and has been implemented in a unidirectional way (downstream): neither citizens nor businesses, or even policymakers, participate in the design or posterior analysis.

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

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

AIRR Dimensions

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

Anticipation

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

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

Inclusion

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

¹⁶ Comissió per a l'impuls de la ciència ciutadana i natura (CICCNA) http://mediambient.gencat.cat/ca/05_ambits_dactuacio/educacio_i_sostenibilitat/educacio_per_a_la_sostenibilitat/ciencia-ciutadana-natura/comissio-impuls-ciencia-ciutadana-natura/

¹⁷ A good example would be CitieS-Health: Citizen Science on Health Issues in Urban Environments, implemented by ISGlobal in 2018 <https://www.isglobal.org/ca/-/arranca-cities-health-ciencia-ciudadana-sobre-cuestiones-de-salud-en-entornos-urbanos>

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

Reflexivity

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

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

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

Responsiveness

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

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

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

Mapping of synthesis of experiences related to RRI-AIRR

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

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

CORE Smart and Sustainable Cities, UAB	Interest in public engagement and ethics in research	Experience in interaction between different quadruple helix stakeholders		
Parc Taulí Research and Innovation Institute	Interested in public engagement and science education		Influence in research ethics to promote the wellness of their patients	
Centre for research in agricultural Genomics (CRAG)	Interested in public engagement	Experience in gender equality		
University and Research Grants Management Agency (AGAUR)	Interested in research ethics and gender equality	Experience in science education and open access		
Rector's Office at UAB	Interested in research ethics, public engagement and gender equality	Experience in science education, reflexivity		
Research Park, UAB	Interested in research ethics, public engagement and gender equality			
Ramon Llull University	Interested in research ethics, public engagement, inclusiveness			
International University of Catalonia	Interested in research ethics, public engagement, inclusiveness			
Ramon Llull University	Interested in research ethics, public engagement, inclusiveness			
Robotics and Industrial IT Institute, Polytechnic University of Catalonia.	Interested in public engagement, research ethics			
Businesses				
SEAT	Interested in research ethics and gender equality			Power to implement sustainability actions, such as reducing pollution and waste
Sorigué	Interested in gender balance and research ethics			
Barça Innovation Hub (Football Club Barcelona)			Influence in public engagement	
ADASA Sistemas S.A.U.	Interested in science dissemination			
FI GROUP			Influence in the policies in public administration	

Inèdit			Influence in sustainability and eco-innovation strategies	
Start-up VEnvirotech Biotechnology	Interested in research ethics and open access			
Start-up B'ZEOS (Compostable food packaging)	Interested in research ethics and open access			
Packaging Cluster	Interested in research ethics in business			
INNOVAFORUM	Interested in citizen engagement and ethics			
VITALA	Interested in citizen engagement and open access			
Innovement	Interested in public engagement, ethics and open access			
Fika Consultoria	Interested in public engagement, ethics and open access			
NGOs and civil society				
Cambra Oficial de Comerç, Indústria, Serveis i Navegació de Barcelona	Interested in research ethics in business		Influence in public engagement	
Agència per la competitivitat de l'Empresa Generalitat de Catalunya, ACCIO	Interest in ethics in business		Influence in anticipation, reflexivity in business	Power to promote and transform companies to situate them as a benchmark
Fundació TIC Salut Social	Interested in ethics and citizen engagement			
Voluntaris en Assessoria Empresarial VAE	Interested in ethics and citizen engagement			
Individual citizens	Interested in ethics and citizen engagement			
Fundació CIPO	Interested in ethics and citizen engagement			
Fundació MAIN	Interested in ethics and citizen engagement			
Chapter2	Interested in ethics and citizen engagement			

