PCTI EUSKADI 2020

A SMART SPECIALISATION STRATEGY

RESEARCH & INNOVATION SMART SPECIALISATION STRATEGY - RIS3

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INTRODUCTION

At the dawn of the 21st century we are at the beginning of a new stage of sustainable growth in the global arena. Today's world is changing at an unprecedented rate. The digital transformation, along with the latest advances in bio and micro sciences, nanotechnologies, advanced materials and photonics are beginning to have an impact on economic and industrial sectors, promising to improve their productivity.

In the Basque Country we need a strategy that allows us to position ourselves in this new scenario. A strategy to help our businesses and socio-economic agents meet new challenges and build lasting competitive advantages. We have to evolve into a knowledge society, based on the talent of people and able to respond effectively to their new demands and needs.

This Plan for Science, Technology and Innovation means loud, clear backing for a better future for the Basque Country; a future that should be built with the participation of knowledge, research and innovation, the hallmarks of future progress. Only then can we hope to see economic growth, create quality jobs and improve our levels of welfare again.

We are a small country with limited resources, so we must work with a long-term vision focused on optimizing our resources. It is a question of providing new capacity in those most promising scientific and technological areas where there are clear synergies with producers and where it is possible to achieve greater economic and social returns. This is what we call a 'Smart Specialisation Strategy', one of the guiding principles of this Plan.

We have the potential required, both scientific and technological and that related to the business fabric itself. Now it comes to focusing the effort, and taking global leadership positions in some of the priorities we have identified as strategic: advanced manufacturing, energy, biosciences and health.

It is worth noting that the new map of agents, the result of the reorganization of the Basque Science, Technology and Innovation Network is a comprehensive, long term project, which will strengthen its orientation towards results and its proximity to the needs of companies and the whole of Basque society.

This Plan is a country-wide initiative. We need the commitment and cooperation of all the institutions: the Basque Government, the Provincial Councils and local bodies, as well as all the public and private agents. This plan demonstrates the strong commitment of Basque society to science, technology and innovation. It shows our commitment to the future of the people.

Iñigo Urkullu Renteria

BASQUE PRESIDENT

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I. BACKGROUND AND CONTEXT

1. A plan to position the Basque Country as a reference for research and innovation in Europe

1.1. Oriented to the generation of welfare and employment

Socio-economic analysis of the most advanced countries and regions agree on the crucial role that science, technology and innovation play in welfare and economic growth. We can therefore distinguish between those economies based on traditional production factors (capital and low-skilled labour) and those based more on knowledge and innovation which, with a medium and long term vision, aim to lay the foundations of sustainable growth over time.

This challenge requires an advance in the knowledge economy, i.e. a society that demands, values economically and produces knowledge. The new policy on science, technology and innovation has to provide economic value to ensure that innovative ideas can be turned into products and services that generate growth and employment. The Basque Country needs to educate the whole social and business fabric on the importance of innovation and its relevance to global competitiveness. Each link in the chain of innovation should be strengthened, from research to commercialization.

In this context, the role of 'PCTI Euskadi 2020' is to create the conditions to improve the level of efficiency of a science, technology and innovation system which has grown successfully over the past 30 years. On this basis, this Plan aims to deepen the results orientation of the system, adapting the different types of research activity and their position in the value chain of the innovation to this objective. This Plan aims to apply more innovation to research, increasing cooperation between the science world and the business world to guide the activity of R&D&I towards results which can meet business demands and help address the major challenges facing the Basque Country, thus contributing to job creation and to economic and social wealth.

The Plan takes as its starting point the country strategy based on Sustainable Growth, Human Development and Smart Growth. The latter is closely linked to 'research and innovation strategies for smart specialisation', driven from within Europe to encourage the concentration of resources and R&D&I investment in areas where there are clear synergies with existing regional productive capacities and potential. This country strategy draws on the Europe 2020 strategy, created with the dual aim of helping to overcome the current crisis and creating the conditions for a different, more intelligent, sustainable and inclusive growth. In this context, the new PCTI Euskadi 2020 is aligned with the launch of the new European Horizon 2020 programme.

Considering the above, the ultimate purpose of the PCTI Euskadi 2020 is as follows:

To improve welfare, sustainable economic growth and employment in Basque society through a research and innovation policy based on smart specialisation and the improvement of the efficiency of the Science, Technology and Innovation System

1.2. A new stage in the scientific and technological policies in the Basque Country

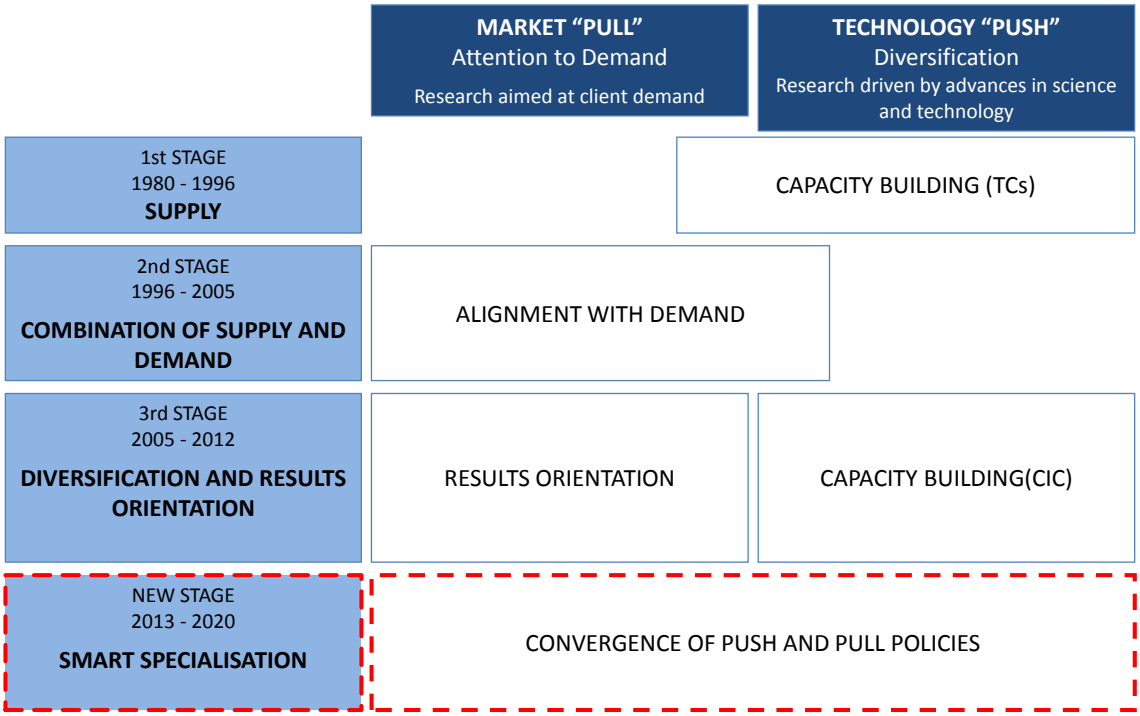
In recent decades the Basque Country has made great efforts to develop a competitive scientific and technological policy. From the creation of basic skills in the decades of the 1980s and 90s, PUSH policies to support the supply of science and technology have been combined with other PULL policies to ensure the orientation of research towards the demands of the productive and social fabric.

As a result of this strategic investment, a Basque system of science, technology and innovation has been built, with a core defined by the set of agents from the Basque Science, Technology and Innovation Network, without whose contribution current levels of development and results could have not been achieved.

Backed by the level of maturity reached by scientific and technological policies and willingness to improve the efficiency of R&D&I investments, we face a new stage characterized by the need to focus efforts on achieving convergence between research oriented towards the demand of the market and society (Market PULL) and research driven by advances in science and technology (Technology PUSH) through smart specialisation.

This focus involves not only reallocating resources but, above all, beginning a process of generation of new capabilities and optimisation of existing resources, seeking to substantially improve the return on investment. This change aims to generate greater value for businesses and society by improving the productivity of the System.

Figure 1: Evolution of scientific and technological policy in the Basque Country



In line with the Europe 2020 strategy, this new approach to research and innovation in the Basque Country is aimed at increasing collaboration along the entire chain of research and innovation, making it possible to reduce the time between the conception of an idea and its introduction in the market.

1.3. An open, participatory process

The momentum and promotion of science, technology and innovation is a cross-sector process that affects multiple aspects of economic and social life, and therefore requires all the abilities and sensitivities available.

The coordinated approach to science, technology and innovation in the Basque Country derives from a global vision of the activities carried out by the Basque Institutions to promote cooperation and interagency collaboration, complementarity of actions and an integrated approach to projects.

Given this need, the 'PCTI Euskadi 2020' was development in three phases:

1. Defining the RIS3 specialisation strategy for the Basque Country.
2. Formulating the basic principles of the new PCTI Euskadi 2020.
3. Writing, checking and validating the document of the new Plan.

Defining the strategy of RIS3 specialisation of Euskadi

The first phase of defining the strategy of smart specialisation in the Basque Country began in June 2013. The RIS3 European methodology puts companies, research centres and universities into a prime position when identifying strategic priorities, so the Government decided to delegate this initial responsibility for promotion and coordination to the Department of Economic Development and Competitiveness.

The definition of the strategy took the priorities established in the previous PCTI, of 2015, as a starting point, as they had been the result of consensus between companies and agents of the science, technology and innovation system. Later, the results of different strategies developed in a participatory manner with public and private actors were also integrated. The final document, with input from different institutions and from all departments of the Basque Government, was agreed after a process of analysis and comparison of existing capacities in the Basque Country.

Formulation of the basic principles of the new PCTI Euskadi 2020

The second phase began on September 13th, 2013, with the meeting of Basque Council for Science, Technology and Innovation[1], in which the need to update the current PCTI was established on the basis of the previous specialisation strategy. The RIS3 strategies for smart research and innovation require the involvement and collaboration of all the government departments. For this reason, and because of the need to consolidate interdepartmental coordination and public-private partnerships, at its meeting on December 4th, 2013 the Basque Council for Science, Technology and Innovation decided on the creation of an Operational Working Group[2] coordinated by the President's Office, which was established in the first quarter of 2014.

At this same meeting in December, the Basque Council for Science, Technology and Innovation also decided to expand its membership to make it more plural and enriching, incorporating representatives from the different areas of the Science, Technology and Innovation, including companies. It also reported on the future composition of the Scientific Advisory Committee, which would consist of renowned professionals in the field of science, technology, research and innovation.

[1] Composition of the Basque Council for Science, Technology and Innovation: Basque Government, Provincial Councils, Universities, Technology Corporations, Companies, Ikerbasque, Jakiunde and Innobasque.

[2] Composition of the Operational Working Group: Basque Presidency and four Basque Government Departments (Treasury and Finance, Economic Development and Competitiveness, Health, Education, Language Policy and Culture), Ikerbasque, Orkestra and Innobasque.

As a result of this second phase, on April 9th, 2014, the Basque Council for Science, Technology and Innovation approved the preliminary document with basic strategic and economic lines of the new Plan for Science, Technology and Innovation Euskadi 2020, prepared by the Operational Working Group. On this date, the Council also formally approved priorities of the Basque strategy for smart specialisation, "Euskadi RIS3", the final result of work begun in the first phase.

Writing, checking and validation of the document for the new PCTI Euskadi 2020

In June 2014, the third and final phase of the process began, aimed at the preparation of the final document for PCTI Euskadi 2020 by the Operational Working Group which, in turn, was helped by the contribution of the Scientific Advisory Committee[3] of the Basque Council for Science, Technology and Innovation, which was established on June 17th, 2014. Based on the contributions of members of the Operational Working Group, the objectives and goals for the plan were developed and the transversal axes were defined, as well as instruments to facilitate its effective deployment, through programmes and services from the policy mix.

In September the procedure of verification and validation of the Plan was launched, and again the main contributors were the Operational Working Group, the Scientific Advisory Committee and members of the Basque Council for Science, Technology and Innovation, as top representatives of the system. The plan was also looked at by experts in the international arena, specifically the RIS3 advisors from the European Commission Kevin Morgan (Cardiff University) and Karen Maguire (OECD), who in turn had led the evaluation of the Basque innovation system carried out by this international organisation. The Plan was therefore presented to members of the European Commission Research DG, the Industrial and Enterprise Policy DG and the Regional DG. This external examination confirmed that the Basque Country is aligned with the RIS3 and Europe 2020 strategy of the European Commission.

After the previous double corroboration process and input received, a final consensus document was written and presented at the meeting on December 15th, 2014 of the Basque Council for Science, Technology and Innovation. Subsequently, the document was submitted to the Governing Council for approval on December 16th and submitted to the Basque Parliament for its information.

[3] Scientific Advisory Committee: Made up of ten renowned professionals in the field of science, technology, research and innovation.

1.4. A strategy aligned with the strategy of Sustainable Human Development

Sustainable Growth, Human Development and Smart Growth represent the core commitments of the Basque Government to its citizens.

These commitments are structured through the Programme of Government of the X Legislature which this new "PCTI Euskadi 2020"[4] is part of.

The Country's strategy for sustainable growth translates into an umbrella programme, the "*Framework Programme for Employment and Economic Recovery*", which takes place in two blocks:

- The Plan for Employment
- The 4i Strategy for Economic Recovery.

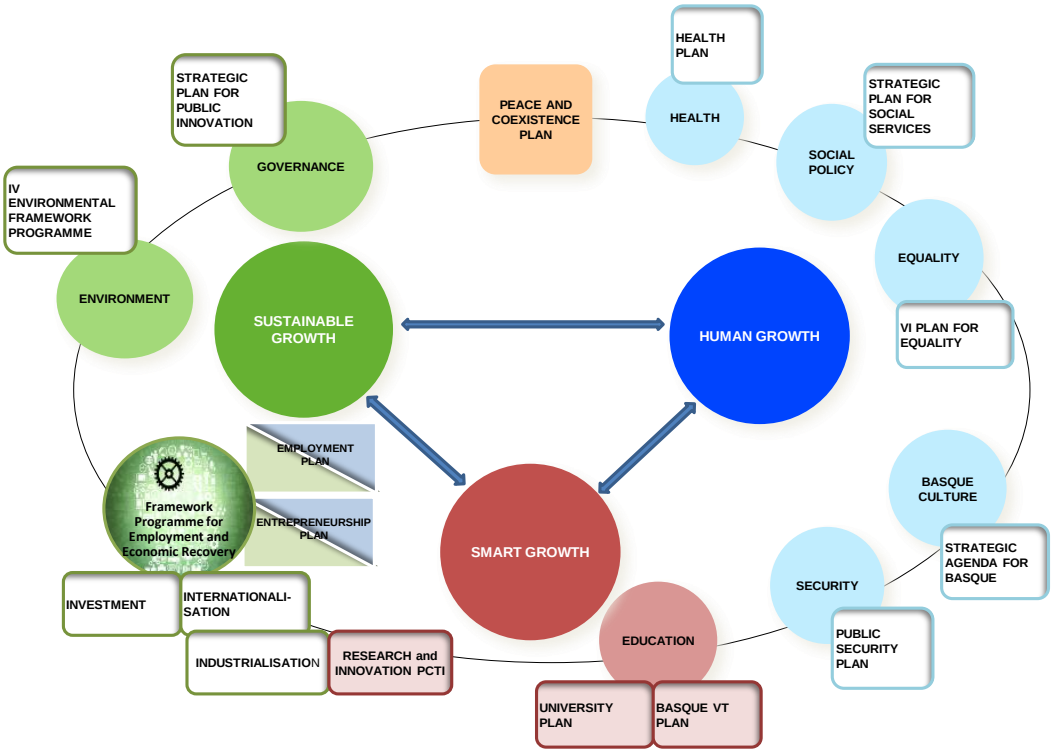
The 4i strategy is a comprehensive attempt to strengthen the competitiveness of our business fabric in 4 key factors:

1. *Innovation*, knowledge-based and as a source of transformation of knowledge into an economic and social value, with a strong commitment to Research and Development. The strategy associated with this factor is that which is presented in this Plan for science, technology and innovation.
2. *Industrialization*, based on the recovery of the industrial spirit and strong support for an intelligent production economy as an engine for development.
3. *Internationalization*, as the best guarantee to diversify risk and improve the overall competitiveness of Basque companies.
4. *Investment*, to boost R&D&I, infrastructure development and strategic projects.

Smart growth, the result of an economy based on knowledge and innovation, is closely linked to the country's strategy for smart specialisation. It involves collaboration between companies, research centres and universities to increase the competitiveness of Euskadi, identifying high value-added activities that allow for the creation of new products and services to generate growth and employment.

[4] X Legislature Government Programme. Commitment I «Employment and People» Axis 1. Area 1.3 «Innovation, the key to our future»

Figure 2: Strategic framework for sustainable growth, human growth and smart growth



Among the Initiatives for Strategic Action Planning of the Government that have the greatest significance for the objectives of the PCTI 2020 are the following five:

- *Industrialization Plan 2014-2016*[5]. This benchmark of support measures for the re-industrialization of the Basque Country as one of the engines of economic recovery is aligned with the commitment to R&D&I, under the criteria of excellence, expertise and transfer of results from companies. The configuration of the axes (SMEs, strategic industrial projects, advanced industry, industrial context, competitive energy and human capital) offer a wide range of possibilities for interaction with the strategic priorities and areas of opportunity that the PCTI 2020 covers.

- *Internationalization Strategy Framework 2020: Basque Country Strategy*[6]. This establishes, among other Strategic Objectives of Government Action, the strategy for industry globalization, internationalization of the Basque System of Science, Technology and Innovation and international training. In the context of this Strategy Framework, the Basque Government has set up a specific Internationalization of Business Plan based on the competitiveness of the Basque industrial sector and the ability of the Basque Country to attract international investment; all this based on a policy of attractive R&D&I and the ability to compete in the international arena.

[5] Approved by Governing Council Agreement on April 29th, 2014
[6] Approved by Governing Council Agreement on April 4th, 2014

- *IV Environmental Framework Programme Euskadi 2020*[7]. This program is based on the existence of a close relationship between a healthy environment and a thriving, modern, advanced, sustainable society. It considers innovation and technological development as inseparable channels for conserving and regenerating the environment. In particular, it covers three especially converging areas of the IV Framework Programme with the strategic priorities of this PCTI 2020: environmentally friendly energy, sustainability and conservation of ecosystems.

- *Health Plan 2013-2020*[8]. This is the instrument that contextualises, guides and programmes the health policies that the Basque Government will carry out in the coming years, detailing the programmes, measures and interventions that respond to a number of basic objectives, in intimate relationship with one of the strategic priorities of the PCTI Euskadi 2020.

- *University Plan 2015-2018*. Law 3/2004 of 25th February of the Basque University System sets out the University Plan as a specific instrument approved by the Government for the management of the Basque university system. The Universities of the Basque University System are the main agents of the Basque Network of Science, Technology and Innovation for generating knowledge with international impact[9]. The universities play a key role not only in the generation of knowledge and training of young researchers, but also in their transfer to the socio-economic fabric.

  In this regard, the University Plan 2015-2018 is structured to comply with the following mission:

  > *"To strategically drive the development of the Basque University System and define an agreed framework of action with its agents to be able to respond to the challenges and needs of Basque society in training, generation and transfer of knowledge, and to be recognized internationally for the high quality of its teaching and research, as well as for its socially responsible character and effective management."*

[7] This IV Framework Programme includes as one of its Strategic Objectives (2) "To progress towards a competitive, innovative, low-carbon economy which is efficient in its use of resources".
[8] Approved in 2013. See: http://www.osakidetza.euskadi.net/contenidos/informacion/publicaciones_informes_estudio/es_pub/adjuntos/plan_salud_2013_2020.pdf
[9] 2014 Report on Science in the Basque Country. http://ikerboost.ikerbasque.net/

- *Basque Vocational Training Plan 2014-2016*. On 25th November 2014 the Government approved the Basque VT Plan 2014-2016, to which 190 million euros will be allocated to align Basque vocational training with the adaptation and innovation strategy of our production system. The Plan promotes a new combined model for Vocational Training, composed of 3 elements: integrated training, applied innovation and active entrepreneurship. These elements are added to the axes of internationalization for Basque VT and the specialisation of centres offering Vocational Training.

  The aim is to adapt vocational training to the needs of SMEs and to develop innovation in products and production processes.

  Ultimately the VT Plan comes down to the following basic principles: an integrated approach to Vocational Training, the person as a "fundamental objective", a commitment to knowledge and innovation and a commitment to the social and business environment.

The new Plan for Science, Technology and Innovation also takes into account essential aspects, established by the Academy of Sciences, Arts and Letters, Jakiunde[10], which all science, technology and innovation policies should include. (See Appendix 1)

[10] Jakiunde statement about science policy (2013)
http://www.jakiunde.org/upload/archivos/Declaraci%F3npol%EDticacient%EDfica.pdf

2. We have a solid starting point

2.1. Diagnosis

2.1.1. Socio-economic and competitive situation

Socioeconomic situation of the Basque Country

As reflected in the latest socio-economic report published by Eustat[11], the Basque Country has a stable population of just over 2 million inhabitants and is one of the regions with the highest life expectancy (85 years for women and nearly 78 for men) and the lowest birth rate (9.3 in 2012). The combination of these two factors gives, as a result, a demographic structure with more people over 64 (19%) than under 21 (17%), a trend which will grow in the coming years.

Moreover, we must consider improvements in health and welfare of the population. Mortality has decreased in the last 10 years and, overall, the quality of life of the Basque population has broadly improved. However, some symptoms of decline have begun to appear, linked to the consequences of the recent economic crisis, reflected, for example, in the fact that the percentage of families who believe that their economic situation has worsened is 42%.

In the economic sphere, over the past decade the economy of the Basque Country was on a path of sustained growth when the abrupt onset of the financial crisis and the subsequent economic crisis came in 2009, and a process of economic recession began that has lasted until 2014. As a result of this situation in the labour market, the unemployment rate of the Basque Country has doubled and while it is far from being as bad as in Spain as a whole (15% versus 24.6% in the second half of 2014), it is still leaves much to be desired compared to the unemployment rate in the EU27 (10.2% in the second half of 2014).

Regarding the composition of GDP, it is worth noting that the weight of the industrial sector in the Basque Country in 2013 was 23%, well above the European and Spanish average.

Overall competitive position of the Basque Country

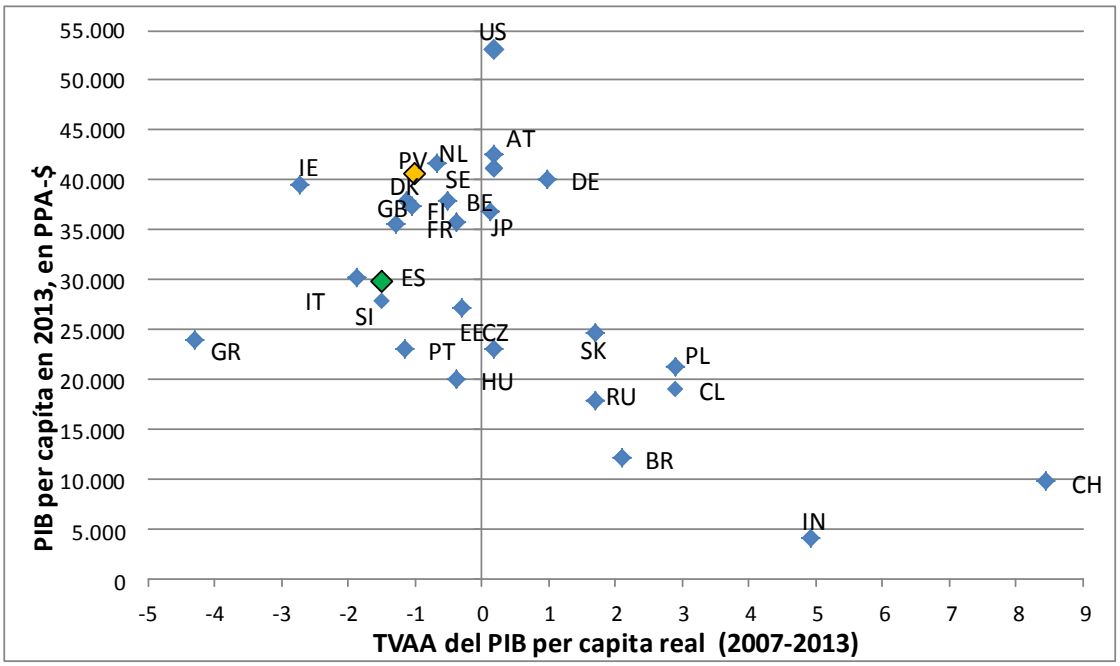
Two indicators are traditionally used to reflect the competitiveness of an economy: per capita GDP and productivity, characterized by the apparent labour productivity (ALP). Per capita GDP reflects the capacity of per capita income generated by an economy.

[11] Published May 2014 for the 2012 Panorama: http://ec.europa.eu/regional_policy/information/legislation/index_es.cfm

ALP refers to the output produced per unit of labour input used in production. Generally, the value of output or gross value added (GVA) is usually taken as a measure of output and unit labour, total employment or number of work hours is taken as input.

The following figure shows that, despite the setback suffered since the beginning of the crisis, Euskadi still ranks among the EU economies with the highest levels of per capita GDP and, moreover, with a level and evolution of this variable that is more favourable than that of the Spanish economy.

Figure 3: GDP per capita in 2013 (at purchasing power parity, PPP- $) and cumulative annual growth rate (CAVR) of the GDP per capita in real terms between 2007 and 2013



Source: Orkestra, based on Eustat and IMF

In terms of productivity, as shown in the following figure, growth in the Basque Country during the long period of pre-crisis growth was higher than that of Spain and close to the EU-15, but without reaching levels of the most advanced countries such as Germany and the United States. During the crisis period ALP kept moving more moderately, partly due to the employment adjustment model (shallower than that in the Spanish economy) and the negative growth of real GDP. As a result, in 2013 the situation of the Basque Country, in terms of productivity, was better than that of Spain and the average EU-15.

Figure 4: Rate of change and level of ALP

Labour productivity	1995-2008	2008-2011	2011-2015	2013 US=100
EU 15	1.4	0.6	0.6	78
Spain	0.5	2.0	1.8	75
Germany	1.6	0.4	0.6	88
United States	2.1	1.9	0.6	100
Basque Country	1.2	0.7	1.1	83

Source: Alberdi (2014) from Eustat, FBBVA-IVIE and AMECO

Data after 2011 is a projection

One of the factors behind the growth in productivity is the TFP or Total Factor Productivity, which reflects increases in productive capacity in the economy attributable to the contribution of capital and labour factors. This factor reflects technological advances, changes in business organization or improvements in the distribution channels of goods and services. In other words, we can say that the TFP includes the contribution of innovation to economic growth.

In this regard, as shown in the following figure, the growth of the TFP in the Basque Country in the pre-crisis period far exceeded that obtained in Spain and was similar to that of the EU-15, without reaching the levels of Germany and the United States. In the crisis period, due in part to the aforementioned employment adjustment model, negative growth in real GDP and, above all, the collapse of the use of production capacity, the TFP showed strong negative growth. However, in 2013 the TFP values of the Basque economy stood still generally well above those of Spain and the average EU-15.

Figure 5: Rate of change and level of TFP

Total Factor Productivity	1995-2008	2008-2011	2011-2015	2013 US=100
EU 15	1.2	-0.9	0.5	63
Spain	0.7	0.6	2.8	64
Germany	1.8	-0.8	0.2	72
Austria	2.4	-0.5	0.3	64
United States	1.5	2.7	1.2	100
Basque Country	1.4	-1.3	-1.0	78

Source: Alberdi (2014) from Eustat, FBBVA-IVIE and AMECO

Data after 2011 is a projection

To gain insight into the relative position of Euskadi with respect to other regions in relation to factors of competitiveness, Appendix 2.1 of this document, following the model of competitiveness developed by Orkestra for the European Cluster Observatory, shows a selection of a set of indicators for which we have quantitative information. In particular, data from Euskadi is compared with that of the 17 Spanish regions, with the 21 European regions which share similar basic structural conditions with the Basque Country (called reference regions), and the mean values of all the EU-28 regions.

The main conclusions drawn from this comparison are:

- The rankings of the latest results in economic terms (GDP per capita and disposable income per capita) show the good relative position of the Basque Country. This relative situation worsens when you consider the social indicators (particularly long-term unemployment).
- In the indicators of intermediate performance the position of the Basque Country is still good when compared with other Spanish autonomous regions, but the picture is not as favourable when compared with the reference regions (especially in employment rates and patents). The intermediate performance indicator where the Basque Country is best positioned is the apparent productivity per worker.
- As for the determinants of competitiveness linked to companies or productive specialisation, the Basque Country remains among the regions that devote the most human and financial resources to R&D. In high and medium-high tech manufacturing the Basque Country continues to maintain one of the highest employment rates of the three groups of regions considered. In companies with knowledge-intensive services, it is in an intermediate position when compared with the European reference regions, although in a good position when compared with the other Spanish autonomous regions. The size of its companies is relatively large when compared with other Spanish regions, but below average compared with the reference regions. In the indicators of collaborative innovation is where the Basque Country is clearly outperformed by the other European regions.
- In the microeconomic environment the Basque Country's position is relatively good in relation to the other Spanish regions. Compared to the average European region and the reference regions, however, its good position in terms

of qualification of the workforce and R&D is marred by the relatively low percentage of the population with intermediate or vocational training as well as an intermediate-low position in the field of ICT.

- Finally, in base indicators it stands out for the high level of decentralization and social capital, for significant institutional quality and for good multimodal accessibility.

2.1.2. Areas of economic and scientific-technological specialisation

To substantiate the subsequent choice of strategic RIS3 priorities, in this section we analyse specialisation in the Basque Country, both financial and in science and technology.

Economic specialisation

The joint consideration of the levels of productive specialisation and trade balance relative to the exterior, allows us to identify the economic branches or sectors in which the Basque Country has comparative advantages. The following figure shows that industry is where the Basque Country simultaneously has a remarkable specialisation index and a positive trade balance relative to the exterior.

Figure 6: Indices of specialisation and relative trade balance of the Basque Country in 2011

	GVA specialisation Index (EU27 = 100)	Index of relative trade balance
TOTAL	100	11
AGRICULTURE AND FISHERIES	43	-76
INDUSTRY	125	8
CONSTRUCTION	131	0
MARKET SERVICES	95	58
NON MARKET SERVICES	89	36

Source: Orkestra, from Eustat and Eurostat.

Appendix 2.2 of this paper gives greater detail on the productive specialisation and trade balance of the Basque economy.

In general, most of the industrial sectors in which the Basque Country has competitive advantages fall within the categories of manufacturers of medium high and medium low technological level in the OECD. In service activities, we can highlight the knowledge-intensive services of Research, Development and Telecommunications.

Scientific and technological specialisation

The study of scientific and technological specialisation of a region is usually based on three types of data:

a) Publications: as the most typical result of its scientific production.

b) Patents: as the characteristic output of a technological nature.

c) Expenditure on R&D in knowledge domains: as a key input for scientific and technological specialisations.

a) Publications: scientific specialisation

According to the latest report from Ikerbasque, the thematic areas that have the greatest weight in the Basque Country are Medicine, Engineering, Physics, Materials Science, Chemistry and Biochemistry, Genetics and Molecular Biology. This distribution has been stable for the last decade. The areas that have undergone higher growth for their relative weight, over the last ten years, are the Social Sciences, Arts and Humanities, Mathematics, Energy and especially Computer Science. For more details on specialisation in Basque publications, see Appendix 2.3 of this document.

b) Patents: technological specialisation

Regarding the technological specialisation of the Basque Country, the main strengths in technological fields are: other sectors (white goods, civil engineering) and mechanical engineering (machine tools, thermal processes and devices, handling). There are also significant strengths in some subfields of Instrumentation (analysis of biological materials, monitoring) and Chemistry (microstructure technologies and nanotechnology, materials and metallurgy). The greatest weaknesses are, however, in Electronics. For more details on specialisation in patents in the Basque Country, see Appendix 2.4 of this document.

Figure 7: Indices of specialisation of PCT patents, ordered by WIPO technological fields corresponding to inventors in the Basque Country

Technological field		Specialisation Index	
Name of field or subfield	Field code	In 2008-2011	Variation from 2004-07 to 2008-11
OTHER SECTORS	5	184.1	-41.3
MECHANICAL ENGINEERING	4	127.4	-28.8
INSTRUMENTS	2	99.3	24.1
CHEMISTRY	3	91.0	9.7
ELECTRICAL-ELECTRONICS	1	50.2	16.2

Source: Orkestra, from the OECD RegPat base, January 2014 edition

Values above 100 mean specialisation in this field; and lower mean subspecialisation

There are a number of modern technologies that are applicable in a variety of fields and therefore have a major impact on economic, social and environmental transformation. These technologies are known as General Purpose Technologies (GPT), or as Key Enabling Technologies (KET), according to the EU and the most recent literature. However, there is no unanimity about the fields that they include. Thus, the literature on the GPTs attaches great importance to ICT while in KET, ICT is not considered as a separate category. There is also no coincidence in codes of the International Patent Classification (IPC) which would be linked to each one.

