Strengthening SDG dimension in Science, Technology and Innovation policies: The case of the Basque Country

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Abstract

The *2030 Science, Technology and Innovation Plan* sets out an ambitious vision for the Basque Country: "Stand among the most innovative regions of Europe, with a high standard of living and quality of employment". Within the framework of a country strategy oriented towards sustainable human development, the Plan is committed to the UN Sustainable Development Goals. For the first time in a Basque science and technology plan, research and innovation must contribute to solving five societal challenges closely related to seven SDGs. The Plan also defines three-plus-one strategic pillars, seven technological specialisation areas and four flagship science initiatives, together with a multi-level governance model.

Introduction

The "Euskadi Basque 2030 Science, Technology and Innovation Plan" (2030 STIP) was developed within the framework of a country strategy oriented towards Sustainable Human Development and committed to the UN 2030 Agenda for Sustainable Development and Sustainable Development Goals (SDGs).

Localisation - translating the 2030 Agenda into local measures and impacts – is a key aspect for the achievement of the SDGs. In 2017 the Basque Country became the first local government in the world to publish a Voluntary Local Review of the SDGs (Siragusa, Vizcaino, Proietti and Lavalle, 2020).

The region embraced the 2030 Agenda by adopting the Euskadi Basque Country 2030 Agenda. The agenda expresses "a Basque model for growth and environmental, economic and social wellbeing". It is considered an overarching action plan for the region (Gea Aranoa, Siragusa and Proietti, 2021).

A strategic commitment to innovation and sustainability

The 2030 STIP represents Euskadi's strategic commitment to Research and Innovation. It sets out an ambitious vision for the Basque: "Stand among the most innovative regions of Europe, with a high standard of living and quality of employment". This is a shared strategy under the Basque philosophy of "auzolana" (community work for the common good), involving public bodies, companies, universities, research centres, technology centres and socioeconomic stakeholders.

The 2030 STIP was elaborated amid the pandemic outbreak, which left Euskadi with several lessons learned. Among them, the crisis become an opportunity to join forces and work together to undertake the triple transition: technological-digital, energy-climate, and social and health.

The 2030 STIP is part of the country's strategy oriented towards Sustainable Human Development (Miedzinski, Coenen, Larsen, Matusiak and Sarcina, 2022) and committed to the UN SDGs (Aranguren, Magro, Morgan, Navarro and Wilson, 2019). For the first time in a Basque science and technology plan, it was made explicit that research and innovation had to contribute to solving five societal challenges closely related to seven SDGs:

- Energy and climate change: SDGs 7, 13 and 11.
- Health: SDG 3.
- Employment: SDG 8.
- Digital Transformation: SDG 9.
- Gender equality: SDG 5.

The 2030 STIP contributes particularly to SDG 9, which states that investments in infrastructure and innovation are fundamental drivers of growth and economic development.

Establishing objectives and targets and measuring progress

The bottom-up participatory process followed to elaborating the 2030 STIP resulted in three strategic pillars[1]: I- Scientific Excellence, II- Industrial Technological Leadership and III- Open Innovation, besides Talent as the necessary foundation. These four elements are essential and contribute jointly to the achievement of the Vision of the Plan, so that results of research are transformed into social, environmental and economic results. These pillars were deployed into

[1] 2030 STIP: chapter 4.2 Strategic Pillars.

4 operational objectives and 18 goals constituting the executive dashboard, allowing for monitoring and evaluation of the Plan over time[2] (Miedzinski, Stancova, Matusiak and Coenen, 2021).