SWOT analysis

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

TOWS analysis

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

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

<i>How can we use Strengths to successfully deal with Threats?</i>	T1 - Difficulties in the identification and access to new groups of stakeholders not traditionally included in collaborative processes hamper inclusiveness.	T2 - There is a certain degree of passivity, reluctance to change and bureaucracy in the public administrations, causing delays in the implementation of new measures and plans and/or corrective measures (responsiveness).	T3 - Rivalry and competition exists between stakeholders with different levels of power, pressure and influence (lobbies) in the territory, resulting in problems of coherency in strategic planning and mistrust when having to engage in collaborative processes.	T4 - The high speed of technological change hinders the capacity of firms to integrate the solutions that best facilitate public participation and inclusiveness (especially for the policy focus of Intelligent Design in Industry).
S1 - Certain RRI keys (science education, gender equality, ethics) are de facto implemented by the research/academia, business and policy making stakeholders. This experience can be used and even enriched by other organisations.	Establish formal and informal meeting points for the quadruple helix stakeholders to exchange experiences and views regarding the application of RRI keys, and for fostering mutual trust. This should be reinforced through their joint participation in workshops and capacity-building initiatives linked to the 2021-2027 EU Funds framework and the RIS3CAT activities.		Formalise and disseminate evaluation and planning tools and strategies of the different quadruple helix stakeholders, fostering trust and participation through an open platform. This is especially important for the stakeholders traditionally less involved in planning and participation processes. The existing Unicorn Challenges Platform enables the creation of such spaces.	
S2 - Anticipation and reflexivity exercises are de facto implemented by the quadruple helix stakeholders' organisations. This experience can be used and enriched by other organisations.	Formalise and disseminate evaluation and planning tools and strategies of the different quadruple helix stakeholders, fostering trust and participation through an open platform. This is especially important for the stakeholders historically less involved in planning and participation processes. The existing Unicorn Challenges Platform enables the creation of such spaces	Use guidelines and examples provided by the Catalan Government to participate in the NGEU initiatives (as well as in future EU Funds projects) and thus improve the use of the full RRI approach in the public administration.		Provide examples of how to use new technologies to improve planning and decision-making.
S3 - RIS3CAT and PECT Vallès Industrial explicitly mention public engagement and inclusiveness of authorities and social and innovation actors in the territory for creating common working arenas.		Extend RIS3CAT's use of the RRI approach in the 2014-2020 and 2021-2027 frameworks to shape new projects with the public administration leadership.	Extend RIS3CAT's use of RRI guidelines and tools (such as the AREA framework or the shared agendas) in the 2014-2020 and 2021-2027 frameworks to build common projects and initiatives in a safe and trustful environment.	
S4 - EU-Interreg project RELOS3 includes Circular Economy, Active Ageing and Intelligent Design in Industry as objectives with concrete actions to be developed with quadruple Helix collaboration.	Use the experiences, tools and knowledge gained in RELOS3 activities (such as future workshops and guidelines about the RIS3) to foster and promote public participation with a focus on local social challenges.	Use the tools obtained in RELOS3 activities (such as workshops and guidelines about the RIS3 local implementation) to feed into the design and future implementation of EU-funded projects, fostering and promoting public participation with a focus on local social challenges.		