Figure 8: PCT Patents corresponding to the KET and ICT

		Total PCT	Total KET	Advanced manufacturing technologies	Industrial biotechnology	Photonics	Micro/nano-electronics	Advanced materials	Nano-technology	ICT
No. Patents years 2008-2011	Basque Country	497	85	20	33	3	6	19	5	91
	Spain	7,025	1,199	207	408	143	133	236	72	1,644
	EU-28	191,385	36,826	8,198	7,199	5,411	6,660	8,773	585	49,594
	US	175,336	41,219	9,530	10,240	4,286	9,263	6,984	915	63,077
% /total	Basque Country	100.0	17.1	4.0	6.6	0.6	1.1	3.7	1.0	18.3
	Spain	100.0	17.1	2.9	5.8	2.0	1.9	3.4	1.0	23.4
	EU-28	100.0	19.2	4.3	3.8	2.8	3.5	4.6	0.3	25.9
	US	100.0	23.5	5.4	5.8	2.4	5.3	4.0	0.5	36.0
Specialisation index	Basque Country	100.0	88.8	93.9	175.4	21.9	32.2	81.8	320.6	70.7
	Spain	100.0	88.7	68.6	154.5	72.1	54.5	73.3	334.3	90.3
	EU-28	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	US	100.0	122.2	126.9	155.3	86.5	151.8	86.9	170.7	138.8
Percentage change in number of patents between 2004-2007 and 2008-2011	Basque Country	52.6	34.5	60.0	66.9	207.1	59.2	-20.8	62.5	125.1
	Spain	30.0	66.2	72.4	43.8	60.4	91.2	60.0	527.3	61.2
	EU-28	2.4	9.3	7.2	-1.9	22.9	18.6	5.3	57.6	-7.0
	US	-10.6	-9.5	-7.2	-13.2	-11.7	-1.9	-19.1	74.9	-17.3
Variation in specialisation index from 2004-2007 to 2008-2011 (percentage points))	Basque Country	0.0	-18.7	0.2	21.9	8.8	-3.6	-80.3	-142.9	27.2
	Spain	0.0	14.7	14.5	20.7	2.0	11.6	12.0	227.7	24.2
	EU28	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	US	0.0	-6.6	-1.1	2.0	-18.6	-8.5	-12.0	36.3	2.6

Source: Orkestra, from the OECD RegPat base, January 2014 edition

Patents regionalised according to the location of the inventor, and assigned to the categories of KET and ICT in accordance with maps developed by Idea et al. (2012) and OECD.

The previous figure was drawn from categories and assignments of IPC contained in the report written by Idea et al. (2012) for the KETs Observatory of the European Commission, to which the ICT patents have been added, identified with the conversion table developed by the OECD for this category of GPT. The main conclusions derived from reading it are:

- The percentage getting KET and ICT patents in total patents in the Basque Country is lower than in the EU and the US. Indeed, there are many voices that attribute the better performance of the US economy in terms of productivity to the wider dissemination and impact of these technologies (especially ICT) across all sectors.

- From an evolutionary standpoint, the number of patents is growing faster in the Basque Country than in other European regions and autonomous regions. Within the total of patents, those related to ICT are growing particularly noticeably, which has mitigated the relative weakness that the Basque Country had in that area. In KETs, however, although the growth rate in the Basque Country is somewhat higher than in other economies, growth is somewhat lower than in the total of Basque patents, which is why its specialisation index in KETs is low.

- Looking at the individual categories of KETS, the Basque Country has high expertise in nanotechnology, although this result is based on a very small number of patents. The Basque Country also has a certain concentration and specialisation in industrial biotechnology, an area in which there has been a significant growth, largely triggered by the BioBasque diversification strategy for the development of biosciences promoted by the Basque Government over the past 10 years. In Advanced Manufacturing Technologies and New Materials the number of patents is also high, but here the Basque Country shows slighter subspecialisation compared with the EU and US. Photonics and Micro-Nanoelectronics are categories of KETs with a small number of patents and high subspecialisation.

c) R&D expenditure: specialisation in fields of knowledge

Finally, scientific-technological specialisation can be analysed through the distribution of expenditure on R&D into scientific disciplines. From the statistics provided by Eustat, a high concentration of R&D in the field of engineering and technology emerges, especially in the corporate sector. There are also notable differences in the R&D expenditure in the public sphere and the private in some scientific disciplines. The positive effect of policies promoting bio and nanosciences by Basque institutions is clear, reflected in the increased share that the disciplines of Medical Sciences and Natural Sciences have shown from the beginning of the millennium to today. For more details on specialisation in R&D in the Basque Country, see Appendix 2.5 of this document.

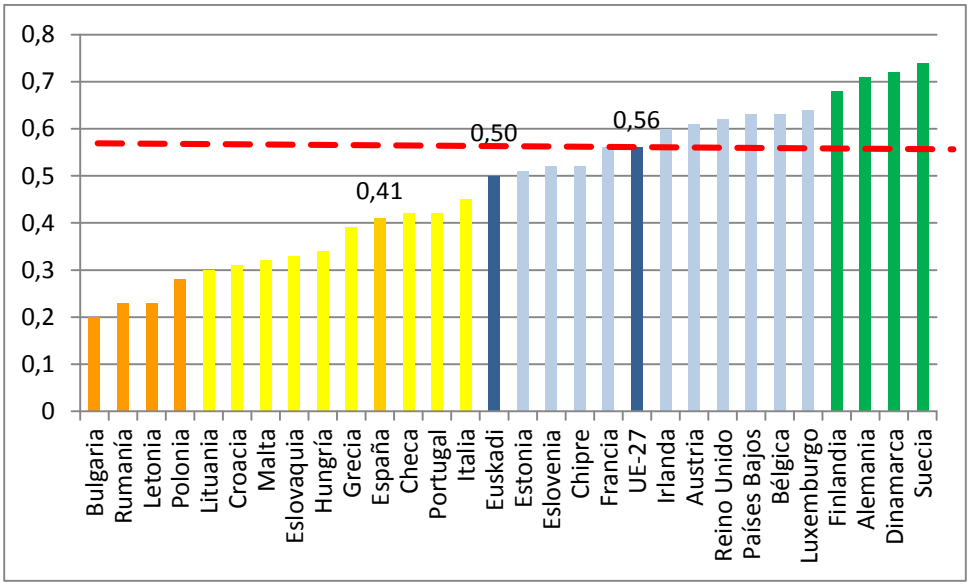
2.1.3. Comparative position of the Basque Science, Technology and Innovation System

In order to illustrate the innovative capacity of the Basque Country it is necessary to look at the indicators adopted by the European Commission to measure the innovative capacity of its member countries and regions: the IUS (*Innovation Union Scoreboard*), referring to countries; and the RIS (*Regional Innovation Scoreboard*), referring to regions.

The IUS-2014[12] values estimated by Eustat for the Basque Country place us six percent below the EU27 average and a notable distance away from the value of the leading countries, although clearly above the value corresponding to Spain.

[12] http://ec.europa.eu/enterprise/policies/innovation/files/ius/ius-2014_en.pdf

Figure 9: Innovative Performance in the Basque Country and member countries of the EU (IUS-2014)



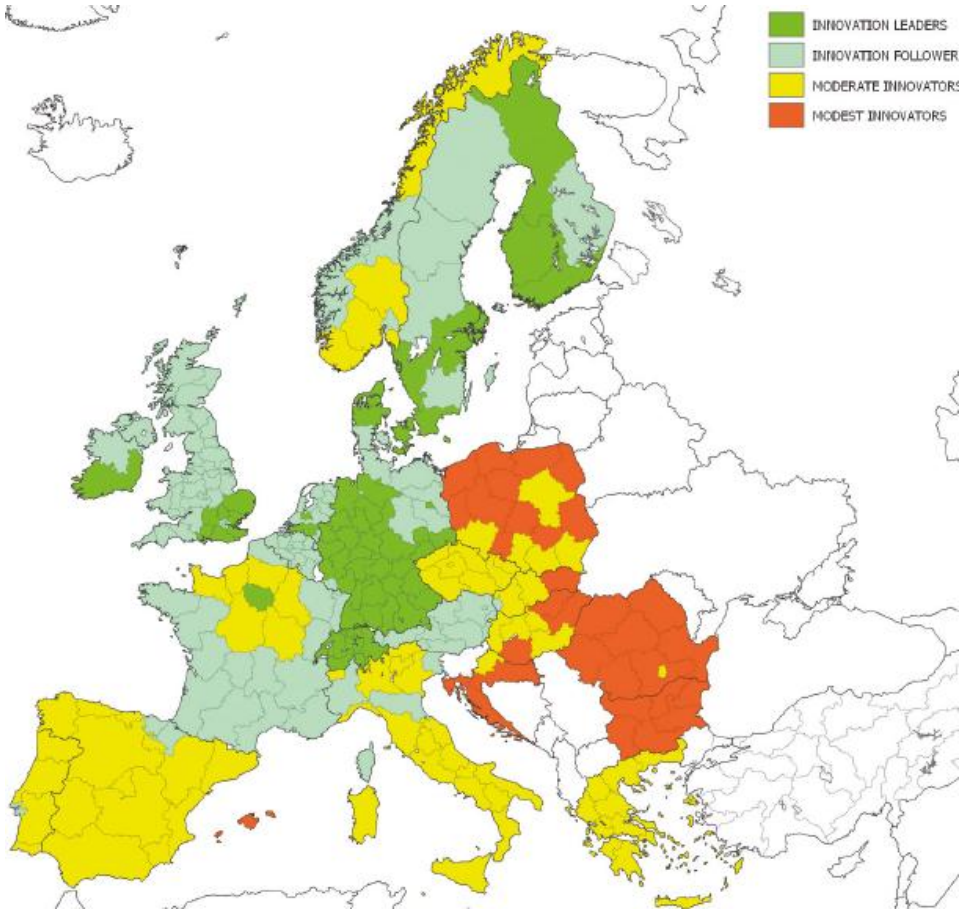
Source: Eustat and European Commission

Orange, countries with low innovation; yellow, moderate innovation; blue, followers of innovation; green innovation leaders

To supplement the IUS, the 2014 RIS[13] allows for a more homogeneous comparison with European regions, as the innovative activity is characterized by high geographical concentration. From reading it, it appears that the Basque Country and Navarre are the only Spanish autonomous communities in the region group of "innovation followers" in a position well above the average of EU regions. The RIS-2012 which, within four broad categories listed in the figure, also distinguished three other sub-categories (high, medium and low), further showed that the Basque Country fell into the high category of "innovation follower" regions.

[13] http://ec.europa.eu/news/pdf/2014_regional_union_scoreboard_en.pdf

Figure 10: Innovative Performance of EU regions (Regional Innovation Scoreboard, RIS-2014)



Source: Regional Innovation Scoreboard 2014

2.2. Evaluation of the PCTI 2015

The PCTI 2015, approved in December 2011 by the Government, established as its primary objective: "to contribute to revitalizing economic growth, employment and welfare of the Basque Country by promoting activities that generate added value through Science, Technology and Innovation".

The fulfilment of this goal was linked to the achievement of certain targets associated with three major indicators of the country: Gross Value Added per worker, Occupancy Rate and an indicator of Happiness and Health. Obviously, the contribution to meeting these goals had to come not only from political science, technology and innovation, but the entire country's policies: industrial, economic, social, educational, health, etc.

The Plan for Science, Technology and Innovation 2015 was based on 6 basic principles that today we can say are still partly in force:

First: An plan based on knowledge generation, promoting the development of a subsystem of science with proven and homologated quality, internationally recognized and properly connected to the other parts of the system.

Second: To move towards a knowledge economy, i.e. a society that demands, values economically and produces knowledge.

Third: To create a system for inclusive and results-oriented governance, capable of properly integrating the different entities and institutions, as well as the various public and private actors.

Fourth: Enhancement of the capabilities of the country relying on the skills, positions and infrastructure that we already have, to grow and deploy a policy of sustainable future.

Fifth: Targeting the market, taking advantage of the presence of business groups so that, based on active cooperation, we are working with guarantees to improve their global positioning with new products and solutions in niches of growing international demand.

Sixth: Public-Private Partnerships to maximize the effectiveness of investment in Science and Technology. Public investment in R&D&I should have an incentive effect on private investment, for better complementarity of public funds.

One of the distinguishing features of the PCTI 2015, related to the fifth point above, was the focus of the system for science, technology and innovation in areas of economic and strategic importance for the country. To do this, target markets associated with global opportunity niches and transverse skills necessary for this were identified, which together represented a continuation of the priorities established in the previous plan 2010, the result of a long process of public-private consensus.

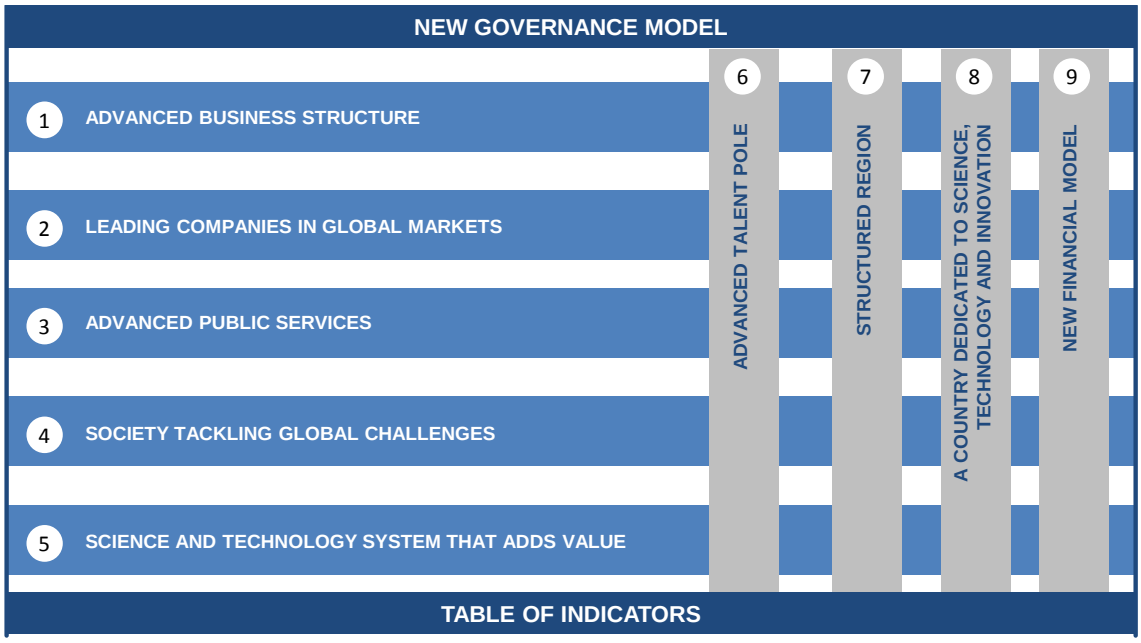
These areas of the PCTI 2015 were:

Target Markets	Transverse Capacities
• Ageing	• Biosciences
• Energy	• Nanosciences
• Transport and mobility	• Advanced Manufacturing
• Digital world	
• Scientific Industries	

Most of these target elements are continued in the current plan for science, technology and innovation through its integration, as will be seen later in the strategic priorities of smart specialisation RIS3 of the Basque Country.

Finally, for the development and implementation of the PCTI 2015, nine targets, each with a series of strategies, tools and programmes were set:

Figure 11: Objectives of the PCTI 2015



Source: Plan for Science, Technology and Innovation 2015

Associated with each objective, a number of indicators were set on which the level of compliance or goal was established for 2015 and for each of the years in the period 2011-2015.

Below, we offer an assessment of the results of the interim evaluation of the PCTI 2015, using the indicators that are considered most relevant in defining new goals for the Basque Science, Technology and Innovation Plan 2020.

Indicators Level 1 (country)

The main indicators of the previous plan referred to Gross Value Added (GVA) per worker and the Employment Rate in addition to Happiness and Health (an indicator obtained from the survey of social capital published by Eustat).

Figure 12: PCTI 2015 country indicators

		PCTI FORECASTS 2015					REAL		
	COUNTRY INDICATOR	2011	2012	2013	2014	2015	2011	2012	2013
1	GVA per worker (GDP per worker)	70,686	73,253	**76,287**	79,758	**83,307**	71,010	72,024	**72,635**
2	Employment rate	>69%	>69%	**>70%**	>70%	**>72%**	64.5%	63.2%	**63.4%**
3	Happiness and Health	>7	>7	**>7**	>7.2	**>7.2**	7.07	7.16	**7.16**

Source: In-house, compiled from PCTI 2015

While the value of the level of happiness and health has remained above the target set for 2013 (7.16 vs. 7), the same has not happened with the values of GVA per worker (72,635 vs. 76,287) and employment rate (63.4% vs. 70%), which were lower than those for 2013, the last year of reference.

As described above, these figures cannot be attributed solely to the PCTI, but are the result of the continuing state of financial and economic crisis during 2011-2013. This negative development of the economic situation is one of the reasons that have forced a review of several of the objectives of the current plan for science, technology and innovation, adapting them to both public and private resources available and the current situation of the environment and the expected developments.

Indicators Level 2 (results)

As for the second-level indicators of the PCTI, more closely linked to the results of the science, technology and innovation system, it is worth noting some of the most significant, such as the following:

Figure 13: PCTI 2015 result indicators (Source: Eustat and Ikerbasque)

Figure 13: PCTI 2015 result indicators (source: Eustat and Ikerbasque)

		PCTI 2015 FORECASTS					REAL	
	RESULT INDICATOR	2011	2012	2013	2014	2015	2011	2012
1	Number of companies doing R & D	>1,500	**>1,700**	>1,900	>2,200	**>2,500**	1,501	**1,578**
2	% of innovative technological SMEs (product and process)	38.50%	**42.50%**	45.50%	47.00%	**50.00%**	37.82%	**34.09%**
3	% of innovative non-technological companies (marketing or organization)	30.00%	**32.00%**	34.00%	36.00%	**40.00%**	27.16%	**24.26%**
4	New product sales as % of turnover	8.50%	**9.00%**	10.00%	11.50%	**13.00%**	12.81%	**16.06%**
5	Employment in knowledge-intensive activities as% of total employment	12.50%	**12.70%**	12.70%	12.90%	**13.50%**	12.20%	**12.00%**
6	ISI publications per million inhabitants	1,275	**1,350**	1,425	1,500	**1,650**	1,737	**1,926**
7	New doctoral graduates (‰ group 25-34 years)	1.00‰	**1.08‰**	1.17‰	1.27‰	**1.40‰**	1.80‰	**1.53‰**
8	% of doctors from outside the EU out of total doctors in the country	17%	**17.60%**	18%	19%	**20%**	13.99	**13.80**
9	% of RVCTI R&D expenditure funded by companies	>20%	**>20%**	>25%	>25%	**>30%**	22.04%	**21.02%**
10	% of RVCTI R&D expenditure funded from abroad	>5%	**>6%**	>7%	>8%	**>10%**	7.03%	**8.08%**
11	% funding of R&D expenditure from abroad	3.36%	**3.39%**	3.56%	3.58%	**3.62%**	4.42%	**5.02%**

Source: In-house, compiled from PCTI 2015

As for those indicators whose evolution is positive compared to the targets set, it is worth noting the percentage of sales of new products to the market and companies (16% in 2012 compared to an expected 9%). In this case, the indicator for 2012 exceeds even the target set for 2015.

Also important is the evolution of scientific productivity measured by the number of ISI publications (1,926 vs. 1,350 publications expected), the result of the work of the Basque university system and centres of excellence created in the last decade and, to a lesser extent by the Technology Centres and other RVCTI agents. In addition, progress in the percentage of new doctorate graduates between 25 and 34 years (1.53% vs. 1.08 %), reflecting the significant effort in training and renewal of the research staff that forms the knowledge base of the scientific-technological system as a whole.

The goal has also been achieved, surpassing even that established 2015, for the percentage of international financing in the total expenditure on R&D in the Basque system (5.32% vs. 3.39% in 2012). This objective has been met for agents of the RVCTI (8.08% vs. 6%). The main reason has to do with a high participation rate in the FP7

European research framework where the Basque Country has achieved excellent results: 461 million euros in the period 2007-2013, compared to 395 million euros established in the previous strategic book. To do this, the country has benefited from the leadership of the Technology Centres in Europe, greater involvement of universities, the important contribution of the Basque Foundation for Science Ikerbasque and growth in the number of SMEs that have participated in European projects.

Finally, the achievement of targets for the share of private funding of research activity in RVCTI centres (21.02% vs. 20%) is of equal importance, reflecting how close they are to business needs, led by the business R&D units themselves as well as technology centres.

On the negative side, we did not reach the target number of companies doing R&D (1,578 vs. 1,700), in a scenario where the total number of firms located in the Basque Country has been declining steadily since the start of the economic crisis (almost 180,000 companies in 2008 to just over 157,000 companies in 2013). In this scenario, the growth this indicator shown in the last reference year 2012 is a positive sign.

On the other hand, we have not met the objectives for the percentage of Basque companies that carry out innovation activities, both technological (product and process: 34.09% vs. 42.50%) and non-technological (marketing and organization: 24, 26% versus 32%). Nor have we reached the share of employment in knowledge-intensive activities, both manufacturing and services (12% vs. 12.70%) or international presence among the doctorates of the country (13.80% vs. 17.60%).

Indicators Level 3 (effort)

As to the third level indicators of the PCTI more closely linked to the resources invested in the system for science, technology and innovation, it is worth noting the following:

Figure 14: PCTI 2015 effort indicators

		PCTI 2015 FORECASTS					REAL	
	EFFORT INDICATOR	2011	2012	2013	2014	2015	2011	2012
1	R&D spending out of GDP	2.02%	**2.13%**	2.35%	2.69%	3.00%	2.06%	**2.06%**
2	Innovation spending out of GDP	4.3%	**4.6%**	5.0%	5.5%	6.0%	4.0%	**4.0%**
3	Higher Education spending out of GDP	**1.00%**	1.10%	1.20%	1.30%	1.35%	**1.18%**	

Source: In-house, compiled from PCTI 2015

As can be seen, in 2011 the goal of higher education expenditure as a percentage of GDP (1.18% versus 1%) was exceeded.

Regarding R&D as a percentage of GDP, a level of 2.06% was reached in 2012, leading the investment figure of all the autonomous communities of the State, despite not having achieved the goal set. For 2013 Eustat has just published a figure of 1.99%, which means a step backwards due to the weakness of the Basque economy and the obligations of compliance with the deficit target set by the government.

Summary of overall assessment of PCTI 2015

One might conclude that one of the main achievements of the PCTI 2015 has been its contribution to the focussing of R&D&I around a series of priorities, many with continuity in this new Plan.

It is also necessary to underline the direct contribution of the RVCTI to compliance with performance indicators, especially those related to scientific productivity, attracting international funds and a percentage of private financing, which notes that the system is quite efficient and close to business needs. Similarly, it confirms that the scarcity of financial resources for enterprises is the main barrier to innovation.

On this solid starting point, and aware of areas for improvement, the new Basque Country PCTI 2020 intends to continue along the path of focusing R&D&I onto the smart specialisation strategy, focusing on the orientation of the system, basic research, industrial research and technological development, in order to meet business demands and help address the major challenges facing the Basque Country as a society.

2.3 SWOT analysis of the Basque System of Science, Technology and Innovation

From the various diagnoses made on the Science, Technology and Innovation System, such as the *OECD report*, the report of the expert K. Morgan commissioned by the European Commission, the *PCTI 2015*, several *Competitiveness Reports* by Orkestra and the *Science Report 2014* by Ikerbasque, it appears that the Basque Country has a solid starting point characterized by:

- *The quality and efficiency of the economic fabric*. Despite the crisis, the Basque Country still ranks among the EU economies with higher levels of GDP per capita, also presenting higher productivity values than the EU-15 average.
- *The existence of leading business groups well positioned in middle markets with tractor growth effects*. Basque companies have managed to position themselves in markets with higher growth potential and in which they compete on differentiation and sophistication of products, in particular in sectors such as energy, machine tools, automotive, aerospace, and health.
- *A powerful system of institutional support and an extensive network of agents supporting the Basque Science, Technology and Innovation System.* Efforts made by the Basque Country in recent decades to develop a competitive scientific and technological policy have resulted in a consolidated network of agents that has generated basic skills in science, technology and innovation and focused them on the demands of the productive and social fabric. These capabilities have been complemented by the existence of various collaborative infrastructures such as cluster associations, technology parks, centres for entrepreneurship and innovation and regional development agencies.
- *Specialised human capital*. As seen in the international reference systems measuring innovation, the Basque Country shows its best results in several indicators of human capital, such as new graduate doctors and the percentage of the population with tertiary education, which reflects a solid and consolidated university system. Also, the number of people who do research in the Basque Country, measured as a percentage of the labour force is higher than the state and European average, and tends to converge with leading countries.

In the following figure, based on the evaluation reports mentioned above, a complete SWOT analysis of the Basque Science, Technology and Innovation System is outlined:

Figure 15: SWOT analysis of the innovation system of the Basque Country

Weaknesses	Strengths
• Poor targeting of the RVCTI in the areas of greatest competitive impact of the industrial sector. • Competitive weakness in technological development compared with reference countries • Limited scientific production relative to other regions (both in absolute terms and relative to population) • A technological system which has to improve its results with intellectual property, entrepreneurship, presence in the international market and technology transfer to SMEs. • Limited ability to attract foreign sources of funding. • Innovation system not very open to the exterior. • Relatively little business innovation, both technological and non-technological, in relation to the more advanced regions. • Insufficient connections between the research conducted by the university system, the science and technology system and companies. • High density of agents in the System and risks derived from competition for resources in times of austerity. • Relative indifference of the public towards science, technology and innovation. • Insufficient innovation tractor projects. • Governance model with a weak evaluation system. • Growing need for generational change in public and private research institutions	• Existence of well positioned leading business groups in international markets and with high growth capacity. • Quality and operational efficiency of the business fabric. • Public-private partnerships, with the ability to develop models and structures of business collaboration. • Highly developed network of agents and infrastructure. Besides online universities, there are TCs, CRCs, BERCs, Health Research Institutes and groups of international scientific excellence. • Highly positive trends in the intensity of R&D. • Powerful institutional support system which is well-equipped, rich in instruments and agents and has a structure to support ICT. • Social sensitivity to global challenges. • Specialist human capital (tertiary education and especially in ICT).

Threats	Opportunities
• Loss of position in the international market. • Risk of relocation of business activities. • Risk of non-differentiation. Many countries and regions are committed to the same niches with the risk of not excelling in anything if there are no real stakes and real prioritization. • Leakage of talent and activities captured by more attractive environments and systems. • Economic sustainability of the welfare system at risk of failing to meet the demands of social services. • Economic sustainability of the RVCTI being highly conditioned to public resources. • Dependence on routine patterns of ICT policies.	• Growth in niche markets where we have capabilities and development of the convergence of technologies and industries. • New H2020 programme • Leverage the traction capacity of the Public Sector.

Source: OECD Report, PCTI Euskadi 2015, Competitiveness Reports by Orkestra and Science Report 2014 by Ikerbasque

In Appendix 3 of this document it is possible to consult in more detail some of the weaknesses listed in the previous SWOT analysis which, in recent years, have appeared in the evaluation reports mentioned above:

- Competitive weakness in technological development compared with the reference countries
- Insufficient basic research and weak connection with the needs of society and business.
- Potential for improvement of the operating results of R&D.
- Innovation system insufficiently open to the exterior.
- Relatively little business innovation.
- High density of agents and risks of competition for resources.
- Relative indifference of the public towards science, technology and innovation.

II. EUSKADI 2020 STRATEGY

3. Euskadi RIS3: A smart specialisation strategy

3.1. A mission

To improve welfare, sustainable economic growth and employment in Basque society through a research and innovation policy based on smart specialisation and improvement of the efficiency of the System of Science, Technology and Innovation.

Smart specialisation will enable the Basque Country to continue to make further progress towards a knowledge-based economy, i.e., towards a society that demands, values economically and produces knowledge.

To achieve this mission and to develop a new phase in innovation policy, characterized by the convergence of the scientific-technological offer and social and business demand, this new PCTI Euskadi 2020 is presented as a strategic plan of the government's programme for this term of office, aligned with the Framework Programme for Employment and Economic Revitalization, approved last January 28th by the Governing Council.

3.2. Two European references

Europe 2020 strategy

The new "PCTI Euskadi 2020" is aligned with the growth strategy presented by the European Union for the decade: Europe 2020[14], with the dual aim of overcoming the recent crisis and creating the conditions for a different growth, smarter, more sustainable and inclusive.

The Europe 2020 strategy proposes three mutually reinforcing priorities:

- Smart growth: developing an economy based on knowledge and innovation, which means improving the performance of the EU in education, research, innovation and digital society.
- Sustainable growth: promoting an economy that makes more efficient use of resources, that is greener and more competitive.
- Inclusive growth: fostering an economy with high employment delivering social and territorial cohesion.

[14] COM (2010) 2020. http://eur-lex.europa.eu/legal-content/ES/ALL/;ELX_SESSIONID=5y6mJ7SpxZyB81gQXpc211QydvpP4vDmyhfQ5ThljWVvr5l26R32!-12304477?uri=CELEX:52010DC0546

The above priorities are specified in five ambitious objectives for Europe in 2020:

1. Employment: 75% of people 20 to 64 years should be employed.
2. Research and Development: reaching a level of investment of 3% of EU GDP in R&D.
3. Climate Change and Sustainable Energy: reducing emissions of greenhouse gases by 20% (or 30% if the conditions are right) compared to 1990 levels; reaching a 20% share of renewable energy and achieving a 20% increase in energy efficiency.
4. Education: bringing early school leaving rates below 10%. At least 40% of people 30-34 years of age must complete tertiary studies.
5. Fighting poverty and social exclusion: reducing by 20 million the number of people experiencing or at risk of poverty and social exclusion.

These objectives are not an absolute reference in themselves, but each Member State should establish its own goals tailored to its particular situation. The European Commission monitors and analyses the extent to which the objectives for each Member State are met, and may issue recommendations and, where appropriate, warnings to ensure compliance.

The strategy also includes seven "flagship initiatives" that will serve to catalyse progress under each priority theme:

Figure 16: Flagship initiatives of the Europe 2020 strategy

<table>
<tr><th>SMART GROWTH</th><th>SUSTAINABLE GROWTH</th><th>INCLUSIVE GROWTH</th></tr>
<tr><td>INNOVATION:
«Innovation Unión»</td><td rowspan="2">CLIMATE, ENERGY AND MOBILITY:
«Resource efficient Europe»</td><td rowspan="2">EMPLOYMENT AND QUALIFICATIONS:
«An agenda for new skills and jobs»</td></tr>
<tr><td rowspan="2">EDUCATION:
«Youth on the move»</td></tr>
<tr><td>DIGITAL SOCIETY:
«Digital Agenda for Europe»</td><td>COMPETITIVENESS:
«An industrial policy for the globalisation era»</td><td>FIGHT AGAINST POVERTY:
«European platform against poverty»</td></tr>
</table>

The "Innovation Union" is the flagship initiative linked to smart growth and aims to improve the conditions of access to funding for research and innovation, in order to strengthen the innovation chain and boost levels of investment across the EU.

With a budget of nearly 80,000 million euros in science and innovation from 2014 to 2020, 25% higher than its predecessor, the **Horizon 2020 Framework Programme** is the key tool for the implementation of the initiative "Innovation Union" and therefore, the main funding program for research and innovation in the European Union.

A notable new point is that for the first time this programme will cover the entire cycle from fundamental research to experimental development[15], including demonstration activities and the phases closest to the market. It is based on three priorities:

- *Excellent Science*: Strengthening the EU position in science to boost high-level research in Europe, including the European Research Council (ERC).
- *Competitive Industry*: Promoting industrial leadership in innovation through increased investment in industrial and enabling technologies (ICTs, more KET or Key Enabling Technologies and Space), greater access to capital, and greater support to SMEs.
- *Social Challenges*: Contribution of innovation to the solution of the major concerns shared by citizens like climate change, sustainable transport, sustainability and energy security, food safety, the aging population and health.

[15] Throughout this document the following terms are used interchangeably:

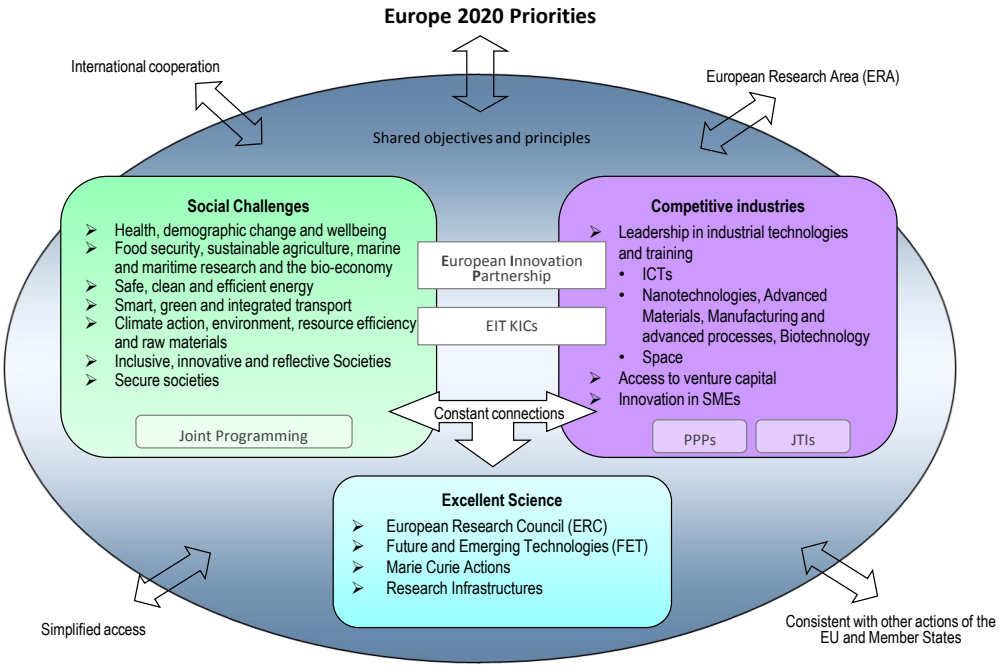
- Basic research <> fundamental research

- Applied research <> industrial research

- Technological development <> experimental development

The terms on the left have been used for many years in documentation, while those on the right are those used in the current "EU R&D&I State Aid Framework"

Figure 17: Horizon 2020 Programme



Source: Europe 2020 Strategy

Smart specialisation: Research and Innovation Smart Specialisation Strategy (RIS3)

The "PCTI Euskadi 2020" takes as its reference the RIS3 smart specialisation strategy adopted by the European Union as a mandatory requirement for access to the cohesion funds[16].