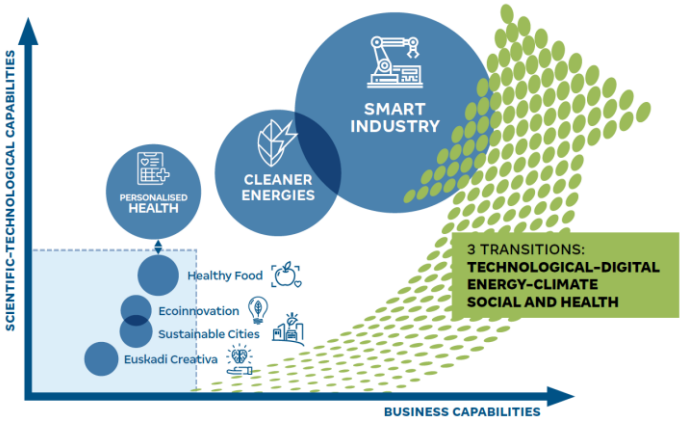
The 2030 STIP contributes to the Euskadi Basque Country 2030 Agenda, the overarching action plan for the region to comply with the UN 2030 Agenda. The 17 SDGs are linked to 15 regional objectives and 100 targets associated with commitments by the Basque government. The Basque 2030 Agenda includes a dashboard of 112 indicators to track progress all monitored by Eustat, the Basque Statistics Institute (Miedzinski, Coenen, Larsen, Matusiak and Sarcina, 2022).

Setting technological and scientific priorities

Embedded in the 2030 STIP there is a Smart Specialisation Strategy named "RIS3 Euskadi"[3], which evolved from the previous 2020 STIP (Aranguren, Morgan and Wilson, 2016). It defines three strategic priorities (smart industry, cleaner energies and personalised health) and four emerging areas of opportunity (healthy food, eco-innovation, sustainable cities and 'Euskadi creativa') where the region has business, scientific and technological capabilities and there are market opportunities.

The selection of these RIS3[4] areas were also influenced by global megatrends and, more specifically, by the three most critical and timely transitions already mentioned. These transformations were incorporated into the RIS3 map as the main drivers of evolution because they have an impact on all areas and represent a challenge, as well as a great opportunity for business, environment and social development.

Figure 1. RIS3 Euskadi



Data source: Basque Government

The evolution of the specialisation areas will largely depend on basic technologies crosscutting all of them and versatile in their range of application. Mastering these technologies is necessary to guarantee that local companies position themselves in the global value chains associated with the specialisation areas. Some of these technologies are already fulfilling this role while other emerging technologies will have the potential to revolutionise the way in which we live and the world of the future. The technologies envisaged in the Plan are gathered in a map of basic crosscutting technologies[5], which each RIS3 area can adapt to its field of specialisation.

Table 1. Map of Basic Crosscutting Technologies

DIGITAL OR VIRTUAL TECHNOLOGIES	**Artificial Intelligence and Big Data/Data Science:** *Algorithms for prediction or decision-making, Machine learning, Data Analytics, Artificial vision, Digital Twin.*
	The Internet of Things and 5G Technologies: *IoT Connectivity, Digital platforms, Cloud computing.*
	Cybersecurity : *BlockChain, Product Cybersecurity, Network Cybersecurity.*
	Cyber-physical Systems: *Control Algorithms, Actuators, Embedded Electronics, Sensors and Biosensors.*
PHYSICAL, BIOLOGICAL, CHEMICAL OR MATERIALS TECHNOLOGIES	**Materials and Processes:** *Advanced and Functional Materials, 3D Printing, Manufacturing processes, Robotics, Microelectronics.*
	Energy storage: *New technologies beyond Lithium-Ion, Storage of hydrogen and power to gas, Hybrid Systems.*
	Power electronics.
	Biotechnologies and Genetics: *Biology of systems, Biological Chemistry, Theranostics, Cell Therapies.*
	Nanotechnologies: *Nanoelectronics, Nano-photonics, Spintronics, Nanobiotechnology.*
	Quantum technologies and Neutron Physics: *Quantum clocks and synchronisation, Optical-quantum metrology, Simulation and design of materials and molecules in quantum computers. Neutron physics.*

Data source: Basque Government

In addition to these RIS3 strategy and map of basic technologies, the IKUR 2030 strategy identifies four flagship areas where the Basque Country seeks excellence in terms of scientific research:

[2] 2030 STIP: chapter 4.3 Operational Objectives.
[3] 2030 STIP: chapter 5 Basis for Smart Specialisation.
[4] "Research and Innovation Smart Specialisation Strategy".
[5] 2030 STIP: chapter 5.3 Basic Technologies Map.