<i>What Weaknesses should be eliminated to make the most of Opportunities?</i>	O1 - Changes in the mentality of Catalan society facilitate the adoption and extension of certain RRI keys, such as public engagement, ethics and transparency (open access).	O2 - The new reactivation plan of EU Next Generation facilitates the implementation of RRI/AIRR-linked initiatives and prioritisation of sustainability issues.	O3 - Public administration is perceived by the rest of the stakeholders as the promotor and guardian of certain RRI keys (ethics, open access, science education). If public administrations “set an example”, it could stimulate the remaining stakeholders to adopt the RRI/AIRR approach, which they consider to be important.	O4 - The universalisation of the use of the internet and digital solutions (software or apps) facilitate the implementation of open access, science education, public engagement and reflexivity exercises.
W1 - Organisations lack knowledge of the RRI/AIRR approach and its potential benefits, and also lack official guidelines.	Use public activities and forums to encourage the dissemination of stakeholders’ previous experiences in certain RRI keys, and thus ease the transition to a full application of the RRI-AIRR approach. In these activities, public participation must be also encouraged.	Use the different available guidelines, such as those developed as part of RIS3CAT, to improve the integration of the RRI approach into new projects linked to the NGEU framework.	Include specific requirements for participation in projects and contracts to enforce the implementation of keys and dimensions.	
W2 - Short-term economic aspects and own internal objectives are prioritised over other considerations like RRI/AIRR.		Use different available guidelines, such as those developed as part of RIS3CAT, to improve the integration of a long-term perspective and RRI approaches into new projects.	Use the Public Procurement of Innovation (PPI) instrument, the Cohesion Funds and other public funding instruments focused on innovation and business to reinforce the RRI-AIRR approach.	
W3 - There is a lack of participative culture in the organisations.		Use guidelines and examples provided by public administrations (such as the Catalan Government) to participate in the NGEU initiatives and thus improve the governance of the quadruple helix stakeholders.	Use the guidelines and examples provided by the public administrations (such as the Catalan Government) to participate in public tenders and any project under public administrations' leadership and thus improve the governance of the quadruple helix stakeholders.	
W4 - The whole RRI/AIRR approach is not included in plans and regulations; and keys like ethics, public engagement and science education are not even recommended for organisations.		Use the different available guidelines, such as those developed as part of RIS3CAT, to improve the integration of a long-term perspective and RRI approaches into new projects.	Implement new requirements for accessing public funding for research, innovation or competitiveness, as the RIS3CAT is proposing for the 2021-2027 period in Catalonia, to improve the integration of the RRI-AIRR approach.	
W5 - Regional and local policymaking and decision-making is down-stream and expert consultation is neither regular nor formally established.				Use new platforms such as the Unicorn Challenge Platform to foster participation of the public and of the quadruple helix stakeholders.

<i>Which Weaknesses must be eliminated, to successfully fight Threats?</i>	T1 - Difficulties in the identification and access to new groups of stakeholders not traditionally included in collaborative processes hamper inclusiveness.	T2 - There is a certain degree of passivity, reluctance to change and bureaucracy in the public administrations, causing delays in the implementation of new measures and plans and/or corrective measures (responsiveness).	T3 - Rivalry and competition exists between stakeholders with different levels of power, pressure and influence (lobbies) in the territory, resulting in problems of coherency in strategic planning and mistrust when having to engage in collaborative processes.	T4 - The high speed of technological change hinders the capacity of firms to integrate the solutions that best facilitate public participation and inclusiveness (especially for the policy focus of Intelligent Design in Industry).
W1 - Organisations lack knowledge of the RRI/AIRR approach and its potential benefits, and also lack official guidelines.	Encourage formal and informal meeting points for the quadruple helix stakeholders to exchange views regarding the RRI keys application, and for fostering mutual trust. This should promote the participation of all the quadruple helix stakeholders.	Use the available guidelines, such as those developed as part of RIS3CAT, to improve the integration of the RRI approach into new projects		
W2 - Short-term economic aspects and own internal objectives are prioritised over other considerations like RRI/AIRR.		Incorporate the principles of inclusion and responsiveness, using guidelines and examples provided by the Catalan Government, to participate in the NGEU initiatives as well as the future EU Funds projects, extending the effects to private companies in particular.	Use the available guidelines, such as those developed as part of RIS3CAT, to foster collaboration, cooperation and long-term thinking when developing new projects within the NGEU and EU Funds frameworks.	Use the Public Procurement of Innovation (PPI) instrument with the RRI approach to successfully integrate innovation and new technologies in the different sectors.