The implementation of Europe 2020 has deepened the need for greater effectiveness of resources destined for growth, particularly of European Funds. As a result, we have seen the need to design national and regional research and innovation strategies for smart specialisation (RIS3 strategies).

It is intended that the Structural and European Investment Funds can be used more efficiently and increase synergies between the different regional, national and EU policies, and public and private investments. To secure this objective, the Commission has proposed that these strategies should be a precondition for ERDF funding. Accordingly, Member States and regions of the EU should establish RIS3 strategies before operational programs that support these investments are approved.

[16] As an integral part of the EU cohesion policy for 2014-2020, the Commission services have also suggested that smart specialisation should be a precondition for ERDF funding for innovation investment.

What is a RIS3 strategy and why is it necessary?

There is a growing recognition that the territories need to build development strategies focused on building sustainable competitive advantages based on their resources, skills and capacities. The debate that has emerged in Europe around what have been called *'Research and Innovation Smart Specialisation Strategies'* (RIS3, for its acronym in English) is a reflection of this development. In the case of the Basque Country, the application of the RIS3 methodology translates to considering our scientific and technological capabilities, strategic sectors and activities, and guidance to local and international markets.

The RIS3 concept first arose from the observation that many regional governments have invested mimetically in certain areas of science, technology and innovation, without considering the plurality and diversity of their specific contexts and without setting priorities. What are required are regional strategies that are 'smart', meaning to specialize and concentrate their resources and investments in areas where there are clear synergies with existing and potential productive capacity of the region[17].

Smart specialisation seeks to identify the characteristics and unique assets of each country and region, highlighting its competitive advantage and bringing together stakeholders and regional resources around a vision of the future that tends towards excellence, maximizing, in turn, the flow of knowledge[18].

With the RIS3 strategy the idea is to contribute, through R&D&I, to the ultimate objectives that the territory, through its representatives, has been set. In the case of the Basque Country, these objectives are determined by the country strategy described in the previous section.

[17] http://ec.europa.eu/regional_policy/information/legislation/index_es.cfm

[18] The European Funds Regulations issued by the European Parliament and the Council of 17th December 2013 define what a "smart specialisation strategy' is. National or regional innovation strategies are required to define priorities to create competitive advantage by developing and adapting the strengths of research and innovation to business needs in order to address emerging opportunities and market developments consistently and at the same time to prevent duplication and fragmentation of efforts.
A strategy for smart specialisation can be included in a political-strategic national or regional research and innovation framework, or take the form of this framework, and must involve the participation of national or regional management authorities and stakeholders such as universities and other higher education institutions, industry and the social partners in the discovery process of entrepreneurs.

Visualizing a 'live' RIS3 strategy for the Basque Country

Given the differences of context and existing problems from one place to another, there are no ideal models for RIS3 or recipes of organization that are better or valid for all. In addition, no territory starts from scratch; all have important antecedents.

As the community expert K. Morgan noted in his assessment made public in March 2013 on the implementation of the RIS3 strategy in the Basque Country: "The Basque Country can legitimately claim to have been building this type of strategy for the past thirty years".

Moreover, he indicates that the current PCTI-2015 "is at the heart of the Basque Regional Innovation Strategy (RIS)". Considering the report of this expert, it is appropriate to use the European methodology RIS3 to review current policies of innovation in the Basque Country in a spirit of constructive criticism.

Building a territorial strategy is a 'live' and continuous process in time. In particular, the RIS3 advocates that identifying the priorities of a region should be done through an entrepreneurial discovery process. That is, a RIS3 strategy is characterized not only by containing vertical and horizontal priorities but also how these priorities are set. The strategy is a dynamic process in which various actors are involved, making up the "quadruple helix" of the innovation process: the public authorities, the business community, academia and the world of knowledge and civil society. In addition, appropriate governance is needed to get the regional level involved with subregional, national and European levels.

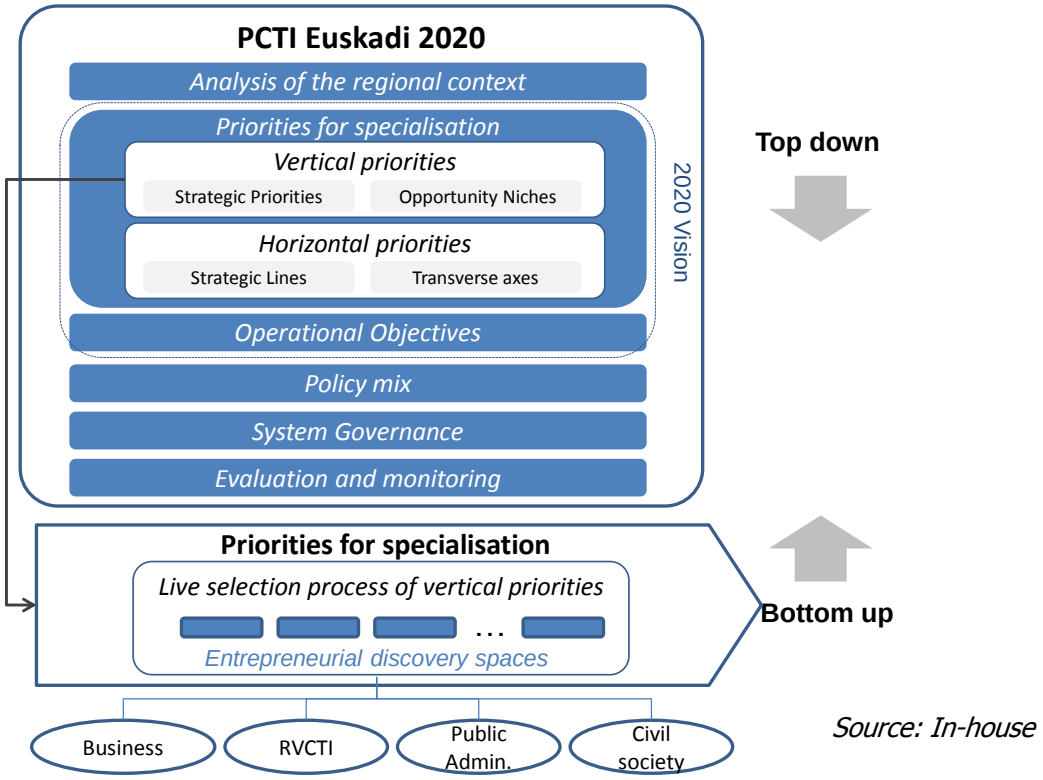
As a result, Euskadi has a solid starting point because, as K. Morgan argues, this process of targeting and identifying priorities has already been happening systematically in recent decades.

The challenge now is to improve the existing strategy, focusing it better to meet the changing needs of transforming our production system and Basque society itself. It is a challenge promoted by the Basque Government, as an institution that holds competencies in R&D, and that intends to add different actors, each with a different role, but with the same vision or ultimate goal strategy: to contribute to the development of the RIS3 and the productive transformation of the Basque Government to generate employment and welfare in the medium to long term.

Thus, the PCTI Euskadi 2020 is a shared vision of the future, combining the necessary setting of goals and budget allocation of public institutions (top down policies) with the

contribution of agents from the system for defining specialisation priorities (bottom-up policies).

Figure 18: Science, Technology and Innovation Plan (PCTI) Euskadi 2020



3.3. Three strategic priorities and one area of opportunity

Following the procedure and methodology established by the European Union, for about a year the different agents of the RVCTI have been working on analysis and contrast with industry to identify priorities for smart specialisation in 2020. The result of this work is the document "RIS3 Euskadi Strategy" was prepared, approved by the Basque Council for Science, Technology and Innovation and forwarded to the Regional Policy Directorate of the European Commission.

Below is an overview of the strategic priorities identified in the process of smart specialisation RIS3 for the Basque Country, where clear synergies between research, innovation and productive capacities of the region have been identified. Other niches of opportunity where we can make progress in the near future to justify a higher concentration of resources, linked to the growth of social and business demand are also described.

The interaction of these three vectors[19]: entrepreneurial skills, science and technology and the markets; and the implementation of the European methodology, the following vertical priorities, differentiated between strategic priorities and areas of opportunity, have been identified:

Strategic Priorities:

- Advanced Manufacturing
- Energy
- Biosciences / Health

Areas of opportunity:

Other niches of opportunity linked to the Region:

- Agri-food industry most closely linked to sustainability and human environment
- Regional planning and urban regeneration
- Certain niches relating to leisure, entertainment and culture
- Specific activities in relation to ecosystems.

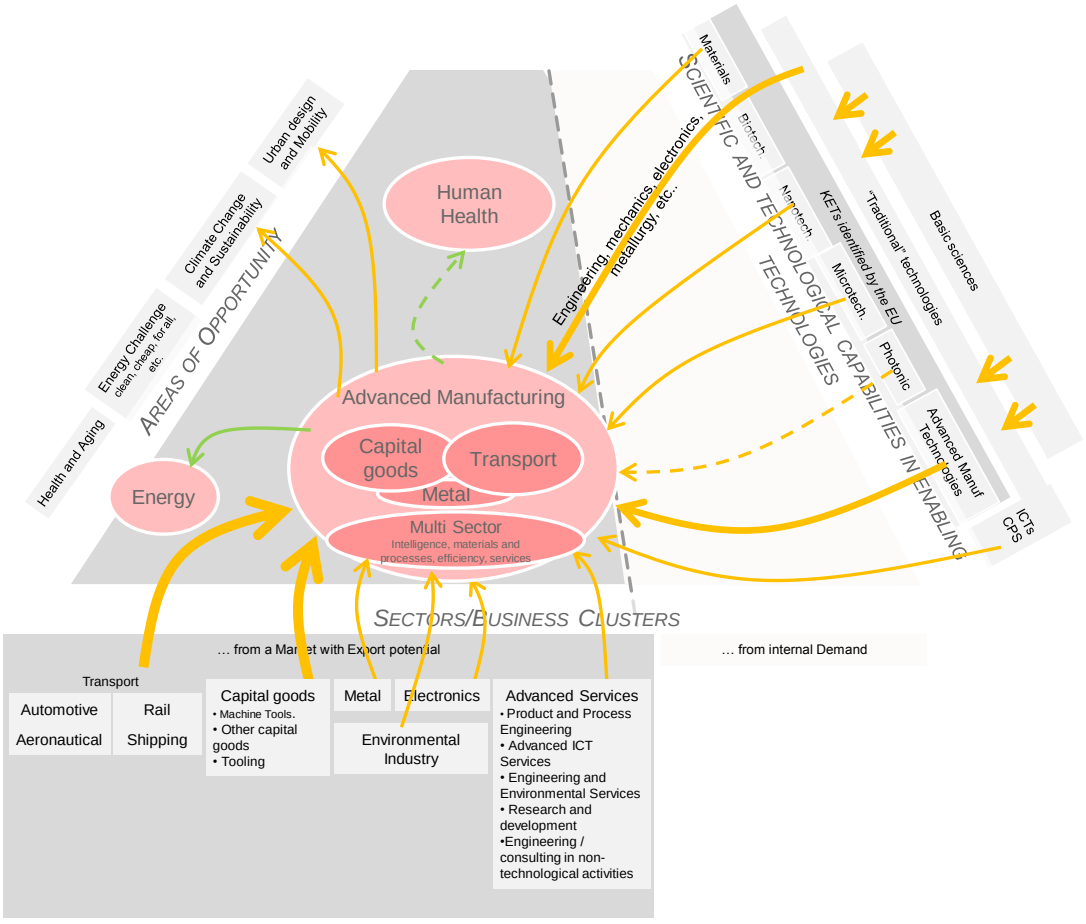
Importantly, it should also boost hybrid and collaborative projects arising from crossover between different priorities.

[19] Appendix 4 shows the prioritisation criteria that have been used

Advanced manufacturing

Research and development directed towards transportation-related industries - notably automotive, aerospace, rail and shipping -, equipment, machine tools and metal. It is a commitment to research aimed at the incorporation of intelligence in material means and production systems, leveraging capabilities and emerging technologies into new products and processes, integrating advanced materials with higher value added solutions or improved processes, efficiency and sustainability of the resources used and the integration of services with high added value. It is an investment, ultimately, in the "Basque Industry 4.0" strategy.

Figure 19: RIS3 advanced manufacturing priority in the Basque Country

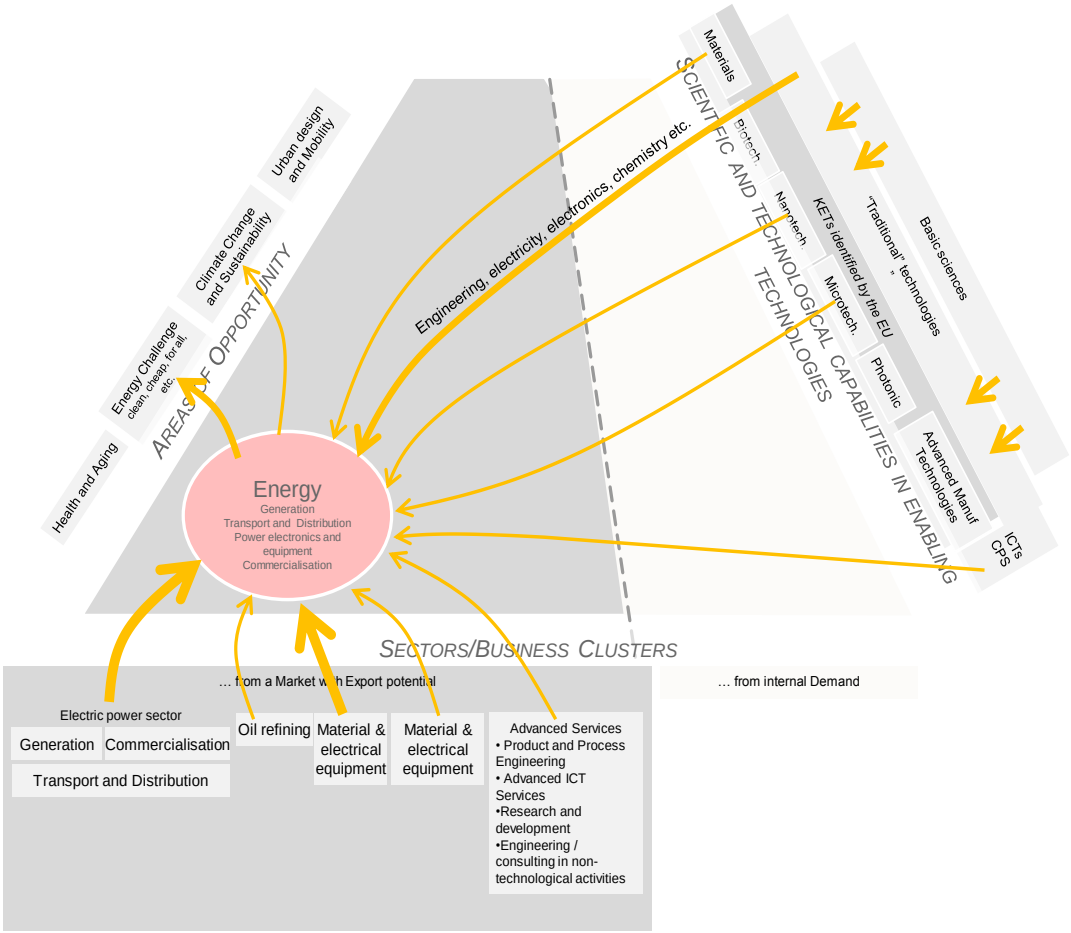


Source: RIS3 Euskadi document

Energy

Research and technological and industrial development in the areas marked by the EnergiBasque strategy along different stages of the value chain - generation, transport, storage and distribution, as well as the related auxiliary industry - applied to different energy sources in which the Basque Country has a strong presence: electricity; oil, gas; and alternative energies (wind, wave, solar, energy storage, smart grids, electrification of transport and energy management services).

Figure 20: RIS3 energy priority in the Basque Country



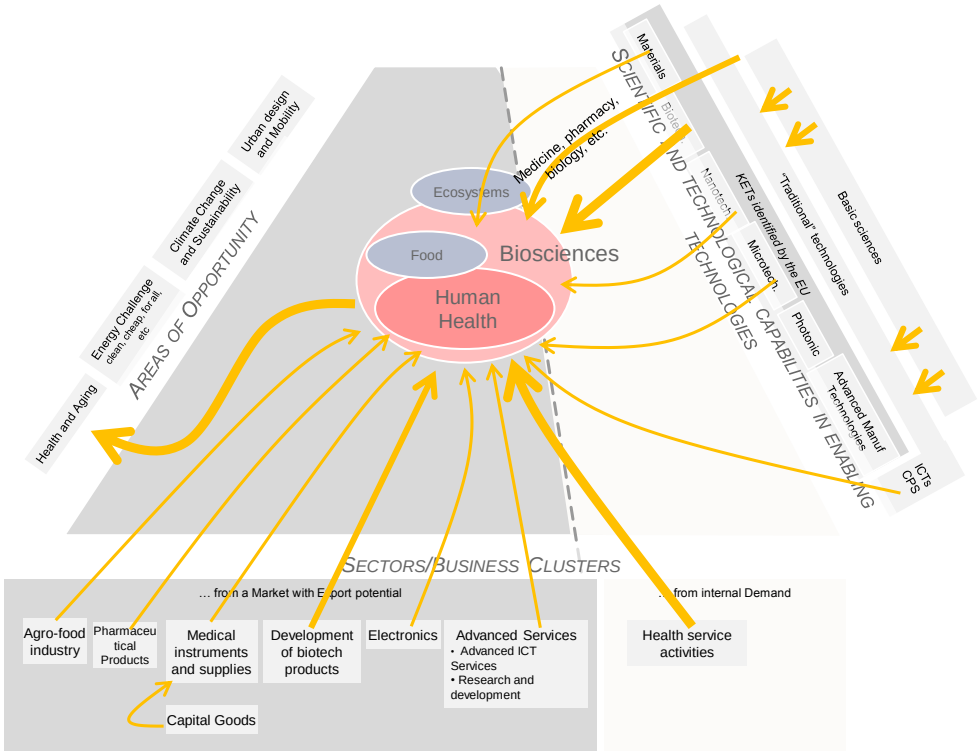
Source: RIS3 Euskadi document

Biosciences and health

The current development of biosciences is derived from a sustained strategic focus which has on one hand led to us having high level scientific-technological capabilities (where the convergence of enabling technologies - micro-nano-bio-ict - is critical) and a new business sector, and which on the other hand has also facilitated the diversification of industrial enterprises. Both are trends that it is necessary to strengthen. This growing business activity includes the biopharmaceutical and strictly biotechnology fields, the ancillary service industry, medical components or miscellaneous equipment industry, capable of internationalisation.

In the Basque Country, the biosciences are concentrated in the sector of human health and to a lesser extent in other niches, such as food, agrochemical and natural ecosystems. The application of bioscience to health reinforces the development of the health sector, based on the existence of a powerful and efficient public network with research and innovation capacity capable of drawing new developments.

Figure 21: RIS3 biosciences and health priority in the Basque Country



Source: RIS3 Euskadi document

Opportunity niches linked to the region

Complementary to the vertical strategic priorities, a number of potential emerging niches linked to the region have been proposed. These activities are skills, scientific knowledge and business experience, with a high degree of application to domestic demand, mainly the government. Four main segments of different types have been identified:

- The agri-food industry most closely linked to sustainability and human environment:
  - Regulations and food security
  - Innovation and technology applied to food products and processes
  - Sustainability of the food chain
  - Aquaculture
  - Gastronomy and catering industry
- Regional planning and urban regeneration: technological and business developments supported by advanced services in the areas of:
  - Planning oriented to the design of smart regions
  - Urban regeneration in the context of smart cities
  - Construction
- Leisure, entertainment and culture:
  - Cultural industries and the language industry
  - Creative Industries (digital entertainment, multimedia ...)
  - Videogames
- Specific activities in relation to ecosystems:
  - Decontamination of water
  - Regeneration and recovery of contaminated soils
  - Monitoring of ecological risk

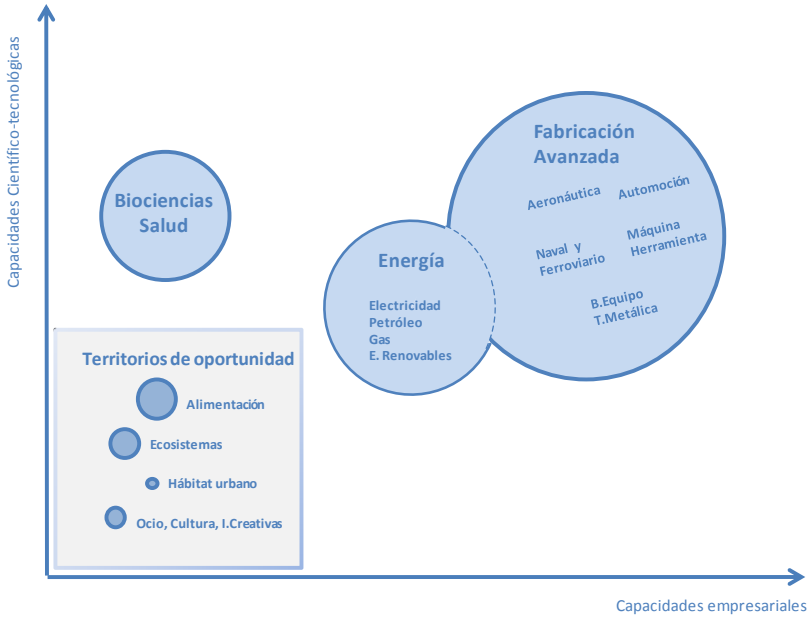
The following figure shows the vertical RIS3 priorities selected, and it is possible to see the different level of balance of abilities in each of them, as well as its real size.

In Advanced Manufacturing and Energy there is evidence of both scientific-technological and business capabilities and they represent a significant dimension in the Basque economy.

In Bioscience and Human Health there is evidence of scientific capabilities, albeit with limited entrepreneurial skills and a lesser dimension, which means it can be described as a sector with clear potential.

In the other niches of opportunity there is some evidence of scientific-technological and/or entrepreneurial skills on a more limited scale and focused on sectors with low relative specialisation or low domestic demand in the Basque Country.

Figure 22: Representation of RIS3 vertical priorities in the Basque Country



Source: RIS3 Euskadi document

These strategic priorities and niches of opportunity have been selected by entrepreneurial base, scientific and technological capabilities and areas of opportunity. Accordingly, and based on the social challenges that the H2020 program focuses its funding on, there is a clear link with the strategic priorities of the PCTI, as reflected below:

Figure 23: Link between H2020 social challenges and strategic priorities and niches of opportunity in RIS3 Euskadi

H2020 Social challenges	Link with RIS3 strategic priorities and niches of opportunity
• Health, demographic change and wellbeing	• Strategic Priority "Biosciences and Health"
• Challenges of the European Bioeconomy: food security, sustainable agriculture, marine and maritime research and biological-based economy	• Strategic Priority "Biosciences and Health" • Niche opportunity of "Region"
• Safe, clean, efficient energy	• Strategic Priority "Energy"
• Smart, sustainable and integrated transport	• Strategic Priority "Advanced Manufacturing"
• Climate action, resource efficiency and raw materials	• Strategic Priority "Advanced Manufacturing"
• Europe in a changing world: Inclusive, innovative, reflective societies	• PCTI Link with strategic plans for Sustainable Human Development
• Secure societies: protect the freedom and security of Europe and its citizens.	• Link with the PCTI Strategic Security Plan

"Live" vertical priorities selection process

The priorities identified in the RIS3 Euskadi report are the result of a process of development, comparison and participation, developed over approximately a year by all the Basque Government Departments and other institutions involved working together.

Maintaining and updating the 'live' RIS3 process will be carried out by the development of each of the priority areas through a participatory process with public and private actors. Throughout this process the priorities already established will be reviewed in terms of new technologies and market trends etc., so that they can respond to changes in the local and international environment.

This participatory process will be updated using "Entrepreneurial Discovery Spaces", which will be structured in working groups in which the 4 agents of the "helix" of innovation - companies, researchers, government and society - will participate,

following the European methodology. Its aim is to facilitate participation in the design, implementation and updating of priorities and to drive the alignment of each agent's strategies. Similarly, it may promote joint strategies and hybrid projects arising from the intersection of the strategic priorities.

3.4. Four strategic lines and two transverse axes

The PCTI Euskadi 2020 proposes a research and innovation policy based on smart specialisation and improving the efficiency of the Science, Technology and Innovation System, through the following strategies:

Strategic Lines

1. To promote the strategy of smart specialisation, through science, technology and innovation aimed at responding to the social challenges of the Basque Country
2. To strengthen industrial leadership through public-private partnerships
3. To raise the excellence[20] of the Science, Technology and Innovation System
4. To ensure the development of human capital in science, technology and innovation

These strategic lines are based on two transverse axes:

Transverse axes

1. Opening and internationalising of the Science, Technology and Innovation System
2. An innovative and connected system

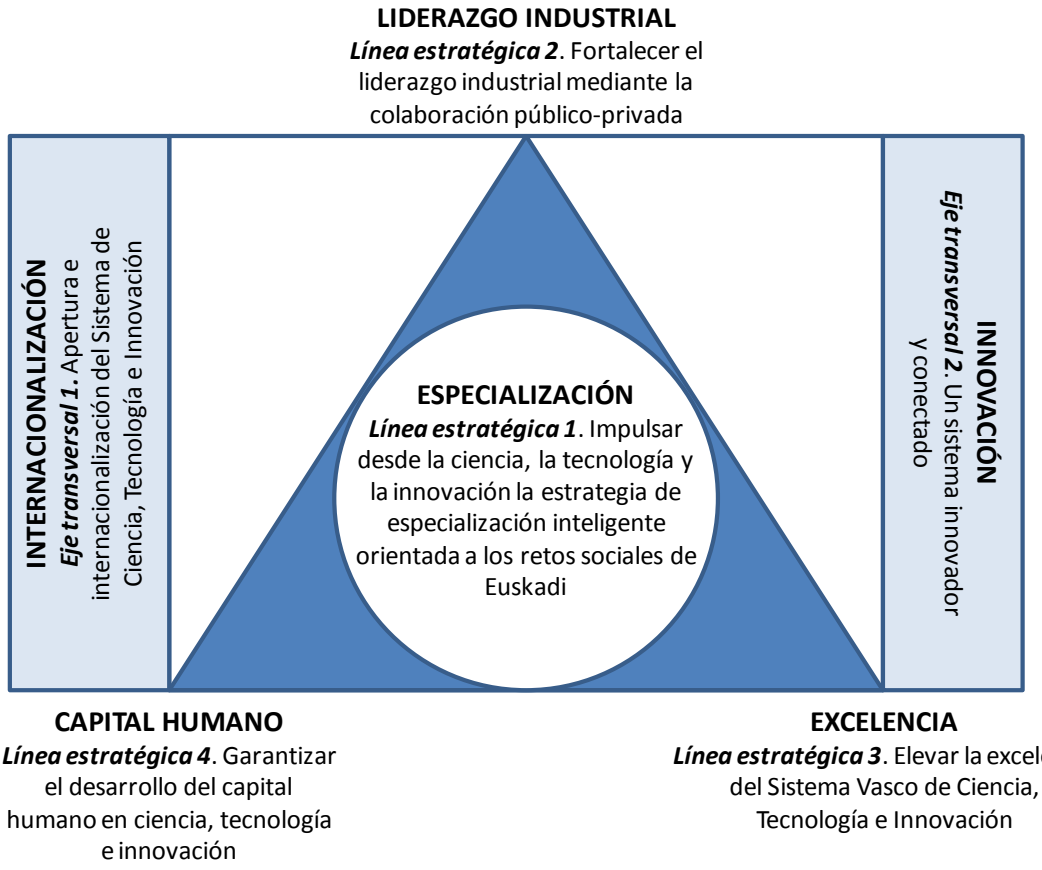
Gender equality as a horizontal component

Also noteworthy in the Plan is a commitment to gender equality as an element of a horizontal nature, promoting two horizontal initiatives:

- The incorporation of gender mainstreaming as a principle to consider in public policies in R&D&I issues.
- The promotion of the employment of women in the most advanced and technology-intensive sectors.

[20] Throughout this text, the word "excellence" should be understood as the combination of a substantial level of knowledge and great technical competence.

Figure 24: Strategic lines and transverse axes of the PCTI 2020



The choice of these strategic lines comes from the need to take advantage of the main future opportunities based on the strengths identified in the SWOT analysis and to respond to the most important weaknesses of the system. A summary table about this is provided in Figure 25.

Figure 25: Relationship between the strategic lines and transverse axes with the elements of the SWOT analysis

STRATEGIC LINES	WEAKNESSES	THREATS	STRENGTHS	OPPORTUNITIES
LE-1. Use ICT to boost the smart specialisation strategy, to address the social challenges of the Basque Country	Poor targeting by the RVCTI of the market in the areas of greatest competitive impact of the industrial sector		Existence of well-positioned leading business groups in international markets and large capacity for growth Highly developed network of agents and infrastructure Social sensitivity to global challenges	Market niches with skills and development of the convergence of technologies and sectors New markets and access to growing demand from emerging countries
LE-2. Strengthen industrial leadership through public private partnership	Insufficient innovation projects attracting business	Risk of relocation of the business activities of the Basque Country	Existence of leading business groups with great capacity for growth Public-private partnership, with ability to develop business models and structures of collaboration	
LE-3. Raise the level of excellence of the Science, Technology and Innovation System	Technological system that should improve its performance Limited scientific production in relation to other regions	Economic sustainability of RVCTI strongly tied to public resources	Highly developed agent network and infrastructure	
LE-4. To ensure the development of human capital in science, technology and innovation		Talent and activities drained by more attractive environments and systems	Specialized human capital (tertiary education and especially in ICT)	
ET 1. Opening and internationalisation of ICT System	Limited ability to attract foreign sources of funding Innovation system not very open to the exterior		Highly developed network of agents and infrastructure	New programme H2020
ET 2. An innovative, connected system	Relatively little business innovation in comparison with advanced regions		Quality and operational efficiency of the business fabric Social sensitivity to global challenges	

Below are described the four strategic guidelines established for the Plan and the two transverse axes on which they rest:

Strategic line 1. To promote the smart specialisation strategy through science, technology and innovation aimed at responding to the social challenges of the Basque Country

The smart specialisation approach aims to bring together resources and knowledge from different fields, technologies and disciplines to develop activities that cover the whole value chain of R&D&I.

The existence of leading business groups that are well positioned in international markets with high growth capacity, as well as a well-developed network of scientific-technological agents and institutional support together with the extensive development of public-private partnership, constitute sufficient basis to advance a collaborative approach covering the entire value chain, from research to the market.

For this momentum of science, technology and innovation priorities to be effective, it is necessary to take into account the shortcomings that the Basque Country has over other countries, as reflected in the initial diagnosis.

Specifically, we refer to the need to strengthen research excellence mainly through the Universities and the BERC and increase the weight of the experimental and technological development of the Technology Centres and Cooperative Research Centres. In addition, there is a need to improve the results orientation of the entire value chain of R&D&I.

Therefore, the development of smart specialisation strategy requires not only the grouping and concentration of skills and resources in the areas defined, but also the strengthening of certain areas of the value chain of R&D&I, and as the results orientation of the whole.

Strategic Line 2. To strengthen industrial leadership through public-private partnerships

This strategic line seeks to accelerate the growth of higher value-added activities, particularly in the sectors related to the priorities selected.

To do so, it relies on the existence of leading business groups in the Basque Country that are well positioned in the international markets with growth potential as well as the ability of the business fabric to develop collaborative models and structures.

The main lines of action that will strengthen this industrial leadership are:

- To acquire critical mass of resources in priority areas which can incorporate knowledge and key technologies[21] for business competitiveness. To this end, we propose strengthening the model of public-private collaboration as a valid instrument for identifying and promoting projects and investments in specific areas related to the strategic priorities as well as promoting initiatives in the European framework to equip projects with dimension.
- To encourage the effective transfer of knowledge between RVCTI agents and businesses, through instruments such as training and development for staff in companies, development of R&D&I under contract, sale and/or assignment of patents and licenses, and the creation of spin-offs and NEBTs (new technology-based enterprises).
- To strengthen the link between scientific and technological policy and the cluster policy.
- To encourage innovative public procurement as an element for attracting technological development in certain strategic sectors where public demand plays an important role versus private: health, transport and security, especially.

Strategic line 3. To raise the level of excellence of the Basque Science, Technology and Innovation System

The Basque Country has infrastructures and a highly developed network of agents in science and technology, whose results determine the level of excellence of the whole system which we are trying to raise through the establishment of the appropriate indicators. This improvement will enable the transfer of knowledge to companies and the consequent reduction of dependence on public funding.

At present there are various systems of indicators that measure the quality and excellence of innovation systems. In Europe, the benchmark for comparison between

[21] In line with H2020, industrial technologies and training (ICT, Nanotechnologies, Advanced Materials, Biotechnology, Manufacturing and Advanced processing and Space) and key enabling technologies or KETs (microelectronics and nanoelectronics, photonics, nanotechnology, biotechnology, advanced materials and advanced manufacturing systems) are considered particularly important for industry leadership.

countries and regions are the IUS and RIS, respectively. However, not all the indicators that make up these synthetic indexes have the same interest for the Basque Country, given its socio-economic structure and its scientific and technological capabilities.

Therefore, we have made a selection of indicators based on the following criteria:

- The relationship of the indicator with the strategic priorities: advanced manufacturing, energy and biosciences/health.
- Its relationship with economic and innovative results.
- Its ability to identify potential weaknesses in the Basque Science, Technology and Innovation System, compared to the IUS benchmark with leading countries.

According to these criteria, we have established the following strategic lines of action for this axis:

- *To increase the scientific production of the Basque Country:* it is mainly to improve the efficiency of the activity of fundamental research, increasing both quantitative and qualitative scientific production to improve its position compared with other regions. The main indicator associated with this line is the number of indexed scientific publications which will be complemented by a quality indicator of these publications.