Neurobiosciences, Quantum Technologies, NeutrIOnics and High-Performance Computing & Artificial Intelligence.

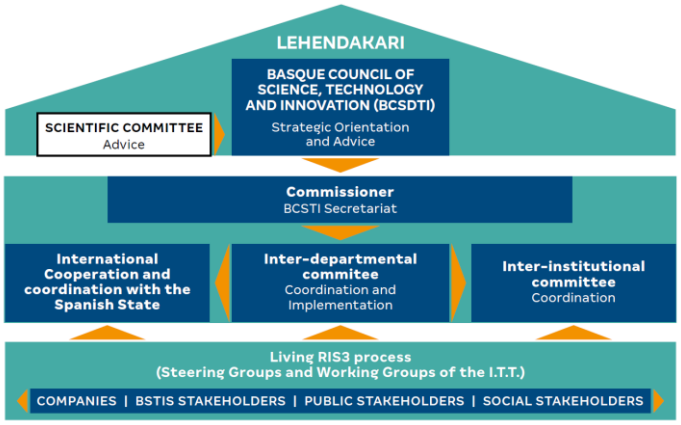
The objective of IKUR is to generate cutting-edge knowledge in these scientific-technological fields, aligned with RIS3 Euskadi, to position the Basque Country as a hub of reference. Likewise, to leverage structural change in the Basque Country with scientific, technological, business and social impact from the promotion of emblematic long-term research initiatives.

To accentuate social orientation and intensify collaboration between the RIS3 areas, the 2030 STIP incorporates the so-called "Cross-cutting Tractor-effect Initiatives"[6]. The objective is to identify new collaborative driving projects in specific strategic areas related to the three transitions. Three Initiatives have been proposed in "Healthy Ageing", "Electric Mobility" and "Circular economy (Nauwelaers, Harding, Perianez Forte, Haegeman and Arregui, 2022).

Implementing a governance model

The 2030 STIP strengthens inter-institutional cooperation and coordination based on a shared commitment to innovation through a multi-level governance model[7]. This model combines the strategic leadership of the Basque Council of Science, Technology and Innovation lead by the Lehendakari (the President of the Basque Country), an operational deployment based on inter-institutional and interdepartmental collaboration and the bottom-up contribution of the RIS3 steering groups. This third level facilitates the participation of the stakeholders in the Basque Science, Technology and Innovation System through different 'entrepreneurial dynamics' (Aranguren, Magro, Morgan, Navarro and Wilson, 2019).

Figure 2. Governance model of the Basque STI System



Data source: Basque Government

The 'Multi-Stakeholder Forum for Social Transition and the 2030 Agenda' is the body that channels the shared governance of the 2030 Agenda between Basque institutions and social agents. Among its main objectives is to contribute to establishing directives and strategic guidelines for implementation of the SDGs in the Basque Country (Miedzinski, Coenen, Larsen, Matusiak and Sarcina, 2022).

Contributing from science, research and technology to the SDGs

A project is currently underway to measure the contribution of the 2030 STIP to the SDGs. Meanwhile, and as a result of monitoring R&D investment in RIS3 areas[8], it is now possible to calculate how much is being invested in Euskadi in topics related to the main societal challenges. Thus, in 2021, 17% of investments were directed towards energy and climate change, 12% towards health and 44.5% towards employment and digital transformation. Compared to 2019, the year prior to the pandemic, the highest growths have been in R&D related to health and social transition (+18.6%), followed by energy-climate transition (+15.2%) and technological-digital transition (+8.0%). As for the challenge of gender equality, in 2021, 36.25% of researchers were women, above the European average of 32.9%.

On the other hand, the implementation of the 2030 STIP is being driven by strategic projects and initiatives with a science and technology base, developed in public-private collaboration and with a strong directionality

[6] 2030 STIP, chapter 5.2 Cross-Cutting Tractor-Effect Initiatives.