W3 - There is a lack of participative culture in the organisations.	Encourage formal and informal meeting points for the quadruple helix stakeholders to exchange views regarding the RRI keys application, and for fostering mutual trust. This should also promote the participation of different organisational levels within the stakeholders' organisations.	Use the guidelines and examples provided by public administrations (such as the Catalan Government) to participate in public tenders and any project under public administrations' leadership and thus improve the governance of the quadruple helix stakeholders.		
W4 - The whole RRI/AIRR approach is not included in plans and regulations; and keys like ethics, public engagement and science education are not even recommended for organisations.		Implement new requirements for accessing public funding for research, innovation or competitiveness, as the RIS3CAT is proposing for the 2021-2027 period in Catalonia, to improve the integration of the RRI-AIRR approach. This should foster cooperation and collaboration under a common objective.		
W5 - Regional and local policymaking and decision-making is down-stream and expert consultation is neither regular nor formally established.	Use new platforms, such as the Unicorn Challenge Platform, to foster participation of the public and of the quadruple helix stakeholders. This should encourage the inclusion of new stakeholders who are not usually involved in participation processes.	Use methodologies such as those proposed by the Catalan Government in the Entrepreneurial Discovery Process, as well as shared agendas and collaboration processes, to improve the design and implementation of new projects by public administrations.		

<i>How can we use Strengths to develop Opportunities?</i>	O1 - Changes in the mentality of Catalan society facilitate the adoption and extension of certain RRI keys, such as public engagement, ethics and transparency (open access).	O2 - The new reactivation plan of EU Next Generation facilitates the implementation of RRI/AIRR-linked initiatives and prioritisation of sustainability issues.	O3 - Public administration is perceived by the rest of the stakeholders as the promotor and guardian of certain RRI keys (ethics, open access, science education). If public administrations "set an example", it could stimulate the remaining stakeholders to adopt the RRI/AIRR approach, which they consider to be important.	O4 - The universalisation of the use of the internet and digital solutions (software or apps) facilitate the implementation of open access, science education, public engagement and reflexivity exercises.
S1 - Certain RRI keys (science education, gender equality, ethics) are de facto implemented by the research/academia, business and policy making stakeholders. This experience can be used and even enriched by other organisations.	Encourage the dissemination of stakeholders' previous experiences with certain RRI keys to ease the transition to a full application of the RRI-AIRR approach.		Use activities (workshops, meetings, etc.) developed by public administrations and related to local development and public participation to disseminate stakeholders' previous experiences with certain RRI keys	Use new platforms, such as the Unicorn Challenge Platform, to foster participation of the public and of the quadruple helix stakeholders.
S2 - Anticipation and reflexivity exercises are de facto implemented by the quadruple helix stakeholders' organisations. This experience can be used and enriched by other organisations.		Use the guidelines and examples provided by public administrations (such as the Catalan Government) to participate in the NGEU initiatives and thus improve the current planning strategies of the different quadruple helix stakeholders.		
S3 - RIS3CAT and PECT Vallès Industrial explicitly mention public engagement and inclusiveness of authorities and social and innovation actors in the territory for creating common working arenas.		Capitalise on the RIS3CAT and PECT Vallès initiatives and their implementation of the RRI-AIRR framework to disseminate new tools and public and private initiatives regarding the NGEU with an embedded use of the RRI approach.	Extend the RIS3CAT's use of the RRI-approach in the 2014-2020 and 2021-2027 frameworks to shape new projects with the public administration's leadership.	Use new platforms, such as the Unicorn Challenge Platform, to foster participation of the public and of the quadruple helix stakeholders.
S4 - EU-Interreg project RELOS3 includes Circular Economy, Active Ageing and Intelligent Design in Industry as objectives with concrete actions to be developed with quadruple Helix collaboration.		Use the experiences, tools and knowledge gained through RELOS3 activities (such as future workshops and guidelines about the RIS3) to feed into the design and future implementation of NGEU projects, thus fostering and promoting public participation with a focus on local social challenges.		