- *To increase the protection of knowledge generated in industrial research:* to increase the efficiency of the activity of industrial research and position companies internationally in niche markets with high added value, it is necessary to improve their ability to develop new technologies. The main indicator associated with this line relates to international patent applications.

- *To increase business revenues from new products*: this means improving the efficiency of the activity of experimental development and the ability of firms to develop or incorporate new technologies and knowledge to their products. The main indicator associated with this line is the sale of innovative products.

Strategic line 4. To ensure the development of human capital in science, technology and innovation.

The preparation and improvement of skills of the researchers is a key element to the system being able to generate internationally recognized scientific and technological knowledge.

Given the critical mass and skills required to compete on the international stage and that prior knowledge is that which precedes innovation in the value chain, it is

necessary for this improvement to cover research and innovation, seeking the greatest possible alignment with the priorities and value niches identified.

It is also advisable to influence the inclusion of researchers in the business sector and scientific-technological agents to extend and develop the knowledge generated and also reduce the risk of a brain-drain, preventing this talent from being captured by other more attractive environments and systems.

Although the Basque Country shows better results in some IUS indicators in human capital than the average of the EU27 (e.g. new doctors in the Basque Country in 2014 were 1.80 compared to 1.70 for the EU-27), the system has the following requirements regarding human capital:

- To increase the excellence of scientific production of the research personnel
- To ensure training of top level human capital in strategic priorities.
- To increase investment in tertiary education and improve its connection to business and society.
- To manage generational change in public and private research institutions, consolidating the leadership of their research groups.
- To open the innovation system to other countries and increase the percentage of foreign researchers.
- To reduce the gender gap in scientific and technological fields.

To meet these needs the following lines of work are proposed:

- **To develop knowledge in all disciplines of the science, technology and innovation system, especially in the RIS3 areas**

  This line focuses on three areas: the creation of home-grown talent, development of basic skills and the enhancement of post-graduate training in key areas for the country.

  - Generation of young scientific-technological- business talent: focussed on ensuring the creation of home-grown talents that would ensure the sustainability of the system in the medium and long term with a focus on promoting scientific vocations.
  - Life-long learning: in order that professionals can constantly refresh their knowledge and skills, availing the effect of the Basque Qualifications Framework provisions of Law 1/2013, of October 10th, Life-long Learning. This reclassification will be strengthened in the RIS3 areas of specialisation.

- Strengthening and improving doctorates: to strengthen high-level activity by increasing the number of doctors and encouraging the development of creative abilities. Special emphasis should be placed on the training of doctors in companies by strengthening existing programs (Zabalduz, Ikertu ...). Thus, the idea is to accompany and synchronize the various scientific, technological and industrial strategies with adequate skills and human talent management.

- **To manage the attraction, retention and mobility of talent**

  Strategies for talent attraction and consolidation initiated in recent years, such as *Ikerbasque, Bizkaia: talent* or *Gipuzkoa Fellows*, have been proven effective for the internationalisation of our system of science, technology and innovation and the construction of new research facilities at the same time have been a great return on competitive investment. For example the Ikerbasque programme currently constitutes 17% of the scientific production of this autonomous region.

  Both public institutions, through their programmes, and the action of hiring and training researchers by agents of the Basque science, technology and innovation system, have expanded the research base of Euskadi. The challenge is to maintain in the future this effort of investment in people that brings us closer to leadership positions at European level through agile and efficient programs aimed at:

  - Attracting the best talent in the fields of investment in the Plan, both in the scientific and technological fields and in business.
  - Promoting the external mobility of the research and technology professionals of our country as a crucial element of their professional development and an embryo for the development of future collaborative networks.
  - Generating a working environment and organizations that promote the building of skills.

Transverse axis 1. Opening and internationalisation of the Science, Technology and Innovation System

The internationalization of the Science, Technology and Innovation System is needed to promote the uptake and generation of new knowledge, to identify trends that favour technological developments and business opportunities and to position the system itself internationally. The idea is to get involved in international networks, to attract foreign investment capital and to leverage the various existing programmes, both in Europe and in other countries, to promote science, technology and innovation.

Furthermore, in the current economic environment, access to finance in the Basque Country is still one of the main factors that hinders the development of innovation. Therefore, it is necessary to increase the uptake of foreign funding in R&D&I, based on good international positioning of the leading business groups in the autonomous community, as well as the strong network of agents and scientific and technological infrastructure. In this regard, it is important to increase the use that is made in the Basque Country of the EIB and EIF financial instruments in the context of structural and cohesion funds, to support the development of innovative initiatives with potential to create economic wealth and employment.

Moreover, it is also necessary to bring actions and initiatives to bear that provide both the Basque Government and the economic and social actors in the Basque Country with a European dimension and interregional collaboration. Of great importance here are initiatives such as Vanguard, the Basque nomination for the KIC on Advanced Manufacturing and activities in the area of the euro-region Aquitaine-Basque Country.

To achieve this goal, we will work on the following lines:

- **Promote Basque participation in H2020** (and other programs of the Multiannual Financial Framework for the EU for 2014-2020)

  The new European framework programme for research and innovation, Horizon 2020, will have the largest funding in the history of the framework programmes, and is aimed at bridging the gap between research and marketing of results, covering the so-called "death valley"

  The Basque Country shares this challenge and is aware of the opportunity of H2020 to capture and generate new scientific and technological knowledge and help companies increase their technological intensity to improve their competitiveness. Furthermore, H2020 will also make it possible to develop research aimed at strengthening the smart specialisation strategy, participating in the European areas most closely linked to the priorities.

  Basque participation in the previous FP7 framework programme can be considered a success. It has not only increased the number of Basque entities involved and the number of projects, but has also exceeded the funding target set in the previous strategic book.

  Based on these strengths, the Basque Country proposes to be even more ambitious in the future. For this new period 2014-2020, the Basque Country has set a new target in relation to the H2020 programme: increasing their

participation in European projects and obtaining a funding figure that is almost double that obtained in the VII PM.

The "Strategic Book for Basque R&D&I in Europe" includes the position of the Basque Country in response to the new challenges of H2020, it sets concrete objectives for participation for each agent and research field, describes existing services to support their participation and serves as a practical guide to understanding the changes in this new programme.

- **Attracting foreign enterprise investment for R&D&I**

  Beyond its presence in European funding programmes, the Basque Country has ample room for improvement in the development of actions for attracting multinational R&D centres, incentives for entrepreneurs and new technology companies, attracting venture capital funds and international business angels, etc.

  The "Internationalization Framework Strategy 2020: Strategy Basque Country", through its different areas of activity, defines the most appropriate instruments for achieving the above objective of attracting foreign investment to the Basque Country. In this context a new strategy to attract investment, "Invest in the Basque Country" has been developed (see Appendix 5), referred to in Internationalization Plan and the Industrialization Plan.

Transverse axis 2. An innovative and connected system

The Basque Country has a high quality business network, capable of developing efficient cooperation structures based on highly specialized human capital and public-private dialogue.

However, business innovation, both technological and non-technological, still lags behind the more advanced regions, and therefore we need to continue moving forward in creating a culture of creativity, risk and innovation in businesses and in Basque society itself.

Significant efforts are being made to meet this challenge, both in business and in government. However, we have to strengthen connections between different areas of research and innovation - universities, research and technological centres - and enterprises. All this without forgetting society, which will finally have to take on board the proposed new innovations as well as being the origin and engine of many of them.

Business Innovation

The vast majority of European policies that support innovation point to the need for more flexible, efficient and effective ways to manage a company, incorporating innovations as a transverse aspect for all its activities.

In this context, the challenge currently features:

- Training companies, especially SMEs, in Advanced Management to advance in the definition and implementation of innovative projects.
- Supporting the actions of the leading companies internationally or with high growth potential for strategic projects that will improve their overall competitive positioning. In this regard the Interagency Plan to Support Entrepreneurial Activity is noteworthy.
- Investing in innovation in the field of business organization, understood as the participation of people (working staff, customers, and society) in the design and implementation of business strategy.
- Boosting the hiring of PhD graduates in businesses to give them the necessary knowledge to enable them to find innovative solutions to everyday challenges.
- Researching the so-called innovation intangibles[22], to find out the factors that affect productivity improvement of Basque companies.

This non-technological innovation is complemented by the necessary acquisition and application of knowledge and technology, to design new products and solutions that best meet changing market needs. Here, the Industrialization Plans 2014-2016 and Internationalization Framework Strategy Euskadi: Basque Country 2020 (mainly through the Business Internationalization Plan) define a set of initiatives and lines of action aimed at strengthening Basque business and industry on both counts.

Innovation in the public sector

As the Basque Country opts for innovation as a key element for improving the competitiveness of its economy, the public sector must assume an exemplary leadership role with respect to innovation, through the improvement of public services, guidance for citizen and operational efficiency to meet the following needs:

[22] For more detail on Basque companies' investment in innovation intangibles and their impact on productivity, see Indizea: http://www.innobasque.com/home.aspx?tabid=1058&idElementoBiblioteca=207

- To adapt the functioning of public administration to the parameters of an advanced democracy.
- To ensure efficient services and quality care to citizens.
- To consolidate and update the development of eGovernment.
- To adapt its organizational structure and professional profiles.
- To involve citizens in the design, management and evaluation of policies.

For this purpose, the Basque Government has launched the Public Innovation Plan as a strategic management tool for moving towards a government that contributes to legitimising the value of public life in Basque society.

This Plan will allow progress towards an innovative and open administration that offers society quality services which are efficient, effective and safe with the active participation of citizens.

The Plan sets out six strategic areas with corresponding objectives and projects:

- Transparency and Good Governance
- Interaction with the public
- Organizational Adaptation
- Improved management
- EGovernment
- Innovation through co-creation.

Social Innovation

According to the definition of the European Commission, Social Innovation consists of finding new ways of meeting social needs which are not adequately covered by the market or the public sector, or in producing behavioural changes needed to solve the great challenges of society, generating new social relations and new models of collaboration.

In this context, social innovation is seen as an opportunity to give a comprehensive and structured response to the great challenges of our society, such as employment, education and aging. Science and technology play an important role in these processes, but must be combined with large doses of social innovation to facilitate the necessary behavioural changes and involvement of individuals and communities in finding solutions.

Under these premises, the strategy for Social Innovation of the Basque Country attempts to recognise the existence of social innovations, promoting specific projects

that represent best practice and to participate in the network of European programmes. In short, it is built on the following key areas:

- Evaluate and compare the social innovations and measure their results in terms of social and economic impact.
- Disseminate best practices identified to raise awareness and to give value to social innovation in Basque society.
- Support initiatives linked to cooperation and social entrepreneurship, detecting potentially innovative agents and supporting projects that will meet the challenges of Basque society. In this regard, it will particularly address the initiatives that respond to the problems resulting from ageing and increasing the quality of life of the elderly, education and life-long learning, and especially, employment.
- Increase participation in European projects and position the Basque Country as a "Social Innovation Node in Europe", giving value to all stakeholders and initiatives that are being developed.

3.5. Five operational objectives and one horizontal operational objective

The strategic lines laid down are divided into six operational objectives; one of which has a more horizontal nature for its impact on the overall system:

1. Focus resources and investment in R&D&I in the areas of specialisation
2. Strengthen fundamental research and experimental development
3. Orient Science, Technology and Innovation System towards results
4. Strengthen attraction for international funding in R&D&I
5. Increase the number of companies that innovate
6. Improve the qualifications of research staff

These operational objectives serve, through the determination of the corresponding indicators and targets, as a vehicle for deploying the strategic lines that form the core architecture of the PCTI, as shown in the following figure:

Figure 26: Relationship between the strategic lines and the axes of the Plan with the operational objectives

STRATEGIC LINES (SL) and TRANSVERSE AXES (TA)	OPERATIONAL OBJECTIVES (OO)
SL1.- Boosting smart specialisation strategy through science, technology and innovation aimed at responding to the social challenges of the Basque Country	OO1.- Focus resources and investment in R&D&I in the areas of specialisation OO2.- Strengthen fundamental research and experimental development
SL2.- Strengthen industrial leadership through public-private partnership	OO1.- Focus resources and investment in R&D&I in the areas of specialisation
SL3.- Raise the level of excellence of Basque Science, Technology and Innovation System	OO3.- Orient the Science, Technology and Innovation System towards results
SL4.- Ensure the development of human capital in science, technology and innovation	OO6.- Improve the qualifications of research staff
TA1.- Opening and internationalization of the Science, Technology and Innovation System	OO4.- Attract more international funding in R&D&I
TA2.- An innovative and connected system	OO5.- Increase the number of innovative companies

The following are the operational objectives set for the Plan.

Operational objective 1. Focus resources and investment in R&D&I in the areas of specialisation

As stated in the initial diagnosis, despite having reached the average level of the EU27 in R&D, the Basque Country presents indicators of output (innovative results and economic effects of the IUS) that can clearly be improved.

To improve the effectiveness of the investments, attract new capabilities and optimize existing ones, as well as to encourage diversification and creation of new areas of opportunity, the Basque Country should concentrate resources and investments in areas where there are clear synergies with our production capabilities in line with the European research and innovation strategies for smart specialisation (RIS3).

To do this, using the European methodology and as has been described in the previous sections, we have identified a number of strategic priorities for the Basque Country which will be constantly updated through a "living" process with the participation of quadruple helix of agents; companies, researchers, government and society.

The specialisation of the Basque Science, Technology and Innovation System will be determined by the ability to achieve critical mass and internationally recognized excellence in strategic priorities.

Main indicator associated with the objective:

Percentage of RVCTI R&D expenditure linked to the strategic priorities RIS3.

As a basis for calculating, the research activities of all operators in the RVCTI will be used, through which public policies supporting R&D&I will be run and which will reflect the degree of alignment of the system with the strategy of specialisation of the country.

Current level of the indicator: 76% (provisional value reflected in RIS3 Euskadi 2014)

Goal to be reached in 2020: 82%

Operational objective 2. Strengthen fundamental research and technological or experimental development

As stated in the initial diagnosis, the Basque Country has competitive weaknesses compared to other countries, where support is aimed at fostering research activities closer to the market, through experimental development (or technological development). Deficiencies relating to the weight of fundamental research excellence - or basic research excellence - are also seen, which along with the productivity of the system, affect the results of scientific production.

The evolution of the mix of R&D in the Basque Country in recent years suggests the need to improve our positioning to reduce competitive disadvantages cited by increasing the weight of experimental development and research excellence.

As reflected in the Eustat data on the evolution of expenditure by type of R&D per agent, the reduced weight in technological development and the bias towards industrial research stems from the change of positioning suffered by companies and agents linked to the Department of Economic Development and Competitiveness, particularly Technology Centres.

Figure 27: % activity by research category and agent type 2005 and 2011[23]

	Internal Current Expenditure on R&D by Research Category (thousand €)				*Mix per segment*			*Weight per agent*	*Weight of each R&D activity of each entity out of the total*		
Situation 2011	**Basic R.**	**Appl. R.**	**Tech. Dev.**	**Total**	**Basic R.**	**Appl. R.**	**Tech. Dev.**	**Weight**	**Basic R.**	**Appl. R.**	**Tech. Dev.**
1. Companies	6,002	280,580	404,220	690,802	1%	41%	59%	58%	0.5%	23.6%	34.1%
2. RVCTI-DEDC	24,798	172,428	19,720	216,946	11%	79%	9%	18%	2.1%	14.5%	1.7%
3. Public Bodies	6,911	57,072	12,329	76,312	9%	75%	16%	6%	0.6%	4.8%	1.0%
4. Higher Education	117,033	82,836	2,761	202630	58%	41%	1%	17%	9.9%	7.0%	0.2%
TOTAL	154,744	592,916	439,030	1,186,690	13%	50%	37%	100%			

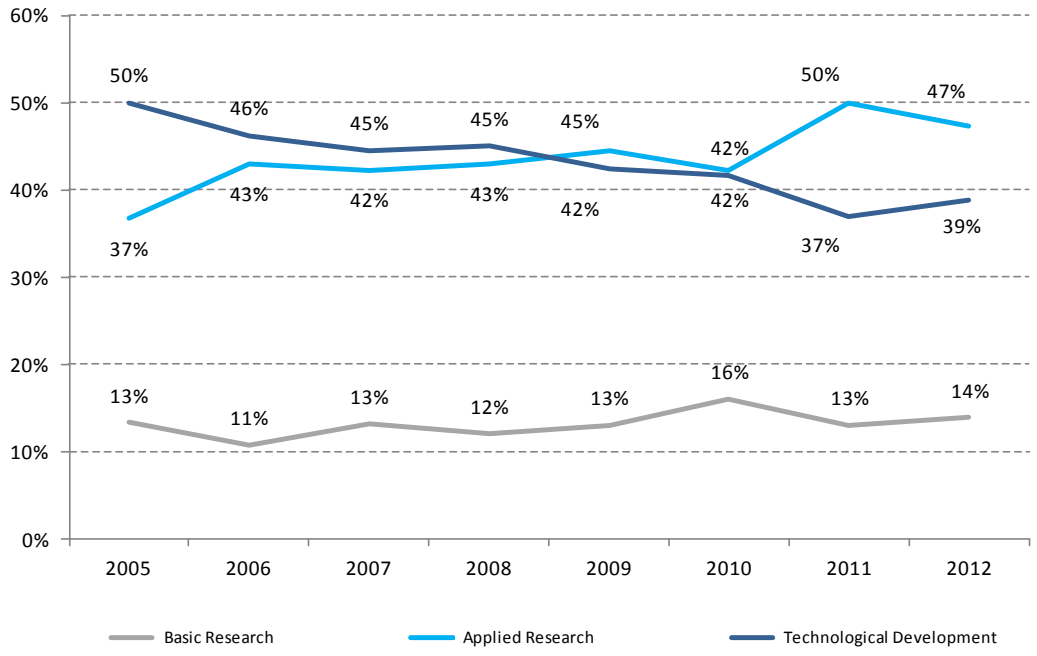
	Internal Current Expenditure on R&D by Research Category (thousand €)				*Mix per segment*			*Weight per agent*	*Weight of each R&D activity of each entity out of the total*		
Situation 2005	**Basic R.**	**Appl. R.**	**Tech. Dev.**	**Total**	**Basic R.**	**Appl. R.**	**Tech. Dev.**	**Weight**	**Basic R.**	**Appl. R.**	**Tech. Dev.**
1. Companies	2,186	123,560	293,546	419,292	1%	29%	70%	59%	0.3%	17.4%	41.3%
2. RVCTI-DEDC	20,847	60,161	53,511	134,519	15%	45%	40%	19%	2.9%	8.5%	7.5%
3. Public Bodies	4,124	21,109	3,647	28,880	14%	73%	13%	4%	0.6%	3.0%	0.5%
4. Higher Education	67,568	55,748	4,030	127,346	53%	44%	3%	18%	9.5%	7.9%	0.6%
TOTAL	94,725	260,578	354,734	710,037	13%	37%	50%	100%			

Source: in-house from Eustat data

Consequently, the increase in weight of experimental development does not involve any transfer of resources between different agents or subsystems, but a reorientation of the research activities of the CICs, technology centres and companies.

[23] RVCTI-DEDC are Technology Centres and CRCs. R&D units have been counted in the area of Companies

Figure 28: Evolution of the R&D mix in the Basque Country



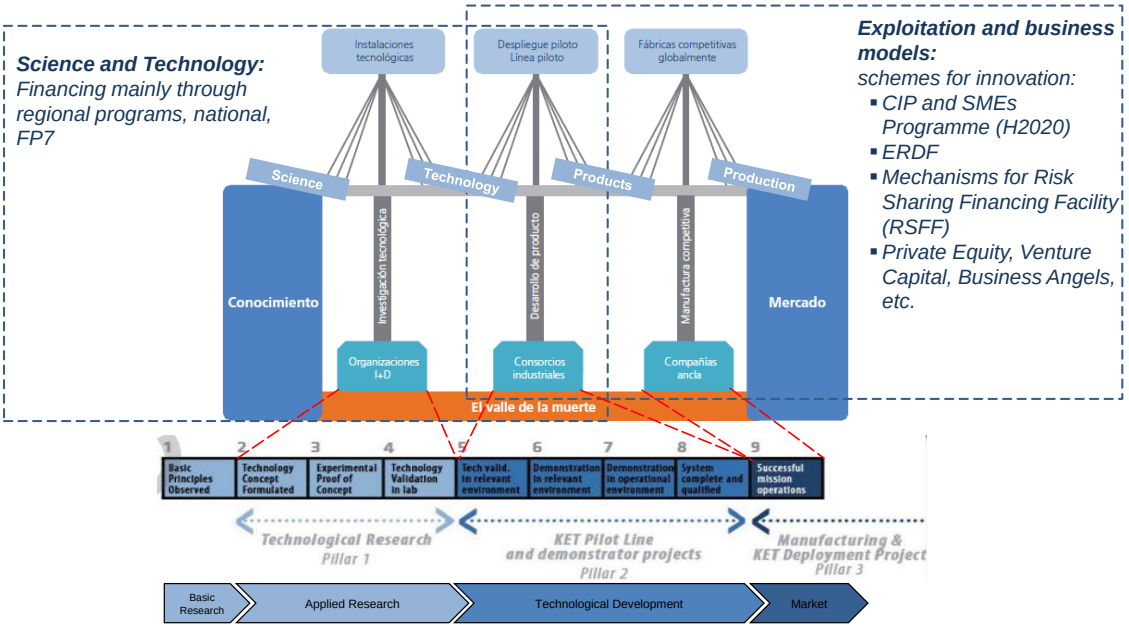
Source: in-house from Eustat data

2.1. Promoting experimental development[24]

The "valley of death" is the gap between research and placing results on the market of through the marketing of goods and services derived from it.

[24] Experimental Development or Technological Development: acquiring, combining and using existing scientific, scientific, technological and business knowledge and techniques, with a view to developing plans and structures or designs for new, modified or improved products, processes or services. *"EU R&D&I State Aid Framework"*

Figure 29: Representation of the valley of death in H2020



Overcoming this gap is one of the main challenges that the Basque Country has to face in the field of R&D&I.

As a result, progress in the experimental phase of development is one of the keys to overcoming the "valley of death" and to obtaining the necessary industrial leadership in priority areas.

The reorientation of public R&D enterprise programmes and the repositioning of R&D by those RVCTI agents that contribute most to experimental development (CIC, CCTT and business R&D units) are the main levers for it.

Main indicator associated with the objective:

Level of investment in experimental development activity out of total investment in R&D.

Current level of the indicator: 39% (2012)

Goal to be reached in 2020: 55%

2.2. Increasing the contribution of fundamental science excellence

Complementary to the enhancement of experimental development, the Basque Country has to continue increasing the contribution of scientific research, if it wants to achieve comparable values with the average of the EU and other developed countries.

Priority should be given to scientific research in areas that are relevant to our economic and social fabric. As a result, it is necessary for this momentum behind the fundamental or basic research to be complemented by the specialisation strategy. We must be able to go deeper into those scientific areas where Euskadi stands out internationally (which largely coincide with the strategic areas mentioned above), without sacrificing the development of research excellence in other areas with clear potential for improvement.

In this regard, overcoming certain regulatory, organizational and cultural barriers in the main agents of generation of scientific knowledge is a prerequisite to overcoming the valley of death, and thereby increasing absorption capacity in companies.

Main indicator associated with the objective:

Weight of investment in basic research activity out of overall R&D investment

15% Current level of the indicator: 14% (2012)

Goal to be reached in 2020: 15%

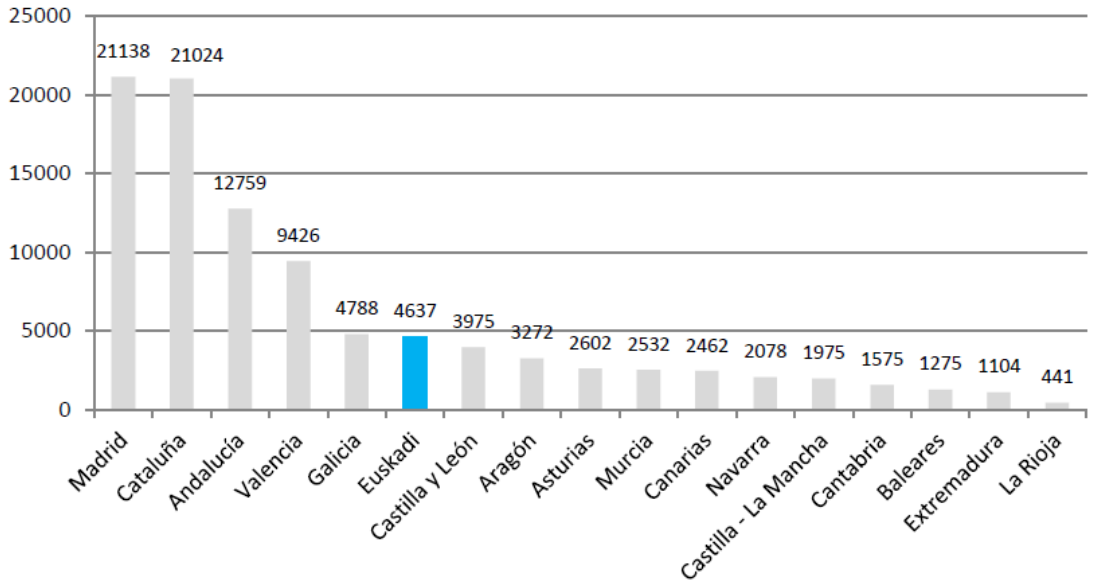
Operational objective 3. Orient the Science, Technology and Innovation System towards results

With the aim of improving the efficiency of the Basque Science, Technology and Innovation System and strengthening its results orientation, three types of indicators linked to each of the strategic lines of action identified are proposed. These indicators measure the performance of different types of research and in each one, goals are set to reach by the year 2020.

3.1. Increase scientific production of the Basque Country

Indexed scientific publications, together with their intrinsic impact, measure the efficiency of fundamental research and are the benchmark for measuring our comparative position relative to other regions.

Figure 30: Scientific Production of the Autonomous Communities (2013)



Source: Ikerbasque from Scopus data

Scientific production in the Basque Country has doubled in less than a decade, increasing by 144% between 2004 and 2013. However, as shown in the figure above, the Basque Country still has room for improvement, occupying sixth place in the Autonomous Communities with respect to absolute volume of production. This position becomes the seventh when taking into account the number of publications

per thousand inhabitants. Among the reasons for this result is the strong presence of the CSIC state science agency in other communities, the thematic specialisation of each and the existence of relatively large universities in some regions.

Main indicator associated with the objective:

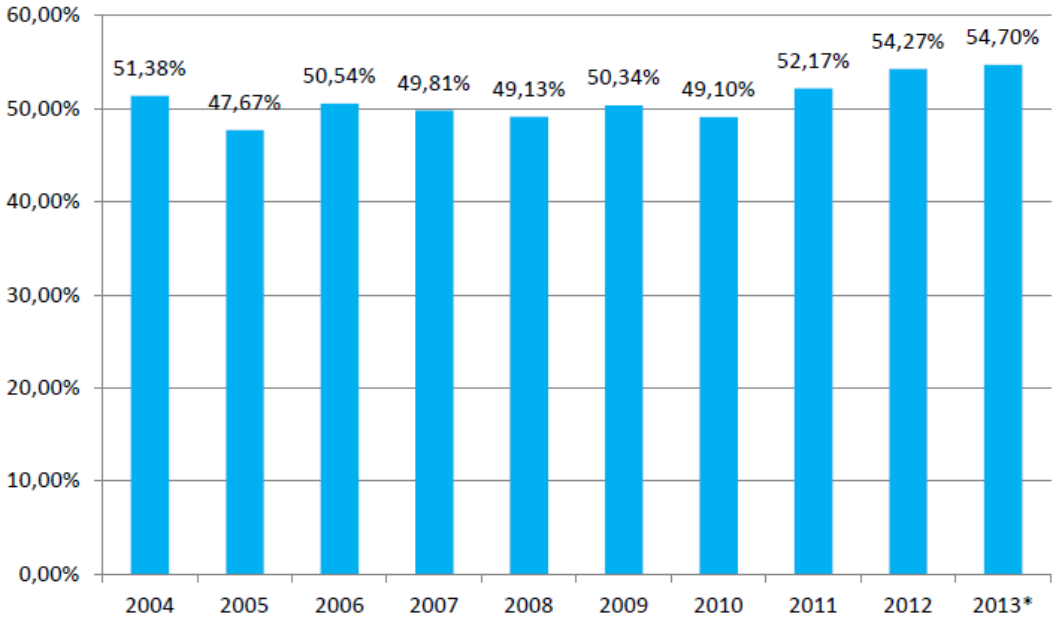
Number of indexed scientific publications in the Basque Country

Current level of the indicator: 4,637 (2013)

Goal to be reached in 2020: 7,500

Another indicator of the quality of published science is the impact of journals in which they are published. Journals are ordered by their impact using various indices such as the impact factor or SJR published annually by the research group Scimago. The journals located in the top quartile of these indices are journals with a greater impact on the scientific community.

Figure 31: Percentage of Basque publications in the top SJR quartile



Source: Basque Country Science Report 2014

(Ikerbasque from Scopus data)

The Basque Country has maintained a stable rate over the last decade: about half of scientific articles were published in 25% of journals with the highest impact in each area. Despite the significant growth seen in the number of indexed scientific

publications, which should expand with the horizon of this plan, the goal that has been set is that their quality should not fall below this level.

Main indicator associated with the goal:

Percentage of scientific publications indexed in Euskadi in the top quartile (Q1)

Current level of the indicator: 54.7% (2013)

Goal to be reached in 2020: 55%

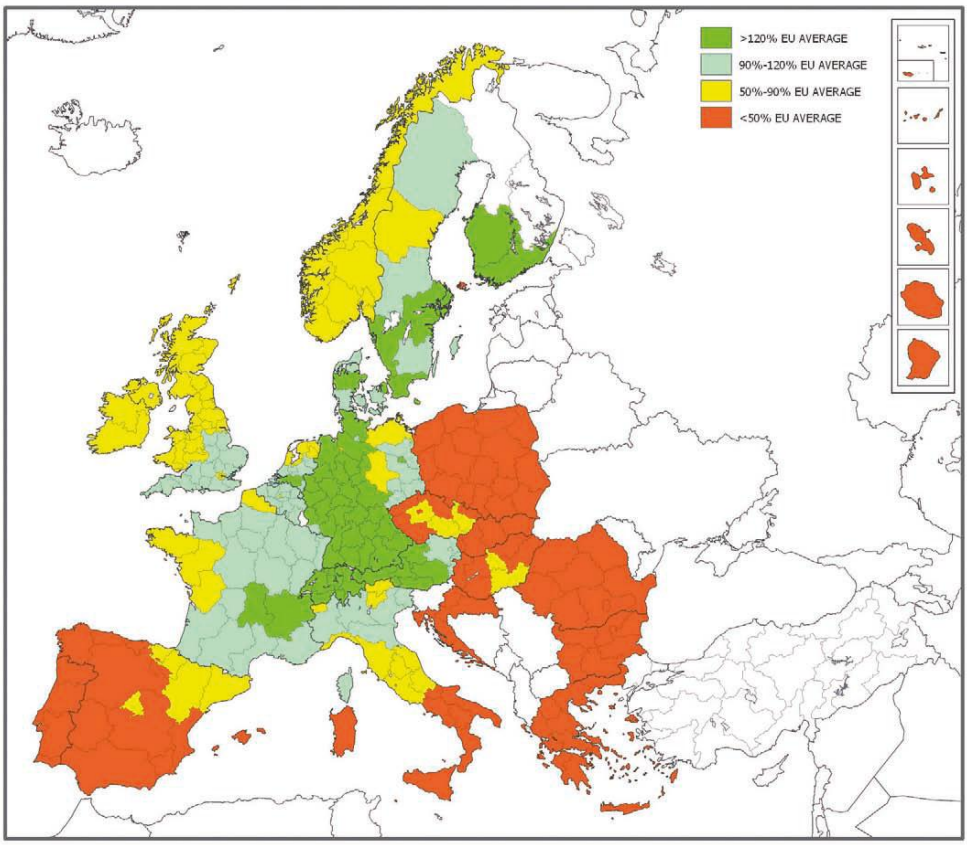
3.2. To increase protection of knowledge generated in industrial research

International patent numbers are a very important indicator of the efficiency of industrial research activity. International patents are good examples of firms' ability to develop new products that allow them to compete in the international market.

As noted in the initial diagnosis and also reflected in the latest competitiveness report, Basque patent levels are inferior not only to the average of European regions, but especially to those regions of similar reference to Basque Country in terms of economic and technological structure. In the IUS 2014, the level of this indicator is 50% lower than the average of the EU-27, while in the RIS 2014 the Basque Country is placed in the third group of regions with values between 50% and 90% of the European average.

In this regard, working with RVCTI agents, business initiatives to enhance and commercially exploit the results of research in the Basque Country will be encouraged, as is happening in other regions and countries.

Figure 32: EPO patent applications per billion of regional GDP (PPP)



Source: RIS 2014 (European Commission)

All this implies an urgent need to improve in this area, especially in areas of RIS specialisation that are a priority to the Basque economy.

Main indicator associated with the objective:

Patent applications EPO/PCT by entities located in the Basque Country

Current level of the indicator: 340 (data 2010 from the OECD Observatory)

Goal to achieve in 2020: 500

3.3. – To increase business revenue from new products

The sale of innovative products is the benchmark for measuring business revenue from new products. This indicator measures mainly the efficiency of the activity of experimental development and the ability of firms to develop or incorporate new technologies and knowledge to their products. In turn, this reflects their success in the process of converting results into new products and knowledge generated in the

previous stages of fundamental and industrial research. In other words, the important thing is not only the number of scientific publications and patents attained by a system, but above all, what really matters is that this knowledge serves to support the development of new products and processes which, through their placing on the market , bring economic and social benefits.