[7] 2030 STIP: chapter 7.1 Model of Governance of the Basque STI System. More information at: https://www.euskadi.eus/modelo-de-gobernanza/web01-a2pcti30/es/

[8] Data sources: Eustat, the Basque Statistics Institute and Eurostat, the Statistical Office of the European Union

towards economic, social and environmental sustainability. The identification of these projects is taking place, among others, in the entrepreneurial discovery spaces associated with the RIS3 steering groups.

Below are a few examples of some of the most relevant strategic projects and initiatives contributing to the Euskadi Basque Country 2030 Agenda and the SDGs:

- *The "Basque Green Deal" (BDG)*. Strongly aligned with the European Green Deal, it takes a holistic approach to Green Transition covering across different relevant policy areas and setting the targets for reducing emissions and generating renewable energy, while promoting an economic model with industry and technology as the main levers.

- *The "Basque Hydrogen Corridor"*. Its aim is to create a hydrogen ecosystem, which will enable progress towards decarbonising the Basque energy, industrial, residential and mobility sectors.

- *The "Basque Net Zero Industrial Super Cluster"*. As one of the few regional initiatives participating in the World Economic Forum Net Zero Industrial Clusters initiative, it seeks to capitalise on accelerated decarbonisation of energy supply and energy efficiency gains in key industrial sectors, both through intense application of technology and innovation (Nauwelaers, Harding, Perianez Forte, Haegeman and Arregui, 2022).

- *BasqueVolt. A* new strategic initiative that aims to become the European leader in the next generation of solid-state lithium batteries, based on a proprietary technology that will enable the mass deployment of electric transportation, stationary energy storage and advanced portable devices.

- *The "Opengela" project*. Driven by the Basque Government, Opengela will improve the quality of life in cities through urban regeneration and neighbourhood offices which, as one-stop-shops, will provide advice and support to the communities through the whole process of renovation of their apartment buildings (Nauwelaers, Harding, Perianez Forte, Haegeman and Arregui, 2022).

- *The "Basque Ecodesign Centre"*. It serves to enhance the competitiveness of participating firms through their acquisition and application of cutting-edge ecodesign-related knowledge and integration of environmental considerations into supply chains (Nauwelaers, Harding, Perianez Forte, Haegeman and Arregui, 2022).

- BAIC, the "Basque Artificial Intelligence Center". Established in July 2021, it will accelerate the implementation of AI in the Basque Country to improve business competitiveness and the welfare of Basque society.

Policy recommendations / conclusions

The Basque Country's experience is based on more than 30 years of designing and implementing innovation policies that have been increasingly oriented towards a sustainable development strategy.

Based on the lessons learned, the following main conclusions and recommendations are summarised below:

1. DIRECTIONALITY. Establish a clear directionality towards sustainable development and the social challenges/SDGs to which research and innovation are to provide a response. A shared vision of the future will guide and help deliver results that have an impact on society and address the three transitions.
2. PRIORITIZATION AND SETTING OBJECTIVES. Define a strategic framework aligned with global trends and set objectives and targets to be achieved, together with a comprehensive evaluating system. Prioritize research areas and technologies according to local capabilities and global opportunities.
3. GOVERNANCE. Put in place a governance model that enhances institutional collaboration and coordination and facilitates the participation of stakeholders, ensuring a dynamic balance between top-down and bottom-up approaches. Make it more inclusive and participatory incorporating the perspective of demand and civil society.
4. COLLABORATION FOR THE GOALS. Facilitate spaces and dynamics that favor open innovation and collaboration, especially between public and private sectors. Promote the identification of strategic projects and initiatives with shared goals that contribute to the achievement of objectives.
5. EMERGING TECHNOLOGIES AND CUTTING-EDGE RESEARCH. Invest in research of excellence and in the development of emerging technologies that have the potential to change our lives and the future of society. Provide the system with adequate scientific and technological infrastructures to enable cutting-edge research.
6. MONITORING AND EVALUATION. Systematically monitor internal progress of the strategy and external changes and make decisions based on all available information. Expand your evaluation

model measuring the contribution and impact of research and innovation on the SDGs.

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