Identification of strategic policy priorities

General Policy Context

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

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

Circular Economy

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

- **Using the RRI-AIRR approach as “the common approach” for any new Circular Economy initiative of the quadruple helix agents and stakeholders in the territory.** It is critical to have a high degree of technological and social innovation as well as a broad implication and participation of all the quadruple helix stakeholders. This would support resilience and adaptation in the face of potential context changes. To make the RRI-AIRR approach feasible, it is important to:
 - Increase the **dissemination of the RRI-AIRR approach**, in formal and informal forums, meetings, or collaboration opportunities of the quadruple helix stakeholders. These actions should be accompanied by **guidelines and diffusion materials** to facilitate understanding and practical application.
 - **Share the experiences and results** of those with a more extensive background in the use of the RRI-AIRR approach. Some of the quadruple helix stakeholders in Sabadell and Catalonia have already worked with or applied the approach (for instance, by participating in some RIS3CAT initiatives or projects), and their experiences can be used to speed up the adoption process and develop a catch-up strategy for stakeholders with little or no experience in strategy or innovation planning and implementation. This would build deeper and more widespread public trust in participation processes.
 - **Leverage public administration prescription and purchasing capacities** to increase the use of the RRI-AIRR approach. The public administrations in Sabadell and Catalonia play a key role in the Circular Economy projects and initiatives. They are leading different projects linked to this policy area within the NGEU¹⁸ and MFF2021-2027¹⁹ frameworks, and they have substantial purchasing power for these kinds of products and services. The adoption of the RRI-AIRR approach in both frameworks could have a significant impact on its presence in the territory.
- **Capitalising on the RIS3CAT framework and on PECT-Vallès and RELOS3 activities.** The ongoing and future development of RIS3CAT 2021-2027 includes different collaboration and co-design activities (workshops, working groups, etc.) in which Sabadell has the opportunity to participate whilst promoting the quadruple helix stakeholders' involvement. In addition, PECT-Vallès is promoting different actions related to Circular Economy and developing deeper collaboration agreements

¹⁸ https://ec.europa.eu/info/strategy/recovery-plan-europe_en

¹⁹ <https://www.consilium.europa.eu/en/policies/the-eu-budget/long-term-eu-budget-2021-2027/#>

amongst the quadruple helix agents in the territory. In this context, the most efficient strategy would be to capitalise on these efforts to embed the RRI-AIRR approach in the different activities by making use of all the guidelines and tools developed for the implementation of RIS3CAT and PECT-Vallès, such as the Unicorn Challenges Platform, which was developed as part of the HubB30 initiative. It is also necessary to ensure that the Sabadell and Vallès Occidental perspectives are included in the new RIS3CAT framework.

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

Active Ageing

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

- **Increased use of the RRI-AIRR approach to meet the growing need for new and innovative products and services related to elderly people.** Innovation and social challenges are both key components of any new project or initiative, but are especially important given the growing need for new and innovative solutions for providing services or products to elderly people. Here the RRI approach could play a central role, and its implementation would require:
 - o Increased **dissemination of the RRI-AIRR approach**, both in formal and informal forums, meetings, or collaboration opportunities of the quadruple helix stakeholders.
 - o **Leverage of public administration prescription and purchasing capacities**, especially when they play a key role in the consumption and dissemination of new products and services focused on elderly people. Public administrations can help to establish the RRI-AIRR approach as a standard in any project or contract they lead.
- **Capitalisation of the RIS3CAT framework and the PECT-Vallès and RELOS3 activities.** Again, the most efficient strategy is to capitalise on the existing efforts of the Catalan Government and different stakeholders in the Vallès Occidental to embed the RRI-AIRR approach in the different activities by making use of all the guidelines and tools developed for the implementation of RIS3CAT and PECT-Vallès, such as the UCityLab Project²⁰ with the Covadonga Urban Lab in the Covadonga neighbourhood of Sabadell, the CatLabs²¹ instrument, and the Unicorn Challenges Platform²². These tools provide a growing framework of public activities where the RRI approach is advertised, and

²⁰ <https://www.ucitylab.eu/>

²¹ <https://catlabs.cat/>

²² <http://unicorn-project.eu/>

promote the participation of many stakeholders with little or no experience in innovation or public policies processes.