As noted in the initial diagnosis based on IUS 2014, the position of the Basque Country in sales of new products is 13% lower than the EU-27 average. In the RIS 2014, the Basque Country is in the second group, called follower regions, characterized by having a performance located between 90% and 120% of the European average.

Main indicator associated with the objective:

Sales of new products as a percentage of total turnover

Current level of the indicator: 12.48% (IUS 2014 calculated by Eustat)

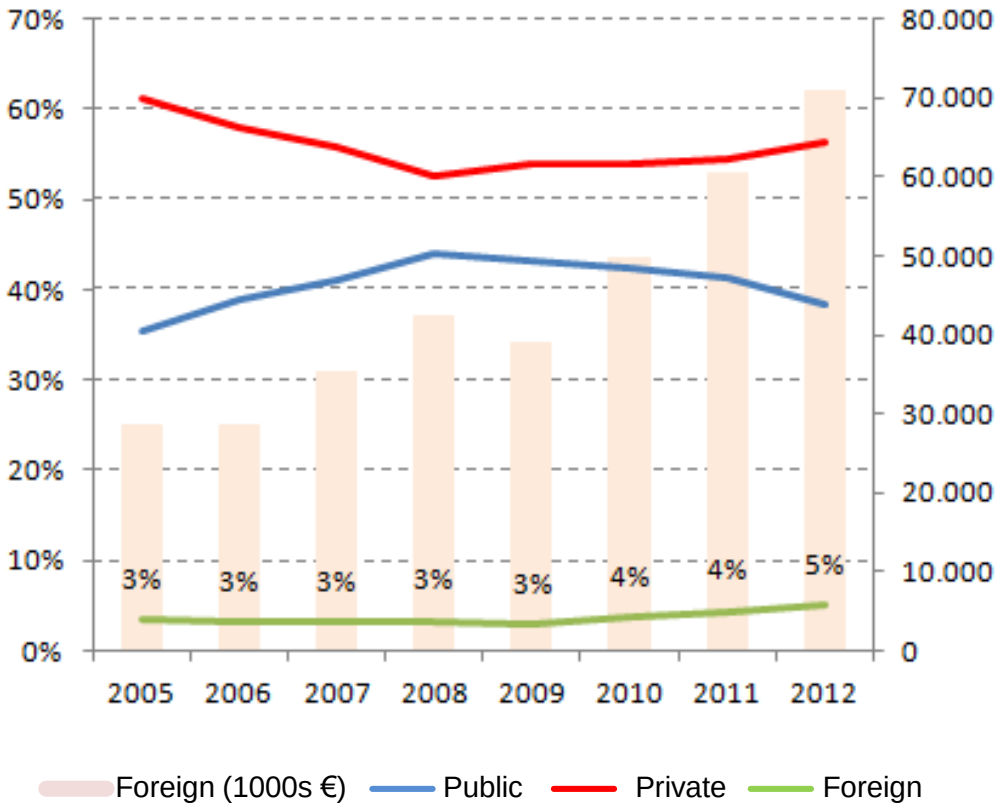
Goal to be reached in 2020: 15%

Operational Objective 4. Attract more international funding in R&D&I

As stated in the initial diagnosis, the Basque Country shows low levels of internationalization of knowledge, particularly with regard to attracting foreign funding. Thus, only 5% of the total funds for R&D comes from international sources (Eustat 2012), although in absolute terms this amount has increased substantially in recent years, mainly due to increased uptake of European framework programme financing funds.

This is especially important in the current economic scenario, where the public administration has budget constraints, while many companies have difficulties in accessing external sources of funding. Therefore it is particularly important to increase foreign funding raised for R&D&I, both from the new Horizon 2020 European framework programme and from private companies.

Figure 33: Evolution of the funding structure of R&D spending in the Basque Country and the absolute volume of funds raised abroad (in thousands of euros)



Source: compiled from Eustat data

Main indicator associated with the objective:

Percentage of international funding in R&D

Current level of the indicator: 5% (2012 Eustat)

Goal to be achieved by 2020: 8%

This indicator is divided into two to differentiate on one hand, the contribution of funds from the H2020 framework programme, and on the other hand, funding from international private companies.

4.1. –Participation in H2020:

Percentage of Basque funding out of total funding under Horizon 2020 programme.

Current level of indicator: 0.89% in the VII Framework Programme (461 million euros)

Goal to be achieved: 1% of the H2020 budget (805 million euros)

Objectives marked for participation in H2020 are covered in the 'Strategic Book for Basque R&D&I in Europe'.

4.2. –Attracting international private investment:

Private annual R&D funding of international origin.

Current level of the indicator: 6 million euros (2012)

Goal to be reached in 2020: 18 million euros

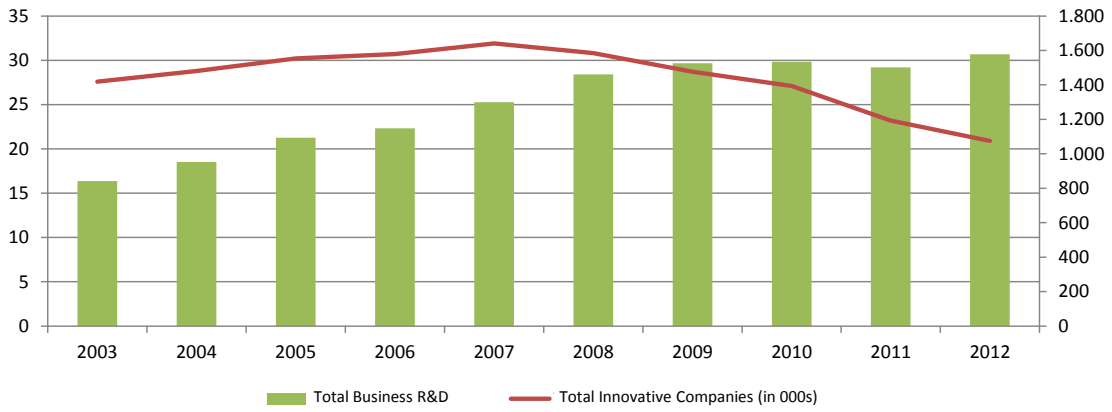
The "Internationalization Framework Strategy 2020: Basque Country Strategy" provides the most appropriate instruments for achieving the above objective of attracting foreign investment to the Basque Country. In this context, a new strategy to attract investment, "Invest in the Basque Country" has been developed and is issued in the Internationalization Plan and the Industrialization Plan.

Operational objective 5. Increase the number of innovative companies

Despite efforts in building capacity, the innovative propensity of Basque companies lags behind that of EU companies (44.2% of innovative firms versus 52.9% in the EU-27 in 2010) and this is the key to making progress in the process of improving their competitive element.

Looking at the total number of Basque innovative companies in recent years, as shown in the following figure, it appears that after an initial period of growth between 2003 and 2007, figures later became negative until the last reference year of 2012. This contrasts with the positive trend in the number of companies doing R&D in the Basque Country, which has been growing almost continuously since 2003, although with some slowdown in recent years.

Figure 34: Evolution of innovative companies that do R&D in the Basque Country



Source: in-house from Eustat data

Improving competitiveness through innovation means we need to have a new focus on European trends and promote innovation in Basque companies.

Main indicator associated with the objective:

Percentage of innovative firms out of a total of companies with 10 or more employees (as defined by EIN from Eurostat)

Current level of the indicator: 45.5% (2012)

Goal to be reached in 2020: 50%

Horizontal operational objective 6. Improve the qualifications of research staff

As stated in the fourth vertical strategic line of this Plan, having well-trained, dynamic and creative researchers is the basic raw material for the best science and for innovation based on the most productive research.

This implies, first, attention to the generation of young scientific-technological-business talent, to ensure the system's sustainability in the medium and long term, with particular attention to promoting scientific vocations. And secondly, and most importantly, it means helping them join the business and scientific-technological fabric. Only then can new talent serve its original purpose of strengthening the competitiveness of the Basque Country, providing a return on the investment made in their training and qualifications.

Particularly, in this operational objective we seek to improve research staff training in the Basque Science, Technology and Innovation System. To do this, it is essential to increase the percentage of staff with a doctoral degree, since it is these precisely people who are best prepared to carry out research work.

According to the latest data from Eustat, the Basque Country had a total of 11,843 people doing research in 2013 on terms equivalent to full-time, dedicated to Research and Development activities. These people were distributed as follows among the major sectors of performance of R&D:

- 49% in enterprises
- 18% in technology centres and CIC
- 5% in public administration

- 28% in higher education (including universities and BERC)

Of this research staff, only 29% had a doctoral degree and this proportion was unequally divided between the different sectors of performance:

- 8.6% in enterprises
- 33% in technology centres and CIC
- 47% in public administration
- 61% in higher education

Based on the above information, this plan aims to increase the proportion of research personnel with a doctoral degree, not only in the scientific and technological field but also in business, to improve their capacity to absorb scientific and technological knowledge.

Main indicators associated with objective:

Percentage of staff with doctoral degree out of total research staff

Current value of the indicator: 29% (2013)

Goal to be reached in 2020: 35%

Percentage of staff with doctoral degree out of total research staff in companies

Current value of the indicator: 8.6% (2013)

Goal to be reached in 2020: 10%

4. An integrated set of tools and action policies

4.1. The Basque Science, Technology and Innovation Network of the 21st century

The transformation of the innovation model that this plan includes involves evolution towards a model based on the creation and exploitation of new knowledge.

This is a systemic challenge whose existence necessarily involves addressing a process of reorganization of the current Basque Science, Technology and Innovation Network, the main generation infrastructure, and the transformation of knowledge of the country, with the following objectives:

- To align the performance of agents with the objectives set out in this Plan.
- To place each agent in the best position to maximize the level of complementarity and coherence of the whole.
- To increase efficiency and add value to the productive and social fabric of the Basque Country.
- To address weaknesses resulting from the high density of agents.
- To give public visibility to all agents that make up the network, so that they are publicly known and recognized.

This exercise in management of the RVCTI will result in a new map of RVCTI Agents in the year 2020, with the following changes:

1) Simplification of the number of **categories of agents from 12 to 8**.

2) **Homogenization of agents in the same category** as a result of a review of the definition of the mission, functions, funding and governance model for each of them and the subsequent re-accreditation.

3) Definition of **performance indicators** for each type of agent and, in the case of technological and innovation subsystem, a scoreboard[25] (see below), aligned with the indicators and targets set out in this plan. Specifically:

    - *Specialisation*: Measurement of the degree of alignment of the agents with strategic research areas to encourage the concentration of resources and investments (operational objective 1).

[25] Note: The scoreboard for scientific and health subsystems will be developed throughout the period.

- *Activity mix*: Assessment of the mix of agent activity in order to enhance fundamental research and technological or experimental development (operational objective 2).

- *Excellence*: Tracking the results arising from the research activity in the form of publications, patents and new technology companies to help raise the level of excellence of the entire ICT System (operational objective 3).

- *Model of relations*: Assessing the level of collaboration with local and international actors, encouraging the uptake of international funds in R&D&I (operational objective 4).

Figure 35: Technology and Innovation Subsystem Scoreboard

LINE		INDICATOR
F. R&D activity mix		% activity in Basic Research % activity in Applied Research % activity in Technological Development
G. Specialisation		Percentage of R&D activity in Advanced Manufacturing out of total R&D activity Percentage of R&D activity in Energy out of total R&D activity Percentage of R&D activity in Biosciences and Health out of total R&D activity
H. Excellence	Fundamental Research	Indexed scientific publications % scientific publications in the first quartile (Q1)
	Applied Research	EPO and PCT patent applications Income from licenses and patents
	Technological Development	New jobs created in NEBTs Turnover from NEBTs
I. Relationship Model	Transfer to market	% private funding in the Basque Country % total private funding Researchers transferred to Basque companies
	Collaboration between RVCTI agents	Co-supervision of doctoral theses Co-authorship of scientific publications Co-invention of patents
	International collaboration	% international public finance International projects with presence in Basque companies

Source: RVCTI redevelopment project

4) **Alignment of public financing** of RVCTI agents by meeting the targets set for the performance indicators established for each type of agent.

5) **Creation of a new publicly accessible register** of agents that make up the RVCTI to give them social visibility.

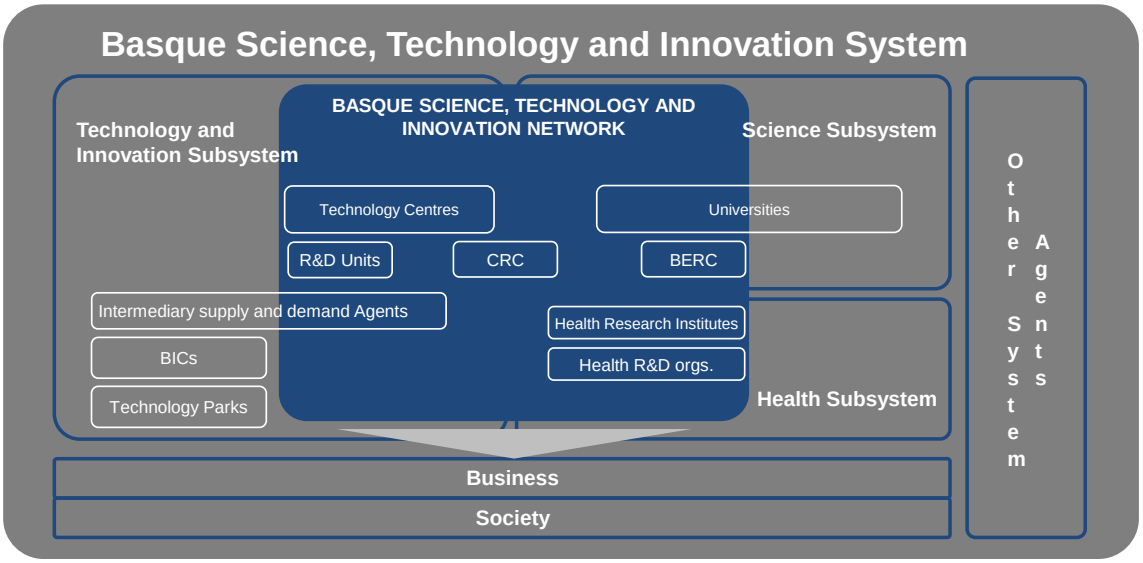
New Map of RVCTI Agents

Based on these premises, the Basque Science, Technology and Innovation Network is configured as a set of agents of science and technology who, **working in a network**, develop **specialised, excellent market-oriented research** contributing to wealth and welfare creation in the Basque Country.

The final objective is to get the set of agents to make a comprehensive scientific-technological offer to address market failures[26] and promote innovation and, therefore, they need to be provided, regulated or funded, at least partially, by the government.

Consequently, the way the RVCTI fits into the Science, Technology and Innovation System is indicated in the figure below.

Figure 36: The RVCTI in the Basque Science, Technology and Innovation System



The RVCTI is designed under an articulated structure in three subsystems based on the principal activity of each of the agents that make it up. The basic idea is that each agent carries out activities along the R&D&I value chain with the aim of promoting the integration of the whole and promoting collaboration through integrated projects to articulate connections between different subsystems, in line with the main international trends.

[26] There is said to be is 'market failure' when, without outside intervention, the market does not reach a level of economic efficiency. In these circumstances, public intervention, including state aid, can improve the state of the market in terms of prices, production and use of resources. EU R&D&I State Aid Framework (2006/C 323/01).

Concretely, these subsystems are:

- The scientific subsystem, consisting of the Research Structures of the Universities and the Basic and Excellence Research Centres;
- The technology and innovation subsystem, consisting of Technology Centres, Cooperative Research Centres, R&D business units and supply and demand Intermediary Agents.
- The health subsystem, consisting of the Institutes of Health Research (IHS) and Health R&D Organizations.

In the specific case of the universities of the Basque University System, they are the fundamental element of the scientific subsystem, although according to the central role attributed by Law 3/2004[27] of the System, its activity covers the entire R&D&I value chain. Therefore, in addition to training and research, its mission includes the transfer of technology and knowledge to the productive system.

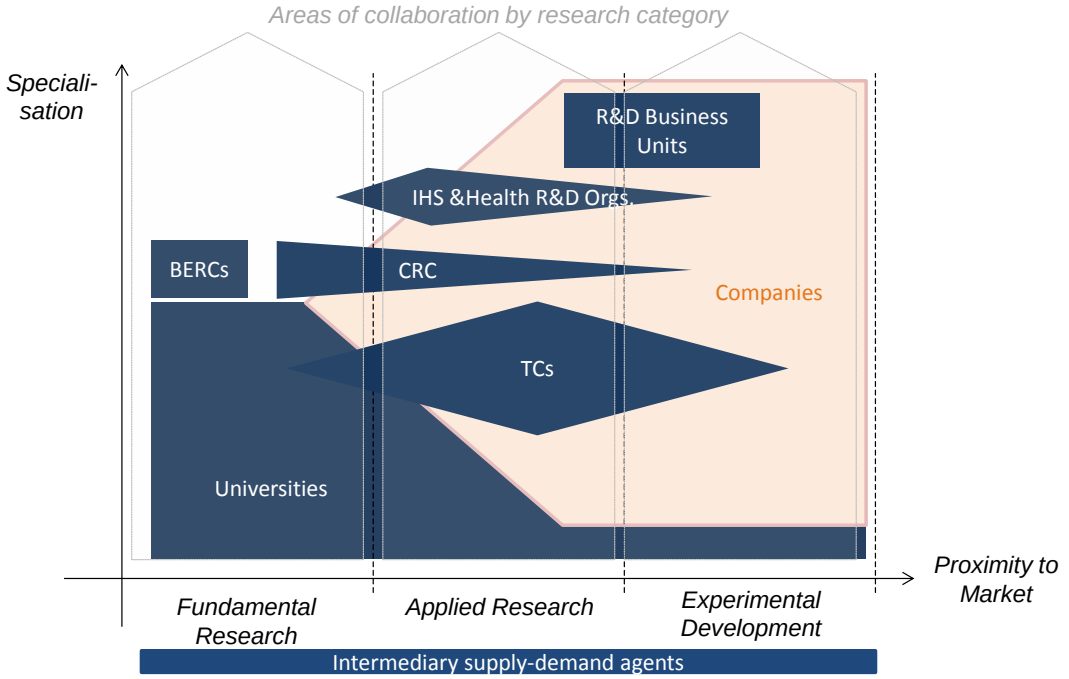
Given that the RVCTI brings together the core agents that make up the SVCTI, this organising process has allowed them to advance in the process of integration of the scientific and technological agents and to define the objectives and the specific positioning of each one in terms of specialisation, excellence and their position in the R&D value chain. The new Agent Map for 2020 would be represented according to the scheme in Figure 37.

The new organisation of the RVCTI provides for a progressive evolution of these agents to enable the achievement of the strategic guidelines and operational objectives of the PCTI. It means precisely that the technology centres should increase their proximity to the market, moving towards experimental development, and achieving higher levels of specialisation in strategic scientific-technological areas for the region. The CRCs must evolve towards a greater balance between fundamental or excellent research, and the extension of these activities to the market, reinforcing their coordinating role. The universities, meanwhile, have to strengthen their presence in the entire R&D&I value chain by tightening their collaboration and coordination with other agents in the system. Meanwhile, Intermediary supply and demand Agents, while not directly engaged in R & D as such, are shown on the Map as agents dedicated to connecting

[27] Art. 53 of Law 3/2004 states that "to ensure the transfer of knowledge and scientific and technological innovation carried out in universities (...), the university may establish or participate in the creation of enterprises and scientific or technological parks (...)"

technology supply with business demand (especially of SMEs) along the entire R&D&I value chain.

Figure 37: Map of RVCTI 2020 Agents and collaborative spaces



The new organisation of the RVCTI looks also to enhance experimental development in both R&D units and in business. Finally, it should be added that the Health R&D Units have been divided into two new types of agents, namely Institutes for Health Research and Health R&D Organizations.

In the new scenario, all agents should collaborate and coordinate with the rest, to optimize existing capacities in the Basque Country and together form an offer of comprehensive scientific and technological excellence to boost the development of the Basque economy.

Composition of the Basque Science, Technology and Innovation Network

a.1 University Research Structures

The mission and activities of Research Structures of the universities are established in Law 3/2004 of 25th February of the Basque University System.

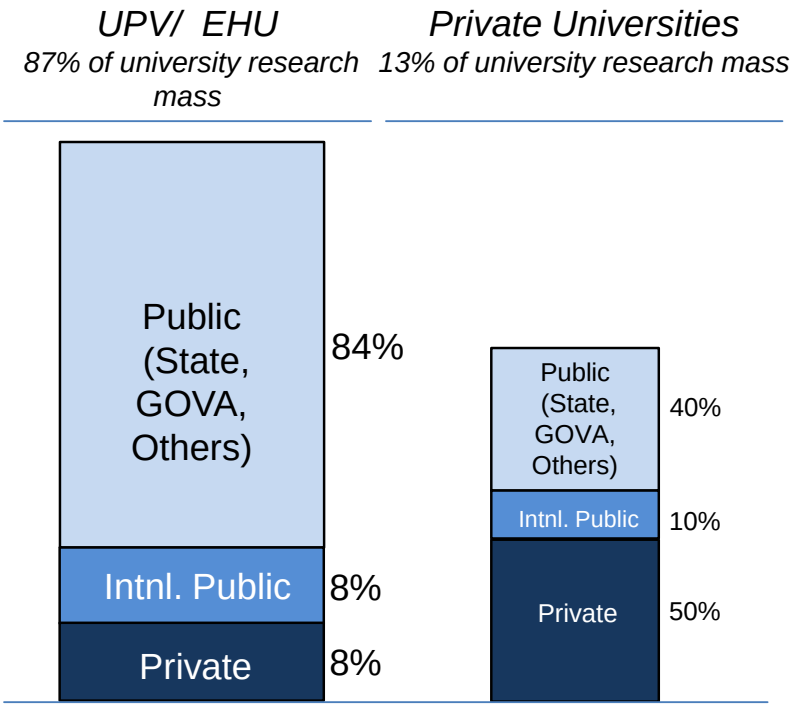
Mission: Research represents, along with teaching, a constitutive and central element of university work (Article 7c). University research work should shall be

excellent and also include the transfer of knowledge and technology (Article 3), and adapt itself to the social, cultural and economic interests of Basque society and the people that inhabit it (Article 7d).

Activities:

- To initiate new researchers into research (Article 52.1).
- To carry out research freely, with no limitations other than those laid down in laws, treaties or international agreements and ethical codes or rules adopted by the scientific community (Article 52.2)
- To articulate the link with the productive system, to ensure the transfer of knowledge and scientific and technological innovation carried out in universities as well as to attract private funding for research work (Article 53.1).
- To create or participate in the creation of companies and science or technology parks, in whose activities the teaching and research staff may participate, with the following objectives (Article 53.2):
    - Promoting and facilitating university research and the dissemination of its results.
    - Fostering a culture of quality and innovation among enterprises.
    - Contributing, through technological development and innovation, to the improvement of business competitiveness.
- To collaborate with whatever institutions aim to carry out innovation activities. Such interaction may take the form of the use of common infrastructures, staff exchanges, joint research projects, or any other activities that are suitable for achieving the objectives (Article 54.1).

Funding Model for research activity[28] (2020)



a.2 Centres for Fundamental and Excellent Research

Mission: Created from the scientific capabilities of the Basque university system, and closely related to them, Fundamental and Excellent Research Centres are characterized by their vocation to becoming international reference centres of scientific research carried out in the Basque Country. Its main task is to place the Basque Country on the world map of scientific research, particularly in areas of knowledge that are considered strategic for the country. The Centres for Basic and Excellent Research should align with the objectives of the PCTI, as well as the priorities for the development of the Basque Government Science Policy, and thus support, promote and facilitate the use of science, technology and innovation as a tool for improving the competitiveness of companies and Basque social development.

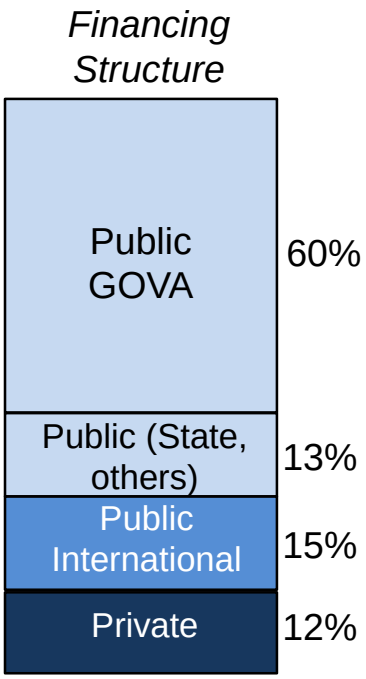
[28] Note: The calculation is based on total funding of research activities, excluding teaching

Activities:

- Generating new cutting-edge knowledge, either in future economic sectors and/or strategic areas for the country from the social point of view.
- Running a long running research programme consisting of multidisciplinary and interdependent research lines.
- Forming research groups capable of carrying out the research lines using standards of excellence.
- Demonstrating scientific-technical training ability and supporting and supplementing the University in high level education.
- Conducting dissemination activities at the highest level of research results, as well as wide social dissemination of their activities to ensure that society is aware of them and can participate in various ways in the activity itself.
- Attracting international researchers.
- Attracting financial resources for the proper development of the activities that are carried out.

  To do this, they must:
    - Have a world-class team of scientific directors and researchers.
    - Have a highly qualified management team.
    - Have an International Scientific Advisory Committee.

Financing Model for Basic and Excellent Research Centres (2020)



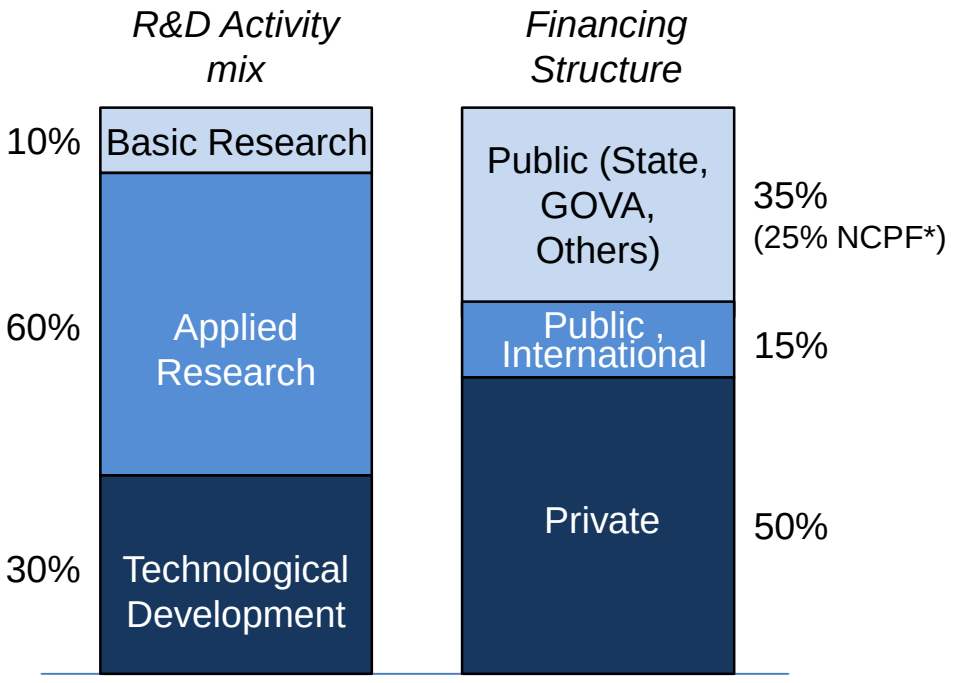
b.1 Technology Centres

Mission: To generate and develop their own multi-technology and/or multi-sectorial technology (Multifocussed TCs) or for a specific business sector (Sector TCs) in research areas that are aligned with the priorities set for the Basque Country as well as the transfer and dissemination of knowledge and technology to the business fabric of the autonomous community.

Activities:

- Creating and developing multi-technology, with the focus on one or more economic and business sectors (Multifocussed TCs), or the focus on a specific business sector (Sector TCs), mainly focusing their work on R&D in industrial research.
- Commercialising the results by generating patents and creating technology-based companies.
- Disseminating and transferring knowledge to companies and society.

R&D Activity Mix and Financing Model for the Technology Centres (2020)



(*) NCPF: Non-Competitive Public Financing

b.2 Cooperative Research Centres

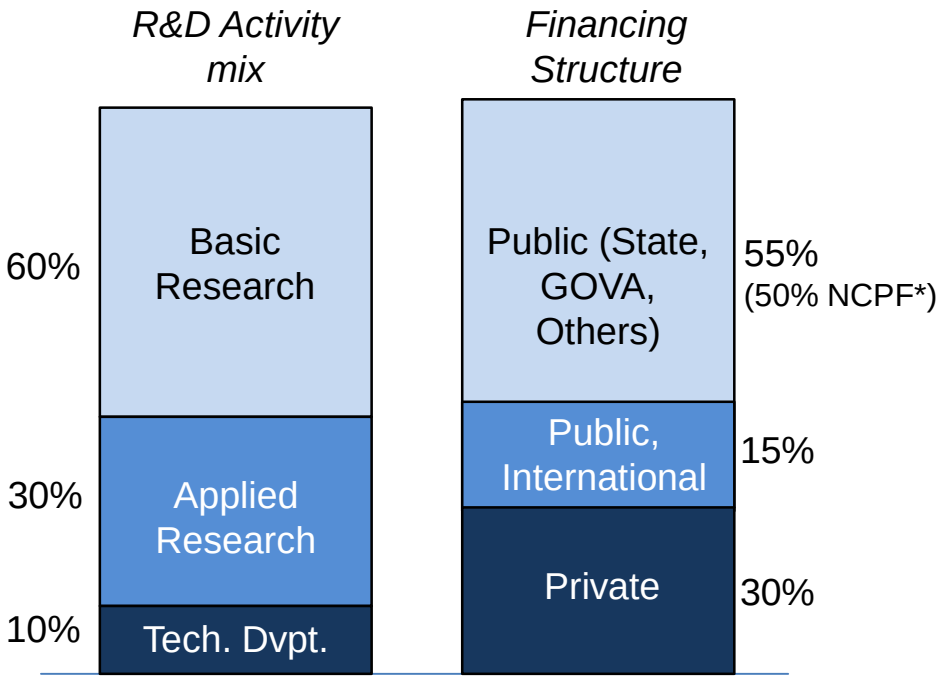
Mission: To make the Basque Country a European benchmark in the established scientific-technological strategic areas, favouring the development of emerging sectors and the incorporation of generic-use technologies in traditional sectors to diversify and improve their competitiveness.

Activities: The CRCs should focus on fundamental research of excellence but covering the whole R&D value chain from, including the commercialisation of research results.

The basic activities to be done will be:

- Collaborative, market-oriented investigation in a scientific-technological field that is strategic for the autonomous community.
- Commercialisation of results by generating patents and creating technology-based companies.
- High level training aimed at agents and industry, complementing that offered by the universities.
- The research will be conducted through collaborative projects that combine personnel from the CRCs, from Basque companies and from research centres/universities, encouraging the mobility of researchers and co-authorship of publications and patents.

R&D Activity Mix and Financing Model of Cooperative Research Centres (2020)



(*) NCPF: Non-Competitive Public Financing

b.3 R&D Business Units

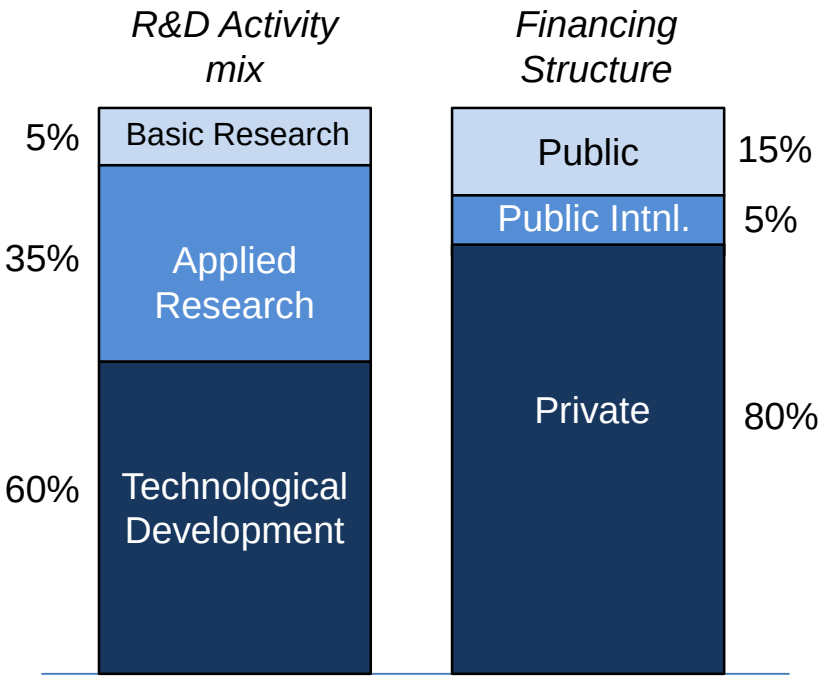
Mission: To promote the use of technology and innovation as a tool for improving the competitiveness of enterprises.

Activities: These agents focus their core business on carrying out R&D projects aligned with the priorities set, according to their own objectives.

The key activities to be carried out are:

- Creating and developing technology, focusing their R&D work on experimental development, but covering the whole research value chain.
- Commercialising the results by generating patents, creating NEBTs and developing new products/processes.
- Collaborating with other scientific and technological agents both in the RVCTI and internationally.

R&D Activity Mix and Financing Model of R&D Business Units (2020)



b.4 Intermediary Supply-Demand Agents

Mission: To ensure maximum market orientation for RVCTI research agents at all stages - from basic research to experimental development - and to maximize the value of knowledge investments made in the Basque Country.

Activities: The main activity is acting as intermediaries between scientific-technology supply and demand through the following activities:

- Advising companies in science and technology.
- Coordinating and integrating demand needs to guide supply, or to bring interests together around R&D.
- Bringing together scientific-technological supply to give easy access to companies (one-stop shop).
- Managing patents (purchase, sale, etc.).
- Promoting R&D projects and new technologically-advanced initiatives in collaboration between companies (especially SMEs) and RVCTI agents.
- Disseminating knowledge generated in the RVCTI to businesses.

Financing Model (2020): Financing for this activity will take place through specific intermediary projects.

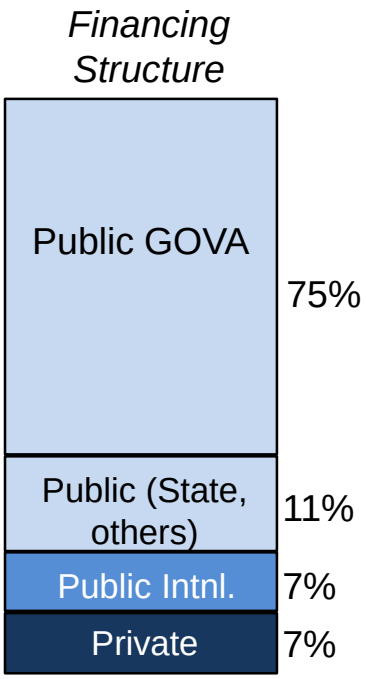
c.1 Health Research Institutes

Mission: To carry out translational research of the highest quality, generating and applying knowledge to transfer the results of basic, clinical and epidemiological research by the health services of the Basque Health System to the patient and society in general. To achieve this mission, collaboration with other scientific and technological agents and companies will be promoted, making a commitment to innovation in medical and health technology, which will bring an improvement in the quality of the Basque Health System, and which will contribute to generating wealth for the country.

Activities:

- Creating and applying knowledge through translational health research.
- Exploiting R&D&I results, commercially and through their implementation in the health system.
- Collaborating in the training of University undergraduates and graduates and developing training activities that are complementary to the university education.
- Disseminating and transferring knowledge to society.

Health Research Institutes Financing Model (2020)



c.2 Health R&D Organizations

Mission: To conduct research and innovation activities in health, and to promote and manage them by facilitating collaboration with other agents, companies and sectors and by helping to develop programmes and health and intersectorial policies with the aim of enhancing the competitiveness and quality of the health system, and contributing to wealth creation and economic development of the Basque Country.

Activities: The Health R&D Organizations will carry out the following activities:

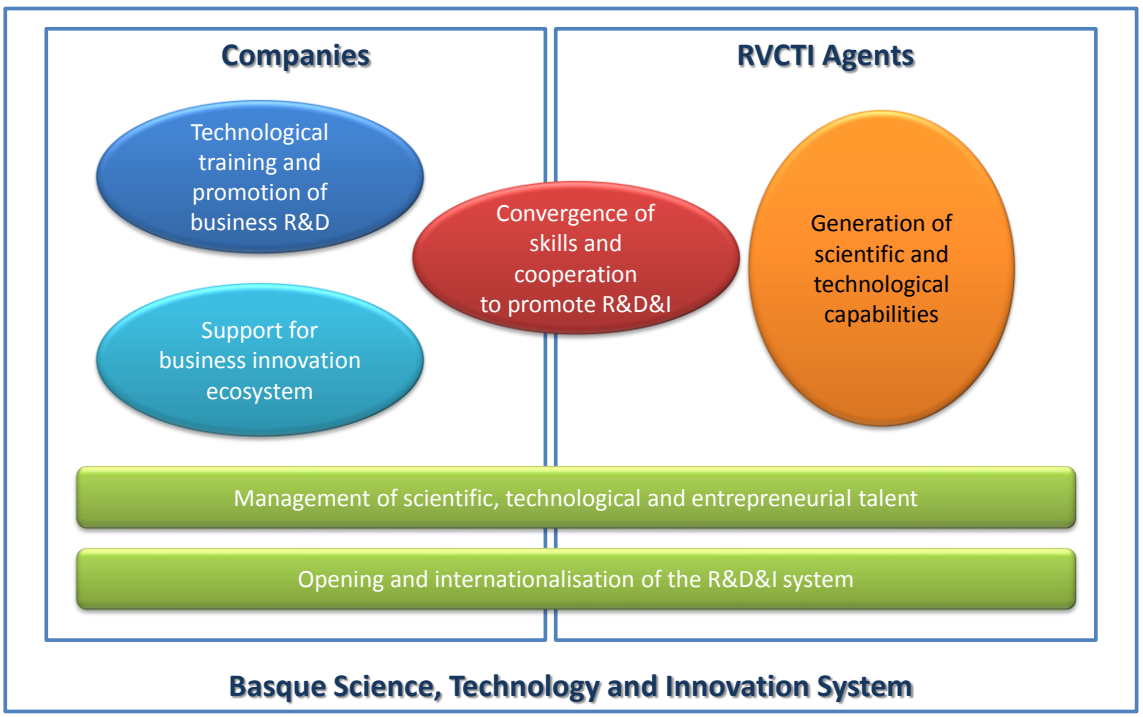
- Promoting research and innovation in the Basque health system.
- Creating and applying knowledge through basic, industrial research and experimental development in health.
- Commercialising R&D&I results through implementation in the health system.
- Internationalizing the healthcare system.
- Collaborating in the training of University undergraduates and graduates and developing training activities that are complementary to the university education.
- Disseminating and transferring knowledge to society.

4.2. Criteria for instrument articulation

To ensure the implementation of the strategic guidelines and operational objectives, the Plan has a set of tools grouped into the following categories:

- Technological training and promotion of business R&D.
- Support for the business innovation ecosystem
- Convergence of skills and promotion of R&D&I in cooperation
- Generation of scientific and technological capabilities
- Management of scientific, technological and entrepreneurial talent
- Opening and internationalization of the R&D&I system

Figure 38: PCTI instrument categories



Source: in-house

The instruments grouped into the above categories can consist either of support or subsidy programs (approved by the relevant decrees) and other initiatives that provide, for example, certain support services for businesses.

Taking a more inclusive vision, in the medium term, the aim is to develop the instruments to give them an interdepartmental character and focus on making connections between the agents of the entire R&D&I value chain, in order to respond to the challenges of the strategic priorities through an approach to funding integrated and collaborative projects that facilitates interaction between agents and their connection with European programmes.

In addition to these instruments, we must also take into account the incentive that tax deductions for R&D mean for companies. The right combination of tax deductions, along with direct support programmes, is an effective way of increasing investment in R&D. In the Basque Country, in particular, tax deductions have served this purpose, as an integral part of the industrial and technological policy in recent years.

Moreover, in the health sector it is interesting to note the implementation of pilot projects for Innovative Public Procurement as a tool for the development of products and/or services that are not yet on the market and that respond to the needs of the healthcare system.

The main beneficiaries of the instruments described above are:

- **Companies**: they are the main mover of the Basque Science, Technology and Innovation System, and it is within companies that we can create socio-economic wealth and employment. As a result, a series of instruments aimed at improving company competitiveness by strengthening their technological and innovative capabilities are provided.
- **RVCTI Agents**: they are the knowledge infrastructures whose main objective is to offer support services to improve the competitiveness of enterprises and resolve the social challenges facing the Basque Country. With this objective, instruments are provided which reinforce their scientific and technological capabilities. As reflected in the figure above, in addition to the instruments for companies and knowledge infrastructures, there are others, with a more horizontal nature, which facilitate the management of scientific, technological and entrepreneurial talent, as well as the internationalization of the whole system. Both aspects are keys to the development of the knowledge economy in a European and international environment, where companies and RVCTI agents must form part of the global value generation chains.

Figure 39 shows a summary of the contribution to strategic guidelines and objectives of the Plan of the different categories of instruments that make up the policy mix.

Based on the different programmes in the current Policy mix, the goal for 2020 is to foster their development in accordance with the following criteria:

- Simplification and targeting based on the strategic lines and operational objectives.
- Strengthening programmes and projects that foster collaboration between agents and respond to the country's challenges.
- Aligning programmes with European programmes to facilitate complementarity with European funds.
- Increasing synergies between different department programmes and interagency collaboration.
- Encouraging attractor country projects in areas of smart specialisation.

Figure 39: Contribution of the policy mix to the strategic guidelines, transverse axes and operational objectives of the PCTI

Categories of the Policy Mix	Technology training and support for business R&D	Support for the business innovation ecosystem	Convergence of skills and promotion of R&D&I cooperation	Generation of scientific and technological capabilities	Management of scientific, technological and entrepreneurial talent	Opening and internationalization of the R &D&I system
STRATEGIC LINES						
• Promote the smart specialisation strategy through science, technology and innovation aimed at responding to the social challenges of the Basque Country	Medium	Medium	High	High	Medium	Medium
• Strengthen industrial leadership through public-private partnerships	High	Low	High	Medium	Low	Medium
• Raise the level of excellence of the STI System	High	Low	High	High	High	Medium
• Ensure the development of human capital in STI	Low	Medium	Medium	Medium	High	Medium
HORIZONTAL STRATEGIC LINES						
• Opening and internationalisation of the Science, Technology and Innovation System	Medium	Low	Low	Medium	Medium	High
• An innovative and connected system	Medium	High	Low	Low	Medium	Low
OPERATIONAL OBJECTIVES						
1. Focus resources and investment in R&D&I in the areas of specialisation	Medium	Medium	High	High	Medium	Medium
2. Strengthen fundamental research and experimental development	High	Low	High	High	High	Medium
3. Orient the Science, Technology and Innovation System towards results	High	Low	High	High	High	Medium
4. Strengthen attraction for international funding in R&D&I	Media	Low	Low	Medium	Medium	High
5. Increase the number of companies that innovate	Low	High	Low	Low	Low	Low
6. Improve the qualifications of research staff	Low	Medium	Media	Medium	High	Medium

Source: in-house

Next, the main instruments of the Basque Government and Provincial Councils existing in the system will be described under the headings mentioned above.

4.3. Deployment of the instruments at the service of the plan's objectives

1. TECHNOLOGICAL TRAINING AND PROMOTION OF BUSINESS R&D

Instrument	Description	Dept. responsible
HAZITEK PLUS	Grants to support the implementation of strategic R&D enterprise projects with high potential for results and impact, as well as other complementary actions	Department of Economic Development and Competitiveness
INDUSTRIAL SCALE	Support for the development of validation infrastructures and demonstration of complex technological systems under conditions similar to those of real operation	Department of Economic Development and Competitiveness
Grants for the promotion, transfer and dissemination of R&D&I	Grants to improve the competitiveness and efficiency of companies and agribusiness organizations, and to contribute to sustainable growth and to promote cooperation in the agricultural, food and fisheries sectors of the Basque Country.	Department of Economic Development and Competitiveness
BALIOSASUN	Grants for undertaking development and innovation activities in health R&D organizations	Department of Health
AIC	Collaborative innovation infrastructures in the automotive sector	Provincial Council of Bizkaia
CFA Aeronáutica	Aviation Infrastructure for the validation and demonstration of aeronautical technologies	Provincial Council of Bizkaia and Dept. of Economic Development and Competitiveness
CFA Eólico	Infrastructure for the validation and demonstration of wind technologies	Dept. of Economic Development and Competitiveness

2. SUPPORT FOR THE BUSINESS INNOVATION SYSTEM

Instrument	Description	Dept. responsible
INNOBIDEAK: **LEHIABIDE**	Support for innovative companies showing a strong ambition to develop, grow, reach new markets and to internationalise, regardless of their technological capabilities, and a high attractor capacity	Dept. of Economic Development and Competitiveness
KUDEABIDE	Impetus for improving the competitiveness of Basque companies by supporting the application and implementation of methodologies, tools, and principles of Advanced Management	Economic Development in collaboration with SPRI, Euskalit and the three Provincial Councils
PRESTAKUNTZA	Raising awareness for Improved Management Skills for Innovation	
PERTSONAK	Encourage the participation of people working in the company, as the key to improving the competitiveness and social cohesion of the territory.	
PVIC: **Live plan for innovation and cooperation in the food industry**	Tool to facilitate, promote and lead innovation and cooperation in the food sector and rural and coastal environments in a holistic approach	Dept. of Economic Development and Competitiveness
INNOSASUN	Collaborative health support network for companies and other entities for the development of innovation activities	Department of Health
ALAVA INNOVA	Support for the implementation of projects and/or actions to promote innovation in Álava (product, production processes, organisation, marketing and markets, etc.) to contribute to economic modernisation, increased productivity and improvement of the competitiveness of Alava's productive fabric	Provincial Council of Alava
Plan for Innovation Promotion	Grants to increase the ability of companies in Bizkaia to compete and innovate, in a sustainable and integrated way	Provincial Council of Bizkaia
BEAZ	Support for the creation of innovative companies, R&D&I projects and the internationalization of SMEs	Provincial Council of Bizkaia
BIC NETWORK	CEDEMI, CEIA, BIC-BERRILAN and SAIOLAN	The Provincial Councils and the Basque Government

Instrument	Description	Dept. responsible
TXEKINTEK/ BARNETEKIN	Support for the creation of technology-based and/or innovative companies; both through personal initiative and corporate intra-enterprise.	Provincial Council of Gipuzkoa
START-UP	Support for New Technology and/or Innovation Based Firms that have great potential for growth and/or a scalable business model	Provincial Council of Gipuzkoa
Programme to promote Business Collaboration	To develop inter-enterprise business collaboration formulas. To boost competitiveness through collaboration between companies to define and achieve suitable dimensions for the development of specific projects	Provincial Council of Gipuzkoa
SOCIAL INNOVATION and WPI-BERRIKUNTZA LAN-POSTUETAN	To promote experimentation and intervention in advanced formulas of innovation in work contexts and territorial and social innovation dynamics that integrate economic, social and educational agents for the competitive and balanced development of business/sectorial and regional areas	Provincial Council of Gipuzkoa
EBALUAKETA	Development and implementation of dynamics and mechanisms aimed at creating public value through accountability, transparency and participation	Provincial Council of Gipuzkoa

3. SKILLS CONVERGENCE AND PROMOTION OF R&D IN COOPERATION

Instrument	Description	Dept. responsible
ETORTEK PLUS	Grants for strategic research by members of the RVCTI in areas of specialisation identified in the Basque Country	Department of Economic Development and Competitiveness
PUE	Support for undertaking research projects in private universities, of interest to and with the participation of companies.	Department of Education, Language Policy and Culture
Coolab Project	Grants to encourage cooperation dynamics for companies in Bizkaia with technological assistance of the research centre Tecnalia	Provincial Council of Bizkaia
	Aid for the implementation of integrated cooperation projects attracting investment in the country	The Basque President's Office

4. GENERATION OF SCIENTIFIC-TECHNOLOGICAL CAPABILITIES

Instrument	Description	Dept. responsible
EMAITEK PLUS	Grants to improve and guide the results and capabilities of Technology Centres and Cooperative Research Centres towards the market, working on the whole R&D value chain, and focusing on acquiring new knowledge with future prospects in the areas of expertise identified in the Basque Country, promoting collaboration.	Department of Economic Development and Competitiveness
Aid for scientific-technological centres for food research	Financial tool to increase technological knowledge in the food industry	Department of Economic Development and Competitiveness
Aid for projects in HEALTH RESEARCH	Aid for the implementation of projects aimed at the generation, transfer and/or application of knowledge aimed at improving the prevention, diagnosis and/or treatment of diseases	Department of Health
OSASUNTEK	Aid for the consolidation of activities of health R&D organizations	Department of Health
IKERKETA TALDEAK	Grants to support the activities of research groups in the Basque University System	Department of Education, Language Policy and Culture
PIBA	Grants for carrying out basic and/or industrial research projects	Department of Education, Language Policy and Culture
IKERMUGIKORTASUNA	Programme for mobility of researchers	Department of Education, Language Policy and Culture
EGONALDILABUR	Grants for stays in centres different from those implemented in the Predoctoral Researcher Training Programme	Department of Education, Language Policy and Culture
PREDOCTORAL Programme for training research personnel without a doctorate	Grants to finance research aimed at the completion of a doctoral thesis by staff researchers who do not have a doctorate yet	Department of Education, Language Policy and Culture
POSTDOCTORAL development programme for research personnel with a doctorate	Aid for the improvement of the staff researchers who have a doctorate	Department of Education, Language Policy and Culture
CTP	Grants for the development of research networks and technological development in the framework of	Department of Education, Language Policy and Culture

Instrument	Description	Dept. responsible
	cooperation of the Pyrenean working community	
EC	Aid for the acquisition of scientific equipment	Department of Education, Language Policy and Culture
BERC Programme	Support for the Agents of the Basque Science, Technology and Innovation Network accredited in the category of Basic and Excellence Research Centres	Department of Education, Language Policy and Culture
Collaboration agreements with RVCTI agents	Formalization of relations between the Department of Economic Development and Regional Administration of the Provincial Council of Álava with CRC ENERGIGUNE TECNALIA and CTA in order to optimize the different actions that correspond to each of the entities complementarily	Provincial Council of Álava
Science, Technology and Innovation Network	To promote research and development in Gipuzkoa, through support for research projects and investments carried out by research centres, technology centres, R & D units, universities and other entities.	Provincial Council of Gipuzkoa

5. MANAGEMENT AND PROMOTION OF SCIENCE, TECHNOLOGY AND BUSINESS TALENT

Instrument	Description	Dept. responsible
Foundation IKERBASQUE	Grants to support the activities of research groups in the Basque University System	Department of Education, Language Policy and Culture
TRAINING grants for young professionals in research and technology	Training grants for young professionals from research and technology in the Basque scientific-technological, business, agriculture, fisheries and food environment	Department of Economic Development and Competitiveness
BIZKAIA: TALENT	Development of attraction, recruitment and retention of talent	Provincial Council of Bizkaia
IKASMINA. Life-long learning	Development of an own model and innovative projects that promote life-long learning	Provincial Council of Gipuzkoa

6. OPENING AND INTERNATIONALISATION OF R&D&I SYSTEM

Instrument	Description	Dept. responsible
Europe Enterprise Network (EEN)	The EEN offers a one-stop shop for organizations, especially SMEs, to apply for free advice and benefit from a wide range of services to support their internationalization and innovation	Department of Economic Development and Competitiveness
ERA-NET	Support for conducting R&D projects in transnational collaboration in areas strategic to the Basque Government	Department of Economic Development and Competitiveness
IKERBILERAK	Grants for the organization of presential conferences and meetings in the field of scientific research that take place in the Basque Country	Department of Education, Language Policy and Culture
EUROSASUN	Collaborative health network for counselling and support for participation in European projects	Department of Health

To access more information about the above instruments, please consult the document:

http://www.irekia.euskadi.net/uploads/attachments/5539/instrumentos_pcti_euskadi_2020.pdf

III. GOVERNANCE, MONITORING AND ECONOMIC SCENARIOS

5. New model of open and participatory governance

5.1. Multi-level governance model

When it comes to establishing effective systems of governance of science, technology and innovation, global trends are evolving into multi-level approaches able to combine different public and private actors. These multilevel approaches are needed to successfully keep the concept of *'a smart specialisation strategy'* alive and constantly updated.

Moreover, governance becomes more important in Euskadi because of the existence of a rich but complex institutional framework[29].

Governance here refers to "coordination mechanisms to synchronize different levels of policy (EU, national, regional, etc.), departments (education, economic development, health, environment, etc.) and innovation actors (policymakers, entrepreneurs, researchers, service providers, financial and educational institutions, etc.) to agree on strategies, objectives, priorities and methods of implementation".[30]

In the new systems of governance the role of *active leadership* at the highest level has a singular importance, to promote policies for science, technology and innovation, from the perspective of public-private partnership.

This multilevel governance system includes the following features:

- *Being integrated and coordinated*, avoiding excessive centralization which could mean an erosion of diversity and scope of initiatives.
- *Being open to participation* by facilitating consensus and support for strategic ideas and priorities established in the Plan.
- *Being led by transparent criteria*, to facilitate the understanding of decision-making and resource allocation among the various entities that make up the multilevel architecture of the new system.
- *Being proactive in managing and measuring results* through the implementation of mechanisms for ex-ante and ex-post evaluation of projects, programmes and policies in the ecosystem, to ensure their effectiveness.
- *Being simple and operational*, so to facilitate and not impede rapid decision-making by each respective agency or agent. It must avoid getting stuck in

[29] Source: 'Basque Country RIS3 Expert Assessment' (Kevin Morgan 2013)

[30] Source: 'Improving Governance in European Innovation Policy' (UE 2009- Proinno)

permanent planning and paralysing monitoring, promoting responsibility and action.

- *Being aimed at achieving the objectives,* which must be defined, and at the implementation of mechanisms and corrective actions to ensure they are done.

5.2. Leadership bodies of the Basque Science, Technology and Innovation System

In accordance with the above criteria, a system of governance of the Basque Science, Technology and Innovation System is proposed, which will be operative and with a clear identity of leadership and responsibility at three levels:

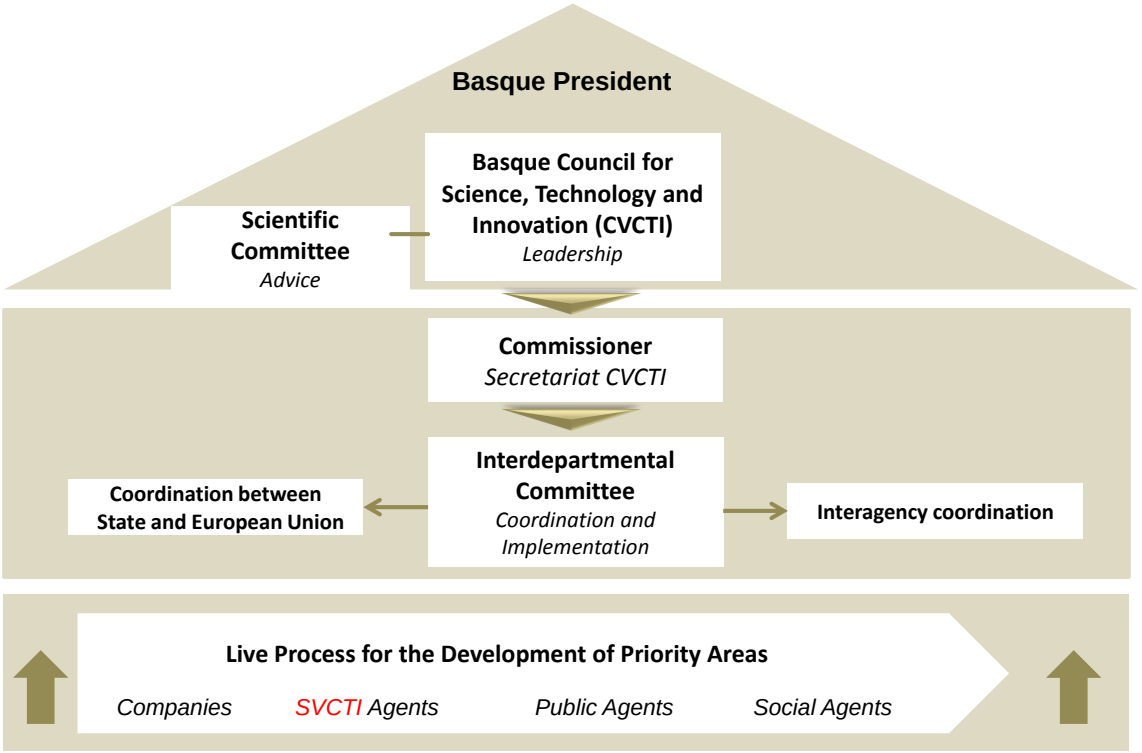
Leadership

The Basque Government is the highest authority in the Basque Country in research, scientific and technological development and innovation, the result of the transfer of functions of the Central Government to the Autonomous Community of the Basque Country in this area in 2009, as established by Royal Decree 3/2009 of January 9th.

Responding to the need for leadership in the system, to effectively integrate and coordinate the initiatives proposed by different levels of government, the Basque Council for Science, Technology and Innovation was established in 2007. The transfer that resulted and the strategy of smart specialisation, among other factors, have led to the renovation of this body verified by Decree 49/2014, of April 8th.

The Basque Council for Science, Technology and Innovation has kept its condition of being a body for strategic guidance, participation, advice and promotion of political science, technology, research and innovation in the Basque Country. It is also configured as the catalyst and coordinating instrument for the Basque Science, Technology and Innovation System.

Figure 40: Organs of leadership and governance of the SVCTI



To reinforce the Council's work, its composition has been expanded, ushering in some of the main representatives of the system. Thus, under the leadership of the Basque President, currently in the Basque Council for Science, Technology and Innovation are the Basque Government, the Provincial Councils, the three universities of the Basque University System UPV-EHU, Deusto and Mondragon, the two technological corporations Tecnalia and IK4, four representative companies of private investment in R&D, the Basque Foundation for Science Ikerbasque, the Basque Innovation Agency Innobasque and Jakiunde, the Basque Academy of Sciences, Arts and Letters.

To facilitate the functions of the Council, the Basque President is assisted by a person who is the Commissioner for Science, Technology and Innovation, who is part of the Council and acts as the secretary. While there is no specific appointment, the functions of the Commissioner will be assumed by the Secretary General of the Presidency. In turn, the Commissioner shall be assisted in his duties by a technical secretariat provided by Innobasque[31], the Basque Agency for Innovation, which in its mission also includes the evaluation, promotion and socialization of innovation.

[31] At its meeting on December 4th, 2013, the CVCTI decided on the continuation of the technical secretariat developed by Innobasque to support the functions of the Commissioner

In addition, the Basque Council for Science, Technology and Innovation has a **Scientific Advisory Committee**, which functions as an advisory body to the Basque Council for Science, Technology and Innovation. This Committee is composed of ten professionals of recognized standing in the field of science, technology, research and innovation, designated by the President of the Basque Government.

The CVCTI informs the Science, Technology and Innovation Plan, which includes the selection of RIS3 priority areas and oversees their implementation.

The Scientific Advisory Committee meanwhile, performs advisory roles in the development and implementation of the Plan and reports on important international initiatives in Science, Technology and Innovation.

The commissioner for science and technology has functions that include coordinating the overall RIS3 'live process' and carrying out monitoring and evaluation reports related to the Plan. For this purpose, it will have the Technical Secretariat of Innobasque as a support tool.

Interdepartmental and interagency coordination

To facilitate interdepartmental and interagency coordination in the operational deployment of the PCTI Euskadi 2020, there will be:

- An *Interdepartmental Committee on Science, Technology and Innovation* made up of representatives of the main departments of the Basque Government with significant activities in research and innovation. This committee shall have the task of managing the RIS3 'live process', to evaluate the Plan instruments and identify corrective actions as well as to coordinate governance with the RVCTI agents.
- *Coordination between the Basque institutions,* through the extension of the previous Committee's scope of work to the representatives of the three Provincial Councils and Eudel to coordinate and support programs, seeking operational synergies to optimize resource allocation and utilization.
- *Coordination* between the policies of the Basque Country and the *General State Administration* are done through established intergovernmental bodies:
    - The Conference of Presidents.
    - The Council for Science, Technology and Innovation Policy.
    - The Basque Country/Spanish State Coordination Commission.

  - The newly created Public R&D&I Policy Network, which is one of the planned Sectorial Networks in the National Strategic Reference Framework for Spain.

- *Coordination of the Basque European strategy* through:
  - The participation of the Basque Country in the Committees for the H2020 Programme.
  - The work of the Basque Delegation in Brussels.
  - Coordination of the participation of institutions and Basque agents in European reference networks such as VANGUARD, EEN (European Enterprise Network), ERA-NET, ERRIN, etc.

In addition, the structured participation of expert staff at national and international level in the areas of priority RIS3 is backed by the advice of the Basque Council for Science, Technology and Innovation Scientific Advisory Committee.

Finally, it is considered advisable to expand relations with neighbouring regions and reference European regions who have RIS3 priorities that are similar and complementary to those of the Basque Country. Not only for the purpose of benchmarking and exchange of good practices, but also to establish partnerships that can complement our system and help us improve our position in Europe.

Implementation of the RIS3 live process

The RIS3 strategy is a dynamic process in which various actors are involved, making up the four parts of the innovation 'helix': public authorities, the business community, academia and knowledge, and civil society.

Therefore, the design and monitoring of its implementation will be done collaboratively through the development of each of its priority areas, by:

- A participatory process, called Entrepreneur Discovery Spaces, to flesh out the priorities in science, technology and innovation in the Basque Country, taking as its starting point the current situation.
- The promotion of **pilot projects** generated from a real need or challenge detected in the Basque socio-economic fabric or from an opportunity for the country, which will be used as a test to validate and/or specify a priority, a new approach or a new way of doing new politics.

This process will be monitored by the Commissioner and each area will be managed from a Department which will designate the organization responsible for coordinating each of the priorities

6. Progress indicators to measure advances

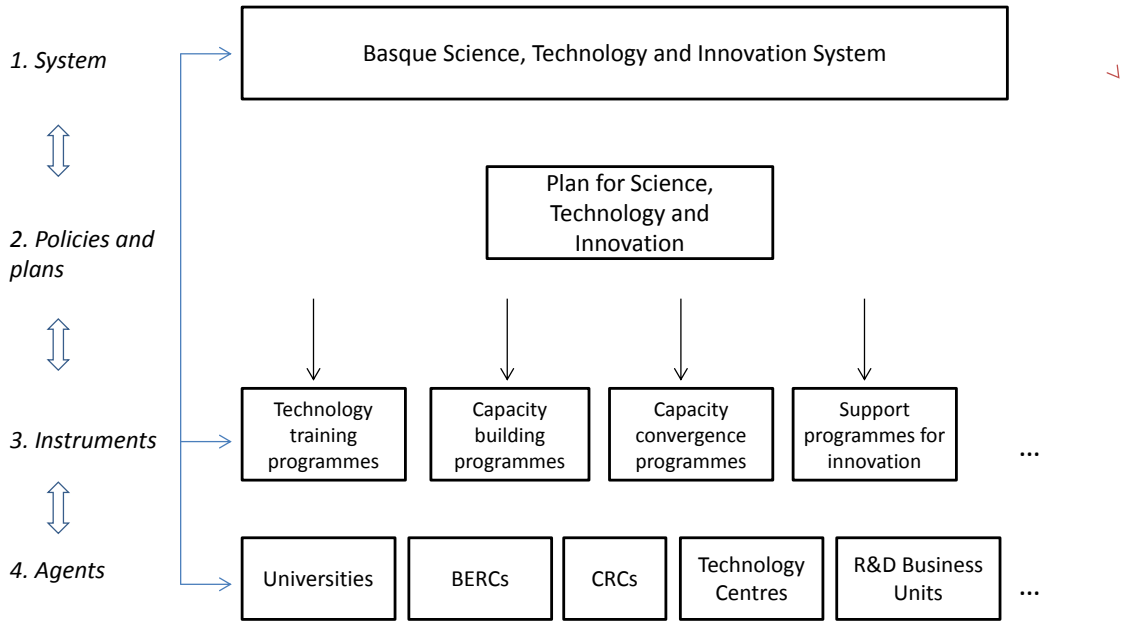
6.1. System Monitoring and Evaluation

As the different diagnostics point out, it is necessary to further refine the integrated system of evaluation and monitoring of public policies in favour of R&D&I.

This need is common in many regions and advanced countries of the world, although it is particularly important in a system like ours that has high levels of public funding for research activity and tight budgetary resources.

An effective system of governance requires, therefore, a coherent and inclusive assessment to ensure adequate return on public investments in the field of science, technology and innovation. This evaluation will allow us to introduce measures to ensure the improvement of these results, according to the established objectives. Therefore, it is essential to evaluate the fit between the priority objectives and the implementation of instruments and programmes designed to achieve them.

Figure 41: Different levels for evaluation of a system (for illustrative purposes)



The assessment shall have the objectives and goals to the previously established at different levels as a reference. To this end, and in order to establish an integrated assessment system for the Plan in the medium term, action will be taken at two complementary levels:

- Strategy Assessment: oriented towards tracking the progress of the targets set in the "PCTI Euskadi 2020" in relation to its goals, quantitatively and qualitatively. To do so, reports will be written annually which will reflect the evolution for each of the objectives, as well as giving information concerning the degree of implementation of the instruments and RVCTI agents:

    - Evaluation of the instruments: aimed at assessing and monitoring the instruments and actions of the PCTI Euskadi 2020, and the fit between these and the objectives achieved. As a result, recommendations for improvement will be proposed and training will be provided for appropriate programmes and tools for the effective deployment of the strategy. It will be the responsibility of the relevant departments to conduct the evaluation of their instruments by analyzing the impact of their R&D&I support programs.

    - Evaluation of RVCTI agents: aimed at measuring their contribution to the objectives set for the RVCTI after the year of reorganisation, using the scoreboard set for each of them. This quantitative analysis will be accompanied by a qualitative one, to establish the non-competitive public funding for each agent, and develop corrective action in each case, and will be conducted by the relevant department responsible.

- Evaluation of the Basque Science, Technology and Innovation System: oriented to know the status and overall performance of the regional system of science, technology and innovation. To this end, the corresponding macroeconomic indicators on R&D&I will be analyzed and reports relating to monitoring and evaluation of this strategy will be incorporated into it regularly.

  The preparation of the system report is the responsibility of the Basque President's Office, with the support of Innobasque, as Technical Secretariat. In addition, this report may include an independent external evaluation.