- **Participation and active involvement of the quadruple helix stakeholders in Sabadell and Vallès Occidental.** One of the key elements of the RRI-AIRR approach is the active implication of the quadruple helix stakeholders, especially citizens. A special effort is required to include older people, who tend not to get involved in participation processes, particularly processes focused on innovation. Using the tools, guidelines and activities provided by RIS3CAT, PECT-Vallès or RELOS3 (such as the RISCAT Monitoring Collection of guidelines, Shared Agendas tool, Unicorn Challenges Platform, CatLabs initiative, co-design policy workshops, Covadonga City Lab, etc.), it is possible to increase the participation of all stakeholders, and especially elderly people, to ensure the effective use of the RRI-AIRR approach. Combined with other initiatives, such as citizen science activities or co-design and co-development processes, involving these stakeholders can facilitate RRI use in the innovation processes in Sabadell.

Intelligent Design in Industry

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

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

Summary of focus group discussions

Analytical summary

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

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

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

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

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

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

Focus group with business representatives

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

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

2_What transformative change should your territory go through to achieve this vision? Which strategic policy priorities stem from the vision?

The main change should be increased co-responsibility of the different agents involved. Public administration should be able to identify emerging initiatives in the policy areas and support their development, especially at the local level. Regarding strategic policy, information must be made accessible to the private sector, a key agent in the provision of local solutions to the challenges of Active Ageing and Circular Economy. It was mentioned that business sector stakeholders, especially SMEs, are frequently unaware of collaboration possibilities with civil society that could help them to develop innovations or transfer research results to commercial products and services. Access to and dissemination of these initiatives are therefore key priorities.

3_How could the RRI framework or individual RRI keys support the process of transformative change?

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

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

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

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

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

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

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

Focus group with civil society representatives

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

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

2_What transformative change should your territory go through to achieve this vision? Which strategic policy priorities stem from the vision?

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

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

3_How could the RRI framework or individual RRI keys support the process of transformative change?

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

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

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

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

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

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

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

Focus group with policy makers

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

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

2_What transformative change should your territory go through to achieve this vision? Which strategic policy priorities stem from the vision?

The group believed that the production and consumption model must be transformed, and citizens should be involved in policy design, to achieve a real collective action. All citizens should reflect on the impact of ageing and design policies. A real transformation would require more efficient use of existing resources, avoiding redundancies in the services offered. The promotion of inclusive technological solutions that can be used by all is a key priority; in this sense, Smart Specialisation Strategies should be more open to citizens, to create shared agendas. Promotion of the collaborative economy and education policies is required to make citizens aware of the need to act. Lastly, the participants mentioned that at the local level, the commercial sector can act as a contact point for reaching old people and involving them in the design of solutions to their challenges. They also mentioned an existing participatory forum for old people in Catalonia, which could be used to implement RRI.

3_How could the RRI framework or individual RRI keys support the process of transformative change?

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

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

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

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

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

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

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

Focus group with researchers

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

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

2_What transformative change should your territory go through to achieve this vision? Which strategic policy priorities stem from the vision?

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

3_How could the RRI framework or individual RRI keys support the process of transformative change?

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

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

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

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

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

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

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

Policy recommendations and conclusions

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

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

Therefore, the main policy recommendations are:

- **To capitalise and build on previous and simultaneous projects and activities** in the territory. The Catalan Government is playing an active role in embedding public engagement and inclusiveness in the new RIS3CAT, MFF2021-2027 and NGEU projects, which will shape most of the future innovation processes. It is important to ensure that these initiatives are well known and actively used as springboards for the promotion of the RRI approach. The quadruple helix stakeholders from Sabadell must play an active role in the design and implementation of RIS3CAT, MFF2021-2027 and NGEU in Catalonia.
- **To formalise and disseminate practical guidelines and information** about the RRI-AIRR approach, with the active involvement of the quadruple helix stakeholders, through:
 - o Participation and interaction in **formal and informal meeting points, activities or forums** where there is room for discussion, collaboration or even “match-making” activities with sharing of experiences, expertise, needs, etc., regarding the RRI approach.
 - o **Exchange and sharing of experiences and results** linked to the RRI-AIRR approach, promoting transparency, cooperation and building of public trust in this kind of process.
 - o **Capacity-building linked to the participation of the quadruple helix stakeholders in the activities and initiatives of RIS3CAT and PECT-Vallès**, as a practical way of subsequently transferring those experiences to their own projects and processes.
- **To boost specific aspects of the RRI-AIRR keys and dimensions that are less common or underdeveloped** among the quadruple helix stakeholders, such as:
 - o Science education and public engagement: fostering the empowerment of civil society and lay citizens, and involving them in design and creation processes, always bearing in mind their heterogeneity and different needs. It is also vital to promote activities such as citizen-