6.2. Indicators

The scoreboard indicators designed to track the degree of implementation of the Plan are shown:

1. Macro indicators

Objective	Indicator	Current situation	Target in 2020
1. Focus resources and investment in R&D&I in the areas of specialisation	Percentage of research aligned with RIS3 strategic priorities	76% (2013)	82%
2. Boost fundamental research and experimental development	Mix of R&D&I activity (%Fundamental Research /% Industrial Research /% Exp. Development)	14/47/39 (2012)	15/30/55
3. Orient Science, Technology and Innovation System towards results	Indexed scientific publications	4.637 (2013)	7.500
	Percentage of publications indexed in the first quartile	54,7% (2013)	55%
	PCT/EPO Patent applications	340 (2010)	500
	% Sales from new products in turnover	12,48% (IUS 2014)	15%
4. Strengthen attraction of international funding in R&D&I	% Financing of R&D&I from abroad	5%	8%
• Encourage Basque participation in H2020	% Basque financing out of total H2020 Framework Programme funding	0,89% (461 M€)	1% (805 M€)
• Attracting private international investment in R&D&I	Annual Private International Funding	6 M€ (2012)	18 M€
5. Increase no. of innovative companies	Innovative businesses with over 10 employees out of total	45,5% (2012)	50%
6. Improve the qualifications of the research staff	Percentage of doctors out of total research staff	29% (2013)	35%
	Percentage of doctors out of total research staff of enterprises	8,6% (2013)	10%

2. Indicators of effort

Indicator	Estimated 2014	Target 2020
Total expenditure on R&D	1.326 M€	1.909 M€
Expenditure on R & D by source of funds • Government and Higher Education • Private company financing. • External funding (European and international)	 461 M€ 779 M€ 86 M€	 590 M€ 1.167 M€ 152 M€

(M€ = Million Euros)

7. Joint mobilisation of public-private resources

7.1. Strategic economic principles

An objective

"To maintain and even exceed the European average in the strategic priorities set"

The main economic objective set for 2020 is to raise the current investment in research and innovation, while maintaining or even surpassing the European average in the strategic priorities of the RIS3 smart specialisation and in those disciplines that may be linked to the deployment of the lines of action plan for science, technology and innovation. This means a total amount of financial resources estimated at 11,100 million euros, which will be used to invest in research activities and technological development for the period 2014-2020.

To ensure compliance with the objectives of the plan and to respond to the priorities and transverse action lines, it is considered necessary for the Basque Country to resolutely continue to invest in R&D so as not to get left behind in innovation and competitiveness in Europe. This commitment must come necessarily accompanied by an increase in the effectiveness and efficiency of invested funds, obtaining better practical results in terms of research excellence, knowledge transfer and technology, with impact on business competitiveness and employment.

Three economic axes:

The previous economic objective extends across three strategic areas:

1. "*Consolidating the efforts and resources of the Basque government in the financing R&D&I*", in line with the tradition of recent years, but if anything, more decisively concerning the context in which it is done.
2. "*Increasing the role of the private business sector*." Much of the growth in investment will be led by the private sector, the real engine of wealth creation and employment in the Basque Country.
3. "*Increasing the uptake of European and state funds"*. A significant amount of resources to finance R&D&I in the Basque Country must come from participation in competitive calls statewide and especially from the European Union, through the framework Horizon 2020 programme.

10 principles

In accordance with the objective and strategic-economic axes set out above, these are the principles that should be considered in developing the Plan:

1. To involve businesses by increasing private leverage in research project funding.
2. To implement joint venture mechanisms for R&D&I initiatives and projects.
3. To establish a reference funding model for each of the different types of research.
4. To determine the funding criteria of the different types of agents belonging to the RVCTI, based on the achievement of objectives.
5. To ensure commitment of the Basque government in a coordinated and stable fiscal effort.
6. To increase the uptake of foreign resources from R&D&I investments of foreign companies.
7. To attract investment funds and private venture capital.
8. To encourage the uptake of European and state funds.
9. To facilitate the collaboration of agents with an active presence in Europe, to coordinate efforts and promote the Basque presence in H2020.
10. To encourage innovative public procurement.

7.2. Expected economic scenario

To reach the targets set in the PCTI Euskadi 2020 needs a major allocation of financial resources, both public and private. The budget estimate that has been drawn up, as reflected above, involves having available a total amount of 11,100 million euros[32] for investment in research and technological development over the period 2014-2020.

Here the expected economic scenario and the distribution of resources is described for the term of the plan.

[32] As stated in Indizea, the Basque innovation index published by Innobasque, R&D investment is only one part of all business investments in innovation intangibles, which include other concepts such as organizational improvements, software, design, ongoing training, marketing, etc. Specifically in the Basque Country, over the period 2000-2010, total investment in intangibles by firms was four times the investment made exclusively in R&D.

Budgets of the Basque government and the State

As reflected in the table below, the main public contributor to funding of R&D in the Basque Country is the Basque Government which, in 2014-2020, will provide an estimated total investment of 2,737 million euros.

Figure 42: Budgets for R&D support from the Basque govermment and the State (2014-2020)

	Base Year	Predicted			Estimated					
Rounded figures in millions of Euros	*2014*	2015	2016	*2014-2016*	2017	2018	2019	2020	*2017-2020*	*2014-2020*
Basque Government										
Scientific and university research	*69*	71	71	*211*	74	77	80	83	*314*	*525*
Technological and industrial research	*140*	143	146	*429*	152	158	164	171	*645*	*1074*
Food research	*17*	18	19	*54*	20	21	21	22	*84*	*138*
Health research (*)	*42*	43	44	*129*	46	48	49	51	*194*	*323*
Research and Public Innovation	*14*	14	15	*43*	16	16	17	18	*66*	*109*
Strategic Innovation Fund	*37*	37	37	*111*	38	40	42	43	*163*	*274*
Other items of expenditure related to R&D&I (**)	*40*	40	41	*121*	42	43	44	44	*172*	*293*
TOTAL Basque Government	***359***	**366**	**373**	***1,098***	**387**	**402**	**417**	**433**	***1,639***	***2,737***
Provincial Councils										
PCB	*30*	31	31	*92*	32	34	35	36	*137*	*229*
PCG	*20*	20	21	*61*	22	23	24	25	*93*	*154*
PCA	2	2	2	*6*	2	2	2	2	*9*	*15*
TOTAL Provincial Councils	***52***	**53**	**54**	***159***	**56**	**58**	**61**	**63**	***238***	***397***
TOTAL BASQUE PUBLIC FUNDING	***411***	**419**	**427**	***1,257***	**443**	**460**	**478**	**496**	***1,877***	***3,134***
Central Government										
General Government Administration (estimated)	*50*	60	80	*190*	83	87	90	94	*353*	*543*
TOTAL STATE PUBLIC FUNDING	***50***	**60**	**80**	***190***	**83**	**87**	**90**	**94**	***353***	***543***
TOTAL REGIONAL, LOCAL and STATE FUNDING	***461***	**479**	**507**	***1,447***	**526**	**547**	**568**	**590**	***2,230***	***3,677***

(*) Incluye varias partidas internas de gasto incluidos salarios de personal sanitario investigador de Osakidetza
(**) Incluye fundamentalmente el 30% de los salarios del personal docente investigador de la UPV/EHU

Source: In-house

Based on the budgets of 2014, the investment scenarios for Basque public administrations have been calculated with a 2% average annual rate of increase for the years 2015 and 2016, and estimating a growth of 4% annual average over the following years of 2017, 2018, 2019 and 2020.

Investment in R&D by source of funds

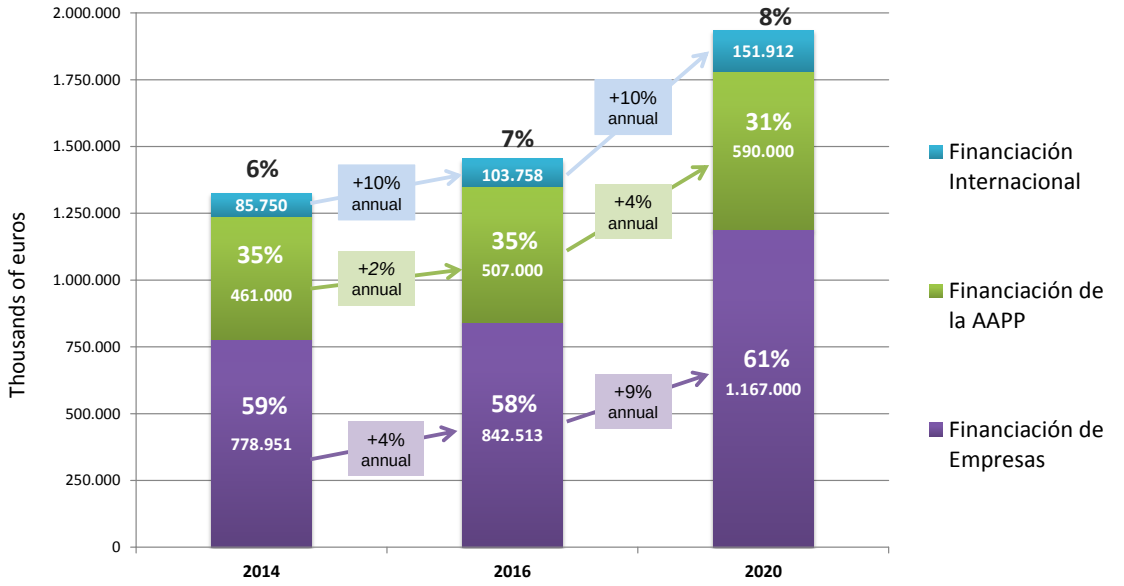
The graph below shows the estimated evolution of total investment in R&D carried out in the Basque Country during the period 2014-2020, distinguishing between the following types of funding sources shown:

- Private business funding.
- Financing by the Public Administrations:
    - The Basque Government.

- Provincial Councils and other local entities from the Basque Country
- General State Administration of Spain.

- International funding, mainly:
  - European framework programmes for R&D&I funding (H2020 and others)
  - Private business funds.

Figure 43: Scenario for R&D investment by source of funds (2014-2016-2020. Figures in thousands of euros)



Source: in-house

In line with the principles described above, the aim is for private R&D funding to grow by two percentage points and move from 59% in 2014 to 61% in 2020. Similarly, financing of international origin should also grow by two percentage points, from 6% in 2014 to 8% in 2020, fuelled by great expectations for the new H2020 framework programme as well as an enhanced ability to attract international private funds. As a result of previous growth, and while still growing in absolute terms, in relative terms this would reduce the percentage weight of funding from government, down from 35% in 2014 to 31% in 2020, closer to European and international standards for public innovation financing.

We have differentiated between the periods 2014-2016 and 2017-2020 because estimated rates of growth in both GDP and R&D investment figures are estimated to be greater in the second period once the economy starts to behave in a more positive way.

In the following table we show estimates for R&D in the whole of the Basque economy for each of the years in the period 2014-2020.

Figure 44: R&D investment by source of funds (2014-2020 Figures in millions of euros.)

(in millions of euros)	2014	2015	2016	2017	2018	2019	2020	TOTAL
Total domestic R&D expenditure	**1,326**	**1,383**	**1,453**	**1,559**	**1,673**	**1,797**	**1,909**	**11,100**
Financing by the government	461	479	507	526	547	568	590	3,677
Financing by Companies	779	810	843	918	1,001	1,091	1,167	6,609
International Financing	86	94	104	114	126	138	152	814

Source: in-house

Financing structure by type of research

Under the funding model proposed in the PCTI Euskadi 2020, reference guidelines are laid out for each type of research that will help to guide agents in their R&D work and to mark directives on public funding programmes.

University research funding

Research carried out by Higher Education is a fundamentally basic in character, meaning that they are positioned even further from the market with their results. Therefore, this has to be financed mostly by the public sector, as has been the case so far, but exploiting the potential for improvement in attracting other external sources of funding.

As a reference framework for the funding of public universities, which currently represents 80% of the Basque University System, the following is stipulated:

- A share of private corporate financing in university R&D investment that will grow in relative terms from 6% in 2012 to 8% in 2020. This growth in private funds will be motivated partly by the increasing effort to exploit the R&D results conducted by the University System.
- Increased activity of university research to raise funds for the programmes of the European Union, in particular H2020. In this regard, it is estimated that fundraising by the Basque University System should double in the horizon of the Plan, from 4% of total R&D investment carried out by the university in 2012 to 8% in 2020.

- As a result of past growth, there is a greater involvement of private and European funding in university research, which will rise from 10% in 2014 to 16% in 2020. This growth in business and international resources, coupled with moderate growth in funding from government, will mean an opportunity for the university to address new initiatives and projects to improve their excellence and transfer results to companies and society in general.

On the other hand, a framework for academic research carried out by private institutions is also established, usually developed in phases that are closer to placing the results on the market. As a result, the framework set for R&D carried out in private universities is as follows:

- A 50% share of private corporate funding.
- A 10% share of international public funding mainly from the European Union and in particular H2020.
- A 40% share of public funding from the Basque Government (this includes funding through the programme contract and access to competitive calls for project funding) and other authorities, provincial councils, local government entities and the central Spanish Government.

Funding of basic research excellence by the BERCs

The key feature of this research is its character of basic research, i.e. far from the market, and the quality or excellence, measured by the impact of its publications and the level reached in the research rankings. Given that the applications of this kind of short-term research are difficult to establish, its funding should be mostly public, but with better access to other funding sources.

As a framework for research funding of the BERC homogeneous standards have been established with similar European centres along the following lines:

- A growing share of private funding from 8% in 2012 to 12% by 2020. To do this, it is necessary to explore the possibilities for these centres to attract private sponsorship funds to facilitate the connection between fundamental research and the market and/or society.
- Increased activity to raise funds from the programmes of the European Union, from 10% in 2012 to 15% in 2020. Given the quality and excellence of the research conducted by these centres, it is reasonable to require them to be very competitive in the funding programmes of the H2020 Framework Programme and grants from the European Research Council (ERC).

- An increase in the weight of the involvement of funding from the Central Government, Provincial Councils and other local authorities, increasing from 12% in 2012 to 13% in 2020, also as a result of the current development and degree of maturity of the BERC, in their level of excellence.
- As a result of increases in other sources of funding, the relative weight of public funding from the Basque Government will be reduced partially although in absolute terms, funds from the Basque Government not only continue, but grow slightly this period, in line with other agents' contributions to science and technology.

Health research funding

The basic aim of health research is to improve people's health, to increase the level of the quality and performance of public health services and to contribute to economic development through the creation of new products and services. Because of the nature of the health system, under the heading of health research there are various different types of research covering all phases of the innovation cycle, from basic research, through clinical testing and development, to implementation in the health service. Given the scope of health research, funding is mostly public, but with a growing potential for attracting private and foreign funding, because its results are applied to solving the great challenges of humanity linked to the health and welfare of the population.

Health research linked to the healthcare system is carried out in the Basque Health Service (Osakidetza) managed by BIOEF, the Basque Foundation for Health Innovation and Research, as well as in the Institutes of Health Research (IHR) Biodonostia and Biocruces, Kronikgune and Osatek.

The framework for health research funding in the Euskadi 2020 horizon states:

- A growing share of private funding in relative terms, from 6% in 2012 to 7% in 2020.
- Increased activity to raise funds from the programmes of the European Union, from 4% in 2012 to 7% in 2020. The greatest opportunities will be in funding programs of the H2020 Framework Programme and DG SANCO in the specific health field and in DG CONNECT.
- An increase in the weight of the involvement of funding from the Central Government, Provincial Councils and other local authorities, increasing from 8% in 2012 to 11% in 2020, the result of the accreditation process Institutes of Health Research and access to specific funding for these centres.

- As a result of the aforementioned increases, there will be a reduction in the relative weight of from public funding of the Basque Government, although in absolute terms these contributions will be maintained and even grow slightly, in line with government contributions to other science and technology agents.

Funding of strategic collaborative research by the CRCs

The CRCs are centres performing market-oriented collaborative research in strategic sectors for the Basque Country. While they currently focus on fundamental and industrial research, they should evolve progressively in the R&D value chain and move closer to business needs. Therefore, their funding model, so far dominated by public funding from the Basque administrations, should grow in capacity to attract more private funding, as their capacities are consolidated and they advance in targeting their technological development nearer the market in collaboration with technology centres and R&D business units.

The funding framework for CRC research states:

- A very significant increase in the weight of private funding, from 3% in 2012 to 30% in 2020, which should come either from the exploitation of intellectual property, or from projects with companies, or from private sponsorship funds.
- A growth in fundraising from European Union programmes, from 5% in 2012 to 15% in 2020. As with the BERCs, the excellence of the research conducted by the CRCs should put them in a favourable position for raising finance from the H2020 Framework Programme and from grants from the European Research Council (ERC).
- As a result of the above, a reduction in the relative weight of public funding from the Basque government and the state. In the case of the Basque Government and other government agents, they will remain committed to funding research activities of the CRCs, with moderate budget growth.

Technological research funding

The Technology Centres aim to generate and develop technological capabilities of excellence and provide R&D, technology and innovation services to the businesses of the Basque Country. Although they focus on industrial research, they should also cover all R&D.

Against this background, the funding framework for CTs research states:

- Maintain current levels of private business financing with a goal in 2020 of no less than 50%, which is mainly developed through R&D contracts, but also through income from the exploitation of research results.
- Consolidate funding from the H2020 framework programme, aiming to maintain 15% of its total revenue for R&D activities in 2020.
- Growing slightly in funding from the Central Government, Provincial Councils and other local public entities, from 7% in 2012 to 10% in 2020
- Keep the Basque Government public funding around 25% in 2020 (relative to the baseline funding for results).

Business research funding

Companies engage in research and technological development primarily aimed at developing new products and services, and improving their manufacturing processes, with the ultimate goal of market differentiation and improving their competitive position. In these conditions, public funding should serve as an incentive for companies to maintain or increase their intensity of R&D, through the additionality or drag effect of private investment.

Under these premises, the framework for business research funding states:

- Maintenance of private funding no lower than 82% in 2020.
- Growth in financing from the H2020 framework programme from 2% in 2012 to 3% in 2020, supported by the work of technology centres and other scientific and technological agents.
- Maintaining levels of public funding from the Basque Government at around 10%, accompanied by a reduction in funding from other public sources.

Summary of financing structures

The following table shows the resulting scenario for 2020 following the funding frameworks for each agent and type of research.

Figure 45: Scenario 2020 Financing structure by research activity

SCENARIO 2020 FINANCING STRUCTURE BY RESEARCH ACTIVITY					
		Sources of research funding			
Agents	**Type of Research**	**B.Gov Public Funds**	**Other Pub. Funds**	**Foreign Public Funds**	**Private Company Funds**
Universities	Public University Research	84%		8%	8%
	Private University Research	40%		10%	50%
BERCs	Basic Research of Excellence	60%	13%	15%	12%
Health Orgs	Health Research	75%	11%	7%	7%
CRCs	Collaborative Strategic Research	50%	5%	15%	30%
CTs	Technological Research	25%*	10%	15%	50%
Companies	Business Research	10%	5%	3%	82%

*Source: In-house (*refers to FPNC)*

APPENDICES

APPENDIX 1: Jakiunde Statement

EUSKO JAURLARITZA
GOBIERNO VASCO
LEHENDAKARITZA
PRESIDENCIA

Jakiunde statement about the scientific policy

15-11-2013

JAKIUNDE STATEMENT ABOUT THE

SCIENTIFIC POLICY

Jakiunde views with satisfaction the efforts of the institutions to establish policies on science and technology in the field of their respective competences, as well as their efforts to coordinate these initiatives.

Public science policies in any area of scientific knowledge (science, arts and letters) and technology should mark ambitious goals and provide the means to achieve these objectives. Government action must, moreover, ensure the sustainability of investments for the implementation of such policies.

In the current economic crisis, with increasing pressure on reducing public investment in general, a bold, demanding and sustainable scientific policy is necessary. It will promote the consolidation of a society with a high degree of understanding and appreciation of science, technology, arts and letters, as well as social and economic development and strengthening commensurate with the demands of today's world, while enabling the consolidation of a highly competitive and developed economy.

Jakiunde believes it is essential to generate an educated and responsible attitude about science and technology in its citizens, as they constitute a cultural asset of incalculable social value as they contain permanent human values and therefore constitute an important public asset. Therefore, public investment in research and scientific-technological development is neither a subsidy nor a luxury but a prerequisite for social development in general, and for the manufacture and marketing of products with high added value, in particular.

In this context, Jakiunde wishes to emphasize the following essential aspects of any scientific policy:

1. It must still be considered as a "country target" and as such, involve all relevant institutions Country competent in such matters in its design, planning, evaluation and implementation.

2. There must be correspondence between objectives and the means provided for achieving them.

3. It must be balanced and flexible, since it must address the multiple facets of research: researchers, infrastructures, technicians and administration.

4. It must have special programmes for young researchers.

5. It must combine sustained and sustainable funding with specific legislative measures and simplified administrative processing for the research.

6. It must identify areas with potential for knowledge transfer and/or innovation for society.

7. It should be complemented with plural assessment processes and actions of social communication and monitoring of the social perception of science, arts, literature, technology and innovation.

Objective of the Country

Society needs science and technology, and science and technology need society. It is a bidirectional relationship. On the one hand, the future of the social and human development of our society is based on globally competitive science and technology and on the other hand, the development of science and technology is dependent on decisive and sustained action implementation of society to finance it. This requires a country-wide agreement.

Research programmes not only require good design and adequate funding, but also require a length of time that does not necessarily coincide with periods of political activity. That is why is necessary to maintain funding for research programmes in the medium and/or long term if these programme are not to become "sporadic" (as happens when the need for continued effort is not anticipated). This enables high approved scientific productivity in the country and in turn facilitates the always difficult, slow transfer of knowledge to society in general and the productive system in particular. This initiative should involve all levels and bodies in the country that are competent in such matters.

Correspondence between objectives and means

Establishing the goals to be achieved is perhaps the most delicate part of planning for science and technology policies. The objectives should be ambitious, no doubt. However, they should also be achievable and above all they should be scientifically relevant; hence the importance of assessing not only the results but also the objectives. Likewise, science and technology policies should enable the means necessary for achieving the objectives, both in terms of staff, whether researchers or technical support, and scientific infrastructures.

Balanced and flexible

Science policy should serve existing people and groups of excellence, regardless of the area in which they work. They must also support those who maintain an approved quality and proven international visibility. They must also provide opportunities for those who want to join the system, enabling the development of a "middle class" of researchers, defined as one with the "medium" level required in the system to be considered a researcher.

Each of these categories requires a different administrative process, which in all cases must be significantly more simplified than today.

Finally, it should ensure access of researchers to the necessary scientific infrastructure and it should lay the foundations for the degrees of the technical research staff.

Special programmes for young researchers.

The incorporation of young researchers to the system is essential to maintain the necessary scaling of age between researchers and thus ensure the sustainability of the system. Furthermore, it should serve to breathe new air into the use and habits of established research and allow its evolution and adaptation to new trends. The incorporation of young researchers must be executed with great care, but once done, those admitted should get continuity in the financing, trust and appreciation of their efforts. Naturally, the appropriate measures should be provided so that young researchers are not doomed to be the servants of established colleagues and so that they should, therefore, be free to develop their projects, either independently or in collaboration/coordination with other groups.

Sustained and sustainable financing

Research groups are not improvised and their creation is an arduous task requiring many years. However, the dismantling of research groups can occur unusually quickly and is irreversible. Therefore, the funding of research groups must be sustained over time, although subject to appropriate assessments and must be sustainable, that is, tailored to the economic reality. Also, research groups should contribute to the sustainability of the system by obtaining external funds whenever possible.

Along with this, the government should consider legislative initiatives to give sustainability to the system, such as the legal regulation of sponsorship, the enactment of tax measures appropriate for the promotion of research, development and innovation and the possibility for the public institutions to be able to acquire endowment funds.

Identifying scientific areas with potential for knowledge transfer

The economic and social return on public effort in scientific and technological research is embodied in knowledge transfer and innovation to the production sector, institutions and society in general. The identification of areas susceptible to generating scientific activity in the field of knowledge transfer and innovation is necessary.

Jakiunde understands that this effort should involve the scientific community, which knows the frontier of knowledge, the administrative/social/business network, which will turn this knowledge into reality, and the government, which should promote relations and understanding between the scientific community and the rest of society.

Promoting the culture of assessment

Jakiunde believes that it is necessary to promote the culture of plural evaluation of research, development and innovation plans at various levels. This includes assessment of the objectives, not only of the results, evaluation of the various proposals and measurement of the increase or decrease of human capital devoted to these tasks in relation to their roles in the system.

No less important than the above is society's understanding of the efforts made and resources invested in research. Jakiunde believes that we should have a coherent, systematic programme suited to the times, in relation to social communication of the state of the sciences, arts, literature and technology.

This statement was approved at the regular plenary session of Jakiunde held on 15th November 2013 at the Olaso Tower in Bergara

APPENDIX 2: Diagnosis of Competitive and Specialisation Situation

2.1. Competitive situation of the Basque Country

Figure 46: Levels and position of the Basque Country in the competitiveness model indicators

		Value	European regions	Reference regions	Spanish Aut. Comms.
Indicators of latest results	GDP per capita PPP (2011)	32.500	25	4	1
	Disposable income per capita PPP (2011)	19.500	18	5	1
	Long-term unemployment (% of pop. Active) (2012)	6,4	144	20	2
	Poverty risk rate (2012)	12,6	46	7	2
Intermediate performance indicators	Employment rate (2012)	62,8	102	19	1
	Employment rate for women (2012)	58,1	97	16	2
	Apparent productivity per worker (2011)	74.233	19	2	1
	Exports / Population (2012)	9.616	31	10	2
	PCT patents per capita (2008-2011)	58,2	83	20	4
	Unemployment rate (2012)	14,9	154	19	1
	Youth unemployment rate (2012)	42,5	165	21	3
Determinants of competitiveness: Business Behaviour	Personal R&D in companies (% employment) (2011)	1,4	10	4	1
	R&D expenditure in companies (% GP) (2011)	1,6	28	7	1
	Co-invention of patents (% of total patents) (2008-2011)	65,6	84	8	4
	Patents with foreign collaboration (% of total patents) (2008-2011)	4,5	187	23	15
Determinants of competitiveness: Specialisation	Employment in manufacturing of medium-high and high technology (2012)	9,7	21	5	2
	Employment in knowledge intensive services (2012)	36,7	94	13	3
Determinants of competitiveness: Business environment	Human resources in science and technology (2012)	15,4	25	4	2
	Population aged 25-64 with upper secondary or tertiary education (2012)	68,1	141	15	2
	Students in tertiary education (2012)	67,1	41	4	6
	Vocational students (2012)	32,5	152	20	4
	Population 25-64 years participating in lifelong learning (2012)	13,7	39	8	1
	R&D personnel in public organizations (2011)	0,5	74	12	13
	Public expenditure on R&D (2011)	0,5	93	15	10
	Total R&D Personnel (2011)	1,9	17	4	2
	Total R&D expenditure (2011)	2,2	41	7	1
	Medium sized business (2009)	16,5	84	14	2
	Families with broadband access (2012)	71,0	90	14	2
	Commerce on the Internet (2012)	42,0	89	15	1
Foundations	Territorial size, measured by population (2011)	2.134.372	81	15	7
	Aging, approximated by the population> = 65 years (2011)	0,2	150	16	13
	Ageing approximated by the population <15 years (2011)	0,1	161	18	13
	Population in functional urban areas (2006)	0,7	163	19	14
	Multimodal accessibility (2006)	93,4	71	16	3
	Decentralization (2009)	58,0	23	8	1
	Institutional Quality (2012)	0,7	67	14	1
	Trust in people (2010)	5,6	30	3	2

Source: Orkestra, from various sources (For details see Orkestra, 2013 and Navarro et al, 2014.).

The group of European regions is generally comprised of 196 units; and the reference regions 23, in most indicators

2.2. Degree of economic specialisation of the Basque Country

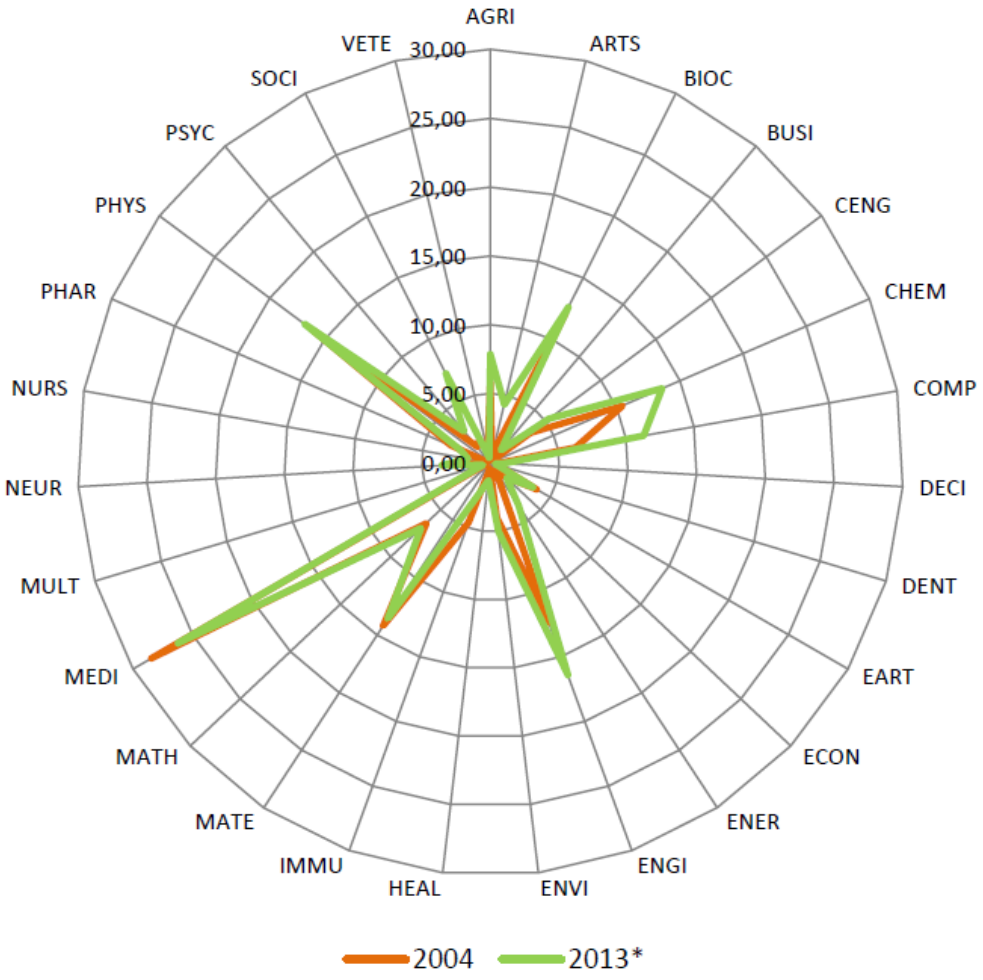
Figure 47: Indices of production specialisation and trade balance of the Basque Country in 2011

	GVA specialisation index (EU27 = 100)	Index of trade balance
TOTAL	**100**	**11**
AGRICULTURE AND FISHING	**43**	**-76**
INDUSTRY	**125**	**8**
Mining and quarrying	13	-99
Food, drinks and tobacco industry	75	-4
Textiles, clothing, leather and footwear	32	-39
Wood, Paper and printing	129	19
Manufacture of coke and refined petroleum products	85	40
Chemical industry	60	-40
Pharmaceutical products	14	-56
Rubber, plastic and other non-metallic products	184	67
Metallurgy and metal products	303	32
Computer and electronic products	63	-33
Electrical equipment	156	22
Machinery and equipment	133	41
Transport equipment	122	60
Furniture and other manufacturing	74	-21
Electricity, gas and steam	152	-3
Water supply and sanitation	66	-59
CONSTRUCTION	**131**	**0**
MARKET SERVICES	**95**	**58**
Trade; vehicle repair	91	75
Transport and storage	104	71
Hotel and Catering industry	148	-100
Edition, picture, radio and television	51	36
Telecommunications	123	-100
Informatics	55	21
Financial and insurance activities	110	63
Consulting and technical activities	95	-100
Research and development	162	53
Other professional activities	77	85
Ancillary services	67	-66
Recreation and culture	94	-100
Other services	56	0
Household activities	196	0
NON MARKET SERVICES	**89**	**36**
Property activities	94	-100
Public administration and defence	79	53
Education	93	85
Health activities	104	-66
Social services activities	46	-100

Source: Orkestra, from Eustat and Eurostat.

2.3. Degree of scientific specialisation of the Basque Country

Figure 48: Thematic specialisation of the Basque Country in 2004 and 2013 (% of publications in each area, out of total Basque publications)



Source: Ikerbasque (2014), from Scopus

2.4. Degree of technological specialisation of the Basque Country

Figure 49: Indices of specialisation of PCT patents, ordered by WIPO technological fields corresponding to inventors in the Basque Country

Technological field		specialisation Index	
Name of field or subfield	Field code	In 2008-2011	Variation from 2004-07 to 2008-11
OTHER SECTORS	5	184.1	-41.3
MECHANICAL ENGINEERING	4	127.4	-28.8
INSTRUMENTS	2	99.3	24.1
CHEMISTRY	3	91.0	9.7
ELECTRICAL - ELECTRONICS	1	50.2	16.2
Technology of nanotechnology & microstructures	3	416.9	31.2
Other consumer products	5	314.2	23.8
Machine tools	4	305.9	96.6
Analysis of biological material	2	249.5	114.9
Thermal processes and apparatus	4	222.3	14.1
Control	2	178.0	90.8
Materials, metallurgy	3	154.2	-76.0
Handling	4	151.8	-124.6
Biotechnology	3	148.1	-14.5
Furniture, games	5	144.1	21.7
Technology of surface & coatings	3	139.2	-38.1
Other special machines	4	126.4	-0.3
Civil Engineering	5	126.0	-128.9
Mechanical Components	4	118.8	-31.0
Food Chemistry	3	107.3	83.8
Pharmaceuticals	3	98.8	58.0
Environmental technology	3	94.4	7.1
Medical Technology	2	89.7	-14.0
Electronics, electrical engineering, electric power	1	78.0	-3.6
Transport	4	77.4	-48.3
Motors, pumps, turbines	4	76.2	-24.7
Measurement	2	72.1	20.3
Material chemistry	3	67.2	29.9
Chemical Engineering	3	57.0	-17.8
Macromolecular chemistry, polymers	3	53.7	6.7
Information Technology	1	52.3	33.7
Management methods by I.T.	1	50.1	-24.0
Audiovisual technology	1	45.7	26.0
Optics	2	41.6	29.6
Semiconductors	1	34.3	8.4
Telecommunications	1	32.5	6.3
Digital communication	1	29.7	26.5
Basic communication processes	1	28.9	-19.1
Textile machinery and paper	4	26.3	-60.5
Manufactured organic products	3	23.5	-8.3

Source: Orkestra, from the OECD RegPat base, January 2014 edition

Figures above 100 mean specialisation in this field; and lower mean subspecialisation

2.5. Degree of R&D specialisation

Figure 50: Percentage distribution of R&D expenditure by scientific disciplines in the Basque Country

		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Natural sciences	8.1	9.6	8.9	12.0	9.4	11.9	10.7	11.9	10.4	10.0
	Engineering and Technology	77.2	76.9	75.4	73.6	72.2	71.7	69.7	69.3	71.7	71.5
	Medical sciences (including pharmacy)	5.5	6.7	8.0	7.7	10.5	8.1	10.0	10.1	9.3	9.9
	Agricultural sciences	4.2	2.4	3.6	1.6	3.7	3.4	3.4	2.3	2.6	2.5
	Social sciences and humanities	5.0	4.4	4.1	5.1	4.2	5.0	6.2	6.3	6.1	6.1
Business	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Natural sciences	1.8	3.4	2.6	6.2	3.5	6.3	3.9	6.4	4.3	3.9
	Engineering and Technology	92.0	91.9	89.2	87.9	84.3	84.5	84.9	84.1	87.5	87.2
	Medical sciences (including pharmacy)	2.9	3.2	4.8	4.6	8.2	4.9	6.5	6.0	5.0	5.6
	Agricultural sciences	3.0	1.2	2.7	0.4	2.9	2.8	2.6	1.4	1.5	1.7
	Social sciences and humanities	0.3	0.4	0.7	0.9	1.0	1.4	2.0	2.0	1.7	1.5
Public Sector	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Natural sciences	31.3	32.2	32.1	33.1	32.7	33.3	31.6	29.8	29.7	29.0
	Engineering and Technology	23.0	22.4	24.8	21.8	23.2	21.6	22.6	21.4	21.4	22.2
	Medical sciences (including pharmacy)	15.0	19.7	19.7	19.0	19.9	20.5	20.7	23.6	22.8	23.5
	Agricultural sciences	8.4	6.8	6.6	6.0	7.0	5.7	5.8	5.1	5.8	4.7
	Social sciences and humanities	22.3	19.0	16.7	20.1	17.1	18.8	19.3	20.1	20.3	20.6

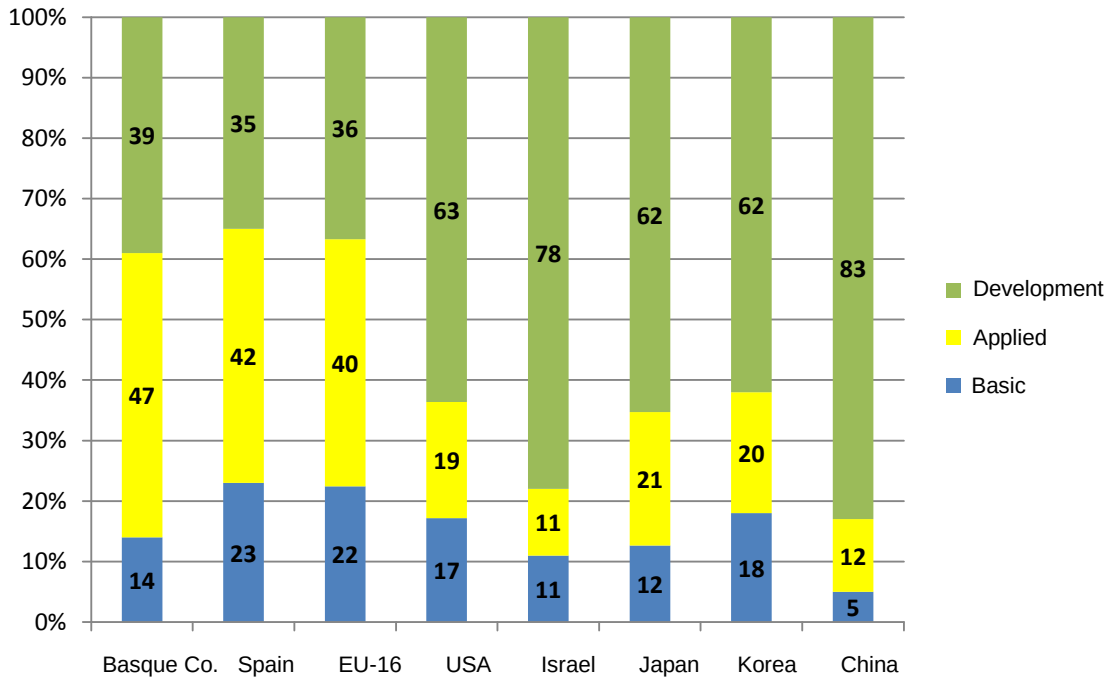
Source: Eustat

APPENDIX 3: Breakdown of the weaknesses of the SWOT analysis

- **Competitive weakness in technological development compared with reference countries**

The R&D mix is another key for comparing the positioning of a Science, Technology and Innovation system with respect to other countries. This is classified into three types of R&D[33]: basic research (fundamental research), applied research (industrial research) and technological development (experimental development). Analysts consider that precisely one of the causes of the worse developments in European competitiveness relative to the US or the emerging Asian economies (Korea, China ...) lies in the fact that in Europe, despite heavy investment in the initial stages of the generation of new knowledge, later policies and organizations do not pay enough attention to another set of necessary activities to adapt that knowledge and create conditions so that a product or process reaches the market, successfully crossing the so-called "valley of death". This is reflected, for example, in the greater relative weight within R&D, that is given in the European Union to activities linked to the "R" (basic and applied research) compared to the "D" (technological development). (See figure)

Figure 51: Percentage distribution of R&D by activity type (2012 or nearest year)



Source: Eustat and OECD.

[33] See definition of each type of activity in the *"EU R&D&I State Aid Framework"*

In the case of the Basque Country, analysis of the mix shows a relatively similar situation to the EU, with a large relative weight of industrial research (the largest of all economies included in the figure) and lower values than more dynamic economies in America and Asia both in technological development and basic research.

As reflected in the Eustat data on the evolution of expenditure by type of R&D per agent, the reduction in weight in technological development and bias towards industrial research refers to the change of positioning suffered by companies and agents linked to the Department of Economic Development and Competitiveness, particularly Technology Centres.

Figure 52: % activity by research and type of agent. 2005 and 2011

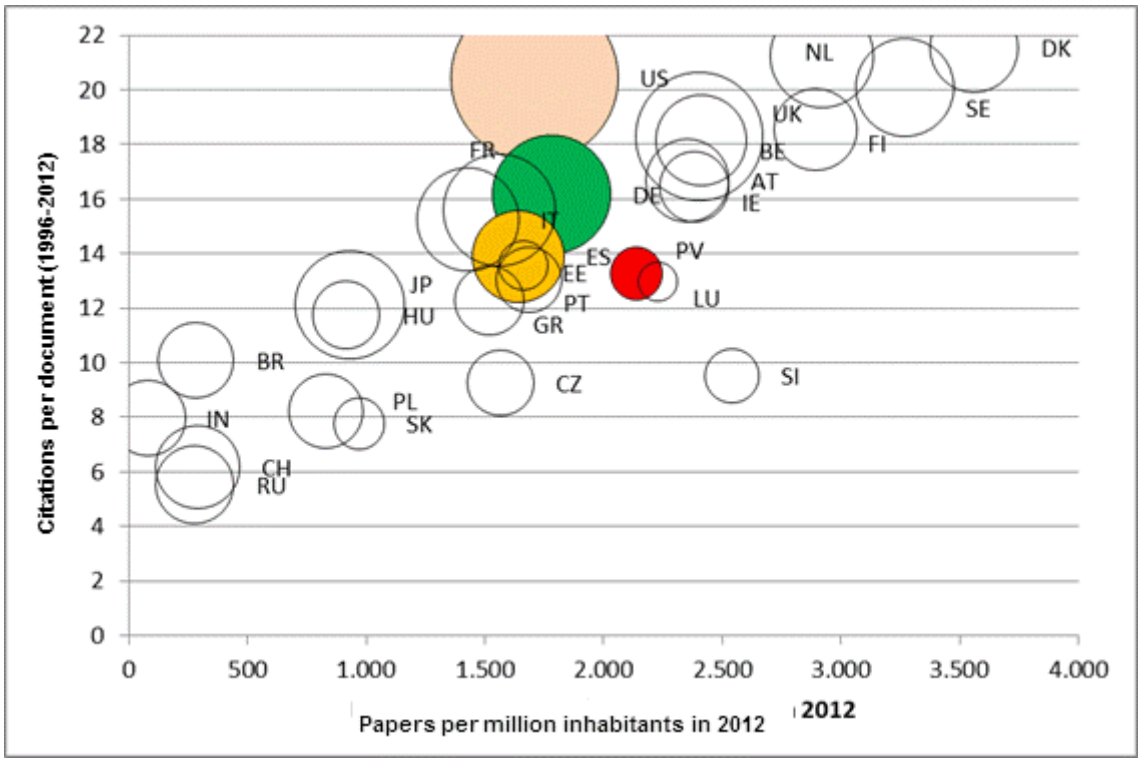
	Internal current expenditure on R&D by Type of Research (thousand €)				*Mix by segment*			*Weighting per agent*	*Weight of each R&D activity of each entity out of the total*		
Situation 2011	**Basic R.**	**Appl. R.**	**Tech. Dev.**	**Total**	**Basic R.**	**Appl. R.**	**Tech. Dev.**	**Peso**	**Basic R.**	**Appl. R.**	**Tech. Dev.**
1. Business	6,002	280,580	404,220	690,802	1%	41%	59%	58%	0.5%	23.6%	34.1%
2. RVCTI-DEDC	24,798	172,428	19,720	216,946	11%	79%	9%	18%	2.1%	14.5%	1.7%
3. Public Bodies	6,911	57,072	12,329	76,312	9%	75%	16%	6%	0.6%	4.8%	1.0%
4. Higher Education	117,033	82,836	2,761	202,630	58%	41%	1%	17%	9.9%	7.0%	0.2%
TOTAL	154,744	592,916	439,030	1,186,690	13%	50%	37%	100%			

	Internal current expenditure on R&D by Type of Research (thousand €)				*Mix by segment*			*Weighting per agent*	*Weight of each R&D activity of each entity out of the total*		
Situation 2005	**Basic R.**	**Appl. R.**	**Tech. Dev.**	**Total**	**Basic R.**	**Appl. R.**	**Tech. Dev.**	**Peso**	**Basic R.**	**Appl. R.**	**Tech. Dev.**
1. Business	2,186	123,560	293,546	419,292	1%	29%	70%	59%	0.3%	17.4%	41.3%
2. RVCTI-DEDC	20,847	60,161	53,511	134,519	15%	45%	40%	19%	2.9%	8.5%	7.5%
3. Public Bodies	4,124	21,109	3,647	28,880	14%	73%	13%	4%	0.6%	3.0%	0.5%
4. Higher Education	67,568	55,748	4,030	127,346	53%	44%	3%	18%	9.5%	7.9%	0.6%
	94,725	260,578	354,734	710,037	13%	37%	50%	100%			

- **Insufficient development of basic research and connections between the research conducted by the university system, the science and technology system and companies**

The previous figure also shows that in terms of basic research, the Basque Country has a lower weight when compared to the EU average, and even compared to the US or Korea. This, together with a number of other indicators, such as publications (according to the figure below) or relative to spending on education and university R&D suggest, also, that the Basque Country should also strengthen its capacity of basic research excellence .

Figure 53: Scientific production and citations by country (2012)



Source: Ikerbasque, from Scopus (extraction May 2014)[34].

Specifically, in documents per million inhabitants the Basque Country is in a better position than the BRIC countries, the newly-joined EU countries and those from the Southern EU, but clearly behind most advanced EU countries. If we consider an indicator of publication quality, such as the number of citations per document, this intermediate position seems somewhat worse, because in citations the Basque Country is overtaken by some of the countries from southern Europe. That is, although there is some problem in terms of the volume of publications, the biggest challenge for the Basque Country arises from their excellence or quality.

However, we must not forget the great advances that the Basque Country has made in this field, as shown by the fact that its relative weight of scientific production in the world has risen from 0.13 in 2003 to 0.19 in 2013 (46% growth). The diversification of the map of scientific agents that has taken place over the last decade has had an

[34] The size of the bubble refers to the value that each territory has on the h index, which measures the productivity and impact of published scientific work. The h index was proposed by Jorge Hirsch, for measuring the professional quality of physical staff and other scientists, depending on the number of citations their scientific papers received. Thus, a scientist has an h index if they have published h papers with at least h citations each. This index can also be used to measure the scientific production of countries.

influence on this, among other factors, with the emergence of institutions specifically dedicated to research, such as the BERCs and CRCs.

Regarding the expenditure on education and R&D in higher education institutions (HEI), the recent OECD report (2013)[35] has shown that both our spending on education and on R&D in the Basque system should increase if it aims to be equated to those of the advanced economies in the EU and OECD.

Figure 54: Spending on Higher Education Institutions (HEIs) in 2009

	HEI Spending	Spending per student in Secondary Schools	HEI Public spending	R&D spending in HEIs
	(% of GDP)	(% of per capita GDP)	(% total of spending)	(% of GDP)
Basque Country	1.0	35	76	0.28
Spain	1.3	42	79	0.38
EU21	1.4	39	79	0.46
OECD	1.6	42	70	0.45

Source: OECD (2013)

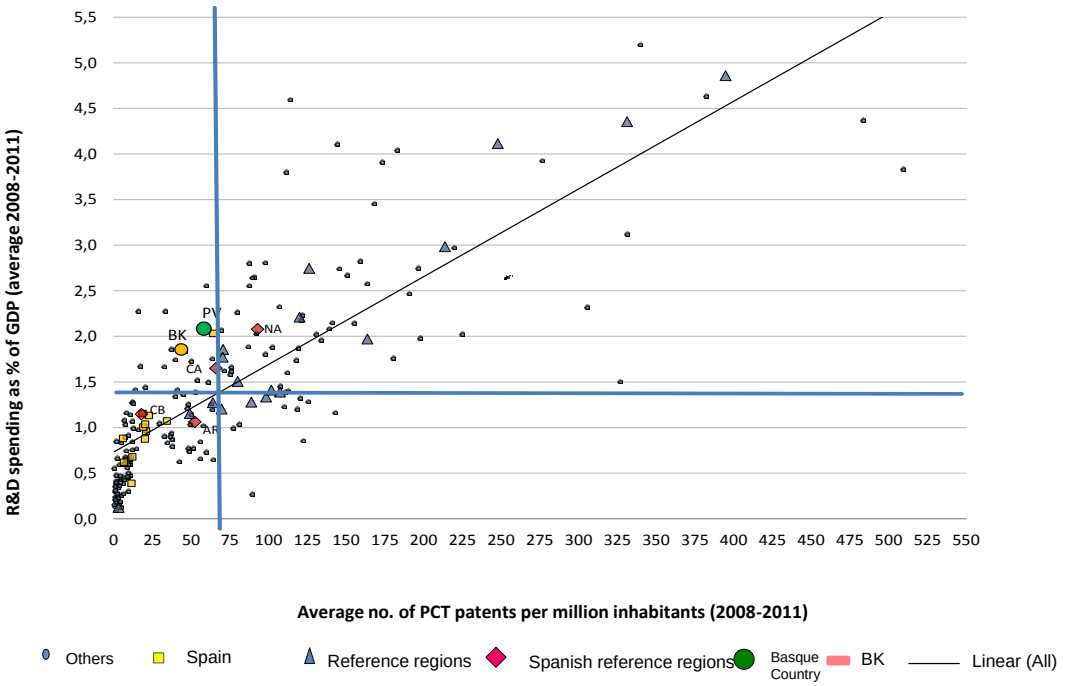
However, this report also emphasizes that, together with insufficient resources, there is also a connection problem between the tertiary education system (especially university) with the needs of society and business.

- **Potential for improvement of the operating results of R&D**

The Basque Country has been making a strong commitment to knowledge and innovation. This commitment is reflected in R&D expenditure, which has evolved incrementally as a percentage of GDP in the Basque Country (2.12% in 2012), above the data in Spain and outdoing the EU-27 after 2010. One sign of the lower efficiency of its innovation system comes with the following figure, which shows the position the Basque Country has in the usual indicators of technological input and output: spending on R&D as a percentage of GDP and the percentage of PCT patents per million inhabitants. As can be seen, in the first, the Basque Country is above the average level of EU regions, while in PCT patents it is below.

[35] Basque Country, Spain. Reviews of Higher Education in Regional and City Development.

Figure 55: Expenditure on R&D (% of GDP) and PCT patents (per thousand) in EU-28 regions

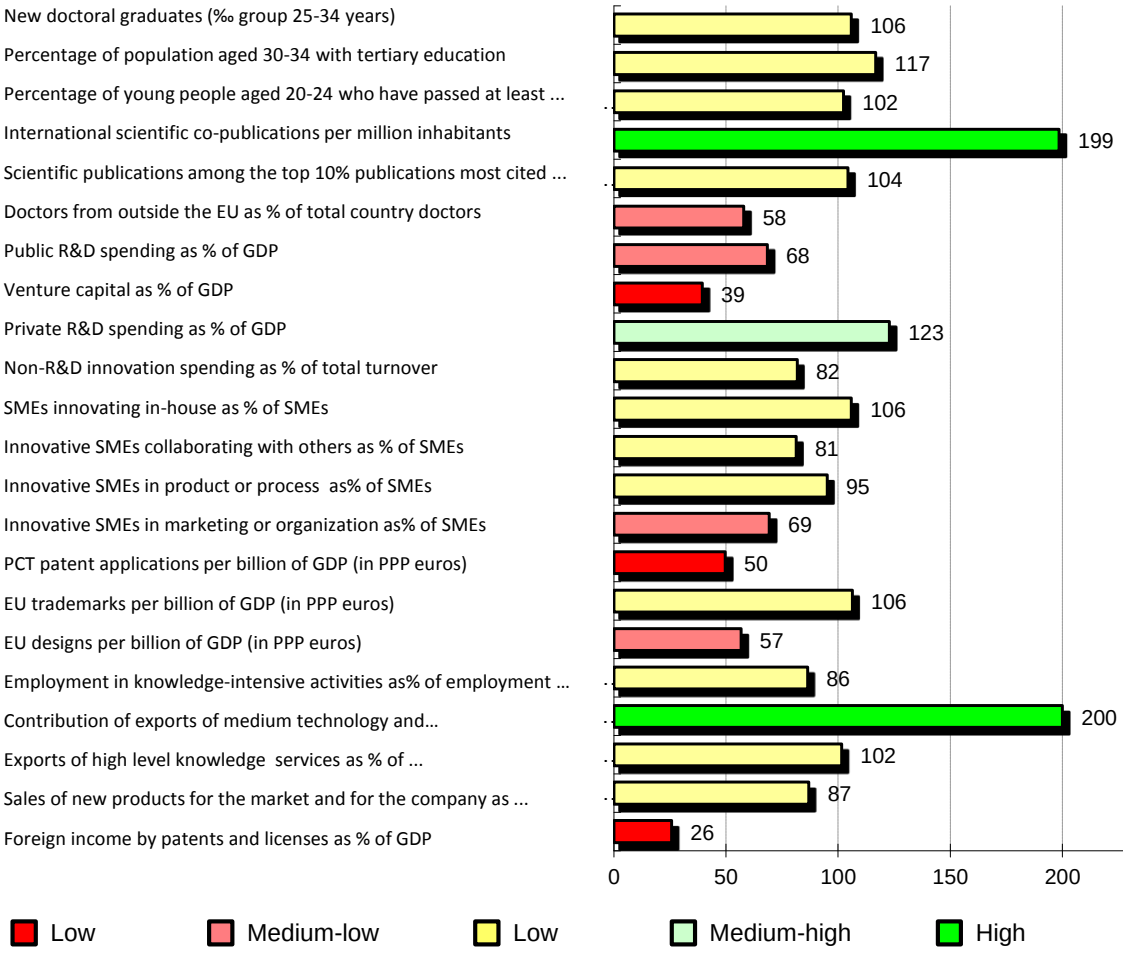


Source: Orkestra, data from Eurostat and the OECD RegPat basis.
Grey triangles, EU regions with starting conditions similar to the Basque Country. Orange diamonds, Spain. Yellow squares, other Spanish regions. Small dots, other EU regions.

Another sign of the existence of a slight problem of efficiency in its innovation system is in the relative position of the Basque Country in the various indicators taken into consideration for the construction of the IUS-2014. The figure below shows, for example, that in input indicators (those which, such as the availability of human capital, are at the top) the Basque Country has a relative better position than in output indicators (those which, like the percentage of sales of new products to the market, licensing revenue, patents per capita etc., are at the bottom). In the case of the availability of human capital it is necessary to clarify, as shown in the 2014 Ikerbasque Science Report, that women account for 35% of total research population even though the number of men and women who finished a thesis has been similar over the last decade (213 women against 194 men in 2011-2012). It is therefore evident that the growth of the research population of the Basque Country has not helped to reduce the gender gap.

In short, we conclude that the Basque innovation system has come a long way in improving its performance.

Figure 56: Relative position of the Basque Country in the different components of the IUS-2014 (EU27 = 100)



Source: Eustat and the European Commission

- **Innovation system not very open to the exterior**

The OECD analysis (2011) and Orkestra point to low levels of knowledge internationalization in the Basque Country. As proof of this, we have the following set of indicators extracted from the Orkestra Competitiveness Report 2011:

Figure 57: Indicators of knowledge internationalization

	Basque Country	Spain	EU-15	US
Imports of high technology goods (% /total)	6	19	21	25
Imports of medium-high technology goods (% /total)	29	39	37	34
Knowledge-intensive services (% /total)	58	79	73	72
Payments of technological balance (% of GDP)	0.1	0.6	2.2	0.4
Income from technological balance (% of GDP)	0.1	0.6	2.4	0.6
Co-invention with foreign patent EPO	2.1	4.4	5.8	n.a.
Co-owned with foreign patent EPO	0.5	4.4	7.5	n.a.
Turnover of subsidiaries of multinationals (% /total companies)	22	26	32	11
R&D spending in subsidiaries of multinationals (% /total companies)	9	38	39	14

Source: Orkestra (2011).

Two aspects deserve particular attention in the coming years in the matter of opening to the exterior, given the restrictive climate of public budgets and demographic scenarios of research staff: attracting foreign funding sources and attracting and retaining talent.

Regarding the former, the figure below shows that the percentage of funding for R&D from abroad is lower in the Basque Country than in Spain or the EU average. This fact is mainly due to lower private financing (i.e., mainly multinationals which finance the R&D that is carried out in the Basque Country). Indeed, as shown in the *Basque Strategic R&D&I Notebook in Europe*, if we look at funding from EU programmes in 2007-2013, the Basque Country has attracted a higher percentage (0.92%) of the total FP7 funding than its GDP represents in the total GDP of the EU28 (0.50%).

Figure 58: Sources of funding for R&D (% /total; 2012)

	Companies	Government	Foreign	Other
Basque Country	55.9	36.0	5.2	3.0
Spain	45.6	43.1	6.6	4.6
Czech Republic	36.2	36.7	26.1	1.1
Germany	65.1	29.5	4.1	1.4
EU28	54.4	33.0	9.2	3.4
US	59.1	30.4	3.8	6.7

Source: Eustat and OECD.

As stated in the aforementioned document, the Basque Country ranks third among Spanish regions, both in participation and in allotted budget, while compared with the 272 NUTS2 regions in the EU it stands at positions 21 and 25 respectively. In this regard the global fundraising goals that were set in the previous book have been exceeded (compared to 395 million euros as a target, we have attracted 461 million), and the growing trend observed in particular since 2011 is to be noted. However, exceeding these targets was especially due to the great capacity for attracting funds and other agents carried out by the two technology corporations because, although there have been positive developments in recent years, companies and especially the university are below the levels of average returns for such agents in Europe and the objectives that were set for them. In this regard, for the forthcoming period, the Basque Strategic R&D&I Book has set a target for growth of 75% with respect to the financing obtained in the FP7.

In terms of recruitment and attraction of talent, the same is necessary for the low percentage of research professionals from abroad in the main agencies (excluding CRCs and BERCs) of the Basque R&D system shown by the diagnoses of the Basque innovation system. Thus, according to the study by Professor M. Sanchez-Mazas of the UPV-EHU and Bizkaia:xede (2007), in 2006 91% of human capital in science, technology and innovation was from the Basque Country, 7% from the rest of Spain and only 2% EU and beyond. While this situation has significantly improved with the creation of the CRCs and BERCs and the efforts of organizations such as Ikerbasque and Bizkaia Talent (or even by the increasing processes of mobility, to and from other countries, of the research staff that the Basque Strategic R&D&I Book shows has been taking place since 2011), yet the situation remains clearly unsatisfactory. Although the recent report of Bizkaia Talent[36] indicates no evidence of brain drain, projections of demographic trends and forecasts of impending retirement of much of the current staff of R&D&I suggest that, if the replacement rate for highly qualified scientific and technological activities is not corrected through active and intense policy of attracting talent and human capital management, the necessary generational changeover will not be not guaranteed.

- **Relatively little business innovation**

Despite great effort in generating innovation capabilities, the percentage of innovative firms remains lower in the Basque Country than the European average, and also this indicator has not improved during the crisis. This lower innovative propensity is

[36] Report on the mobility of talent. Class of 2006, 2007 and 2008. UPV / EHU, University of Deusto and Mondragon University.

particularly observed in non-technological innovation or when combining innovations of a different nature.

Figure 59: Percentage of innovative firms

	Innovative Companies	Only technological innovation	Only non-technological innovation	Technological and non-technological innovation
Basque Country 2009	**45.9**	**18.2**	**7.1**	**18.8**
Basque Country 2010	**48.4**	**15.7**	**6.9**	**21.7**
Basque Country 2011	**48.1**	**17.4**	**6.7**	**21.0**
Basque Country 2012	**45.5**	**17.1**	**7.0**	**17.8**
Spain (2010)	**41.4**	**12.9**	**12.2**	**16.3**
EU-27 (2010)	**52.9**	**12.2**	**14.0**	**26.8**
Germany (2010)	**79.3**	**17.7**	**15.1**	**46.5**
Czech Republic	**51.7**	**9.3**	**16.9**	**25.5**

Source: Eustat and Eurostat

- **High density of agents and risks arising from competition for resources**

There are many people who analyse the Basque innovation system (Navarro, 2010; Navarro et al, 2013; OECD, 2011; Orkestra, 2013; Morgan, 2013, etc.) who have said the Basque Science, Technology and Innovation Network (RVCTI), although it undoubtedly constituted one of the main assets and singularities of its competitive diamond, also had a high number and complexity of agents, with obvious risks of duplication and competition. The unanimity existing in these diagnoses meant that a series of analyses of the different component RVCTI subsystems got under way, without waiting for the approval of this PCTI. The first result of this analysis was the document "*Reorganising the RVCTI: Phase 1. Design of the RVCTI 2020*" prepared by the Department of Economic Development and Competitiveness of the Basque Government, SPRI and Innobasque, confirming the existence of such problems and proposing a rearrangement of some categories of the existing network, as well as a series of indicators and targets for different types of agents in four areas: specialisation and alignment of the agents with the priorities of this PCTI, market orientation, improving excellence and a new model of relations between network agents and between them and companies and the whole of society.

- **Relative indifference of the public towards science, technology and innovation.**

This weakness in the Basque Country was identified in the previous PCTI 2015 where it was noted that people, in recent years, were very concerned about the impact of the economic crisis on public services, especially education, health and social services, yet they seemed far less worried and aware about issues related to science, technology and innovation, not realising that they are largely responsible for many of the improvements and advances in the provision of such public services.

However, the results of the report on the social perception of Science 2013, coordinated by Elhuyar in collaboration with the Department of Education, Language Policy and Culture of the Basque Government and the Professor of Scientific Culture of the UPV/EHU, presented in July 2013, showed that:

1. Basque citizens' interest in Science and Technology has increased by 11% since 2008, and is higher among younger people.
2. A large part of society believe that science and technology should be a priority in public spending (this percentage has increased by 18% since 2008), and precisely in times of crisis should invest more in science and technology.
3. People living in the Basque Country think that the objective of investment in S&T development should be to reach the same level as leading countries in research and innovation.

With regard to social innovation, the publication *Resindex 'A regional index to measure social innovation'*, written by Sinnergiak and edited by Innobasque, concludes: "The rate of social innovation is very low in the overall system. Companies, universities and non-profit organizations need more support to orient themselves toward social matters innovatively, i.e. to be able to generate new or improved products, processes, services and methods to address social needs/demands in a new and different way"(p. 36)

APPENDIX 4. Criteria for prioritization aligned with best practices

In accordance with the European RIS3 process and methodology for the Basque Country, a series of vertical and horizontal priorities under the new "PCTI Euskadi 2020" have initially been identified. The prioritization criteria and their results are described below in a summarized form. More detailed information is contained in the RIS3 Euskadi report appendixed to this document.

Smart specialisation involves identifying the characteristics and unique assets of each region, highlighting their competitive advantage and bringing those involved together around a shared vision of the future.

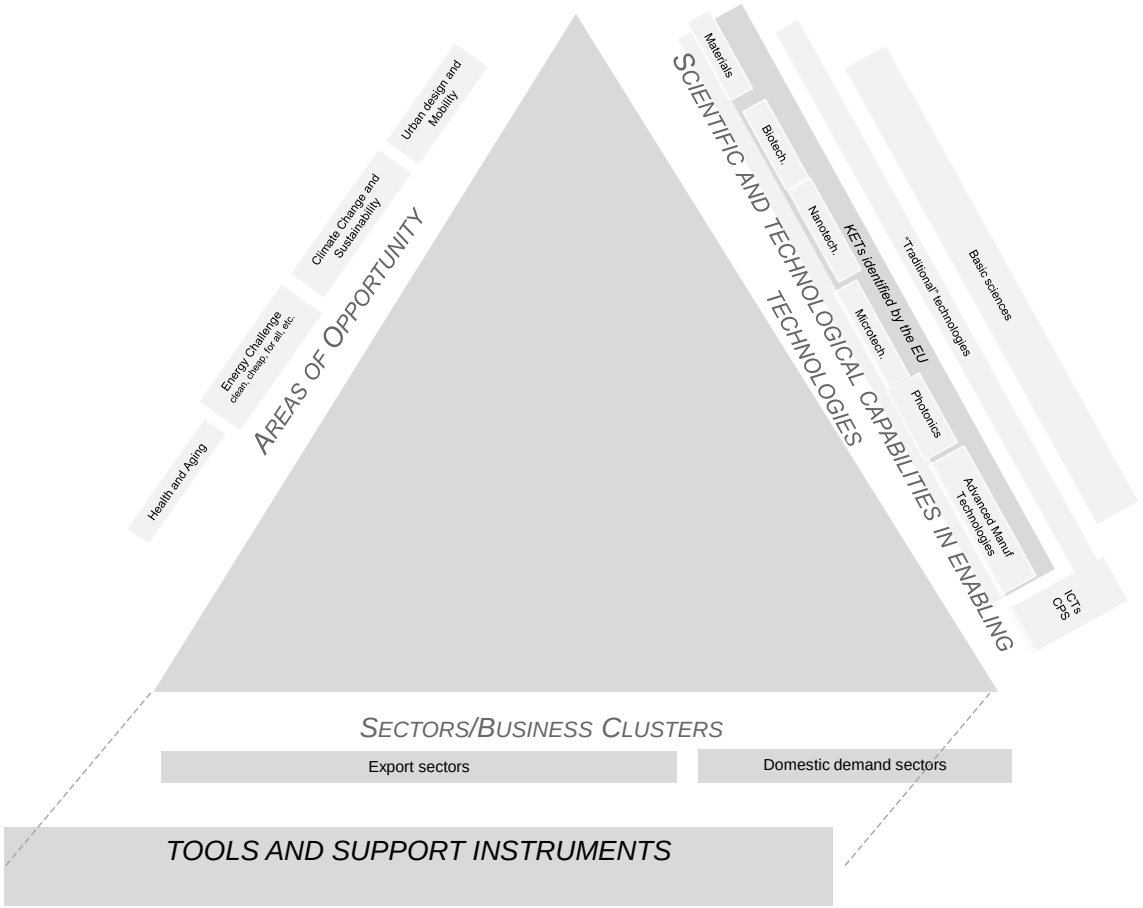
In this sense, the initial criteria used in the selection of these priority areas are as follows:

- Priorities should be based on recognizable strengths:
    - A competitive business fabric capable of exploiting innovation and investing in its development
    - Differential scientific-technological capabilities
- Addressing challenges where there is capacity to provide solutions based on knowledge
- Having support tools (strategies, support programmes, etc.)

Aspects such as the historical background and the evolution of public policies implemented, as well as balance and additionality between priorities, provide a more complete view of the strategy of smart specialisation. These aspects have been considered in the analysis process.

Consequently, the selection of vertical priorities of the Basque Country presented is the result of convergence and interaction of three vectors that have led to the construction of the following triangle:

Figure 60: Triangle showing selection of RIS3 vertical priorities in the Basque Country



Source: Euskadi RIS3 document

The triangle is also supported on the base of a fourth dimension, the existence of tools and public or private support instruments.

The first three mentioned vectors are described below.

A. SCIENTIFIC-TECHNOLOGICAL CAPABILITIES IN "KEY ENABLING TECHNOLOGIES (KET)"

This represents the presence of significant scientific and technological capabilities, with particular emphasis on the so-called 'Key