science projects and/or involve the educational sector (primary and secondary schools) to capitalise on knowledge and experiences and to increase the openness of processes, results and science education.

- o Ethics: promoting public engagement and monitoring of any ethical issue linked to innovation processes, by providing tools and platforms where concerns or complaints can be manifested. This RRI key is especially relevant in Active Ageing and Circular Economy.
- o Open access: increasing the transparency of the innovation processes and the involvement of public administrations, with a specific focus on organising and disseminating the information created by these stakeholders so that business or any other interested stakeholder can benefit from it.
- o Gender equality: through transparent monitoring of the different levels of compliance in processes and projects, facilitating discussion and the provision of solutions or measures to ensure an appropriate level of compliance. It is important to include this element as an initial and critical part of any process or project, rather than a last-minute add-on.
- o Anticipation and reflexivity: ensuring all stakeholders gain a better understanding of the tools and processes involved in implementing these keys. From different staff levels in organisations to lay citizens, active exchanges and interactions must be established through agreements, meetings or even formal guidelines or training, to guarantee a level playing field and encourage the active involvement of them all.
- o Inclusiveness: promoting the participation of all quadruple helix stakeholders irrespective of their final degree of involvement in the implementation phase would improve the governance and the design processes in the projects and activities linked to initiatives such as RIS3CAT or NGEU.
- o Responsiveness: increasing the weight of the monitoring and evaluation processes. This can be achieved through the tools and activities provided, for example, RIS3CAT, which has a long-standing record of yearly reports and in-depth evaluations both in the strategic and operational dimensions.

References

- Ajuntament de Sabadell. (n.d.). *PECT: Vallès Industrial. Innovació i Disseny de la Indústria Europea*. Retrieved 22 October 2021, from <https://web.sabadell.cat/pect/que-es>
- Consorci de Serveis Universitaris de Catalunya (CSUC). (2016, January 1). *Portal de la Recerca de Catalunya (PRC)*. CSUC. Retrieved 22 October 2021, from <https://portalrecerca.csuc.cat/>
- EADA Business School. (2021, July 19). *Bretxa salarial i presència de la dona en posicions directives 2021*. Retrieved 22 October 2021, from <https://www.eada.edu/ca/actualitat/noticies/2021/05/bretxa-salarial-i-presencia-de-la-dona-en-posicions-directives-2021>
- European Commission. (2020, November 11). *Recovery plan for Europe*. European Commission - European Commission. Retrieved 3 November 2021, from https://ec.europa.eu/info/strategy/recovery-plan-europe_en
- European Council. (2021, May 31). *Long-term EU budget 2021–2027 and recovery package*. Retrieved 3 November 2021, from <https://www.consilium.europa.eu/en/policies/the-eu-budget/long-term-eu-budget-2021-2027/#>
- Fundació Pere Tarrés. (2020, April 1). *El 80% de les cuidadores no professionals són dones*. Pere Tarrés. Retrieved 22 October 2021, from <https://www.peretarres.org/premsa/sala-de-premsa/noticies/80-de-les-cuidadores-no-professionals-son-dones>
- Generalitat de Catalunya. (2016, November 1). *La xarxa CATLAB és part del programa CATLABS*. Catlabs. Retrieved 3 November 2021, from <https://catlabs.cat/>
- Generalitat de Catalunya. (2018, May). *RIS3CAT Action Plan 2015–2020*. https://catalunya2020.gencat.cat/web/.content/00_catalunya2020/Documents/angles/fitxers/pla-accio-ris3cat-2018-en.pdf
- Generalitat de Catalunya. (2019, November 7). *Pacte Nacional per a la Societat del Coneixement – PN@SC*. Gencat. Retrieved 22 October 2021, from <http://empresa.gencat.cat/ca/intern/pnsc>
- Generalitat de Catalunya. (2020, June 4). *La RIS3CAT 2021–2027 i la política d'innovació transformativa – Tatiana Fernández i Alberto Pezzi L'impuls de trajectòries de desenvolupament sostenibles i inclusives, per superar la crisi de la COVID-19*. EAPC blog. Retrieved 3 November 2021, from <https://eapc.blog.gencat.cat/2020/05/26/la-ris3cat-2021-2027-i-la-politica-dinnovacio-transformativa-tatiana-fernandez-i-alberto-pezzi/>
- Generalitat de Catalunya. (2021a, January 12). *Comissió per a l'impuls de la ciència ciutadana i natura (CICCNA)*. Gencat. Retrieved 22 October 2021, from http://mediambient.gencat.cat/ca/05_ambits_dactuacio/educacio_i_sostenibilitat/educacio_per_a_la_sostenibilitat/ciencia-ciutadana-natura/comissio-impuls-ciencia-ciutadana-natura/
- Generalitat de Catalunya. (2021b, February). *Next Generation Catalonia*. https://economia.gencat.cat/web/.content/20_departament_gabinet_tecnic/arxius/pla-recuperacio-europa/next-generation-catalonia.pdf
- Generalitat de Catalunya. (2021c, November 7). *Pacte Nacional per a la Societat del Coneixement – PN@SC*. Gencat. Retrieved 22 October 2021, from <http://empresa.gencat.cat/ca/intern/pnsc>
- Idescat. (2021a, March 5). *Idescat. Indicadors de la Unió Europea. Bretxa salarial entre homes i dones*. Gencat. Retrieved 22 October 2021, from <https://www.idescat.cat/indicadors/?id=ue&n=10128>
- Idescat. (2021b, May 21). *Idescat. Indicadors demogràfics i de territori. Estructura per edats, envelliment i dependència. Catalunya*. Gencat. Retrieved 22 October 2021, from <https://www.idescat.cat/pub/?id=inddt&n=915>

- Idescat. (2021c, September 23). *Idescat. Indicadors de la Unió Europea. Esperança de vida en néixer. Per sexe*. Gencat. Retrieved 22 October 2021, from <https://www.idescat.cat/indicadors/?id=ue&n=10106>
- Institut de Salut Global de Barcelona. (2018, February 7). *Arrenca CitiS-Health: ciència ciutadana sobre qüestions salut en entorns urbans*. ISGlobal. Retrieved 22 October 2021, from <https://www.isglobal.org/ca/-/arranca-cities-health-ciencia-ciudadana-sobre-cuestiones-de-salud-en-entornos-urbanos>
- Interreg Europe. (2021, June 1). *RELOS3*. Retrieved 22 October 2021, from <https://www.interregeurope.eu/rel0s3/>
- Scratch. (2008, December 6). *Scratch - Imagine, Program, Share*. Retrieved 22 October 2021, from <https://scratch.mit.edu/>
- UCITYLAB. (2021, March 11). *UCITYLAB – University-City Action Lab*. Retrieved 3 November 2021, from <https://www.ucitylab.eu/>
- UNICORN project. (2019, January 2). *UNICORN project*. UNICORN. Retrieved 3 November 2021, from <http://unicorn-project.eu/>
- United Nations. (2018, April 20). *THE 17 GOALS / Sustainable Development*. Retrieved 3 November 2021, from <https://sdgs.un.org/goals>
- Universitat Politècnica de Catalunya. (2021, April 1). *Llibre de dades*. UPC. Retrieved 22 October 2021, from https://gpaq.upc.edu/lldades/indicador.asp?index=1_1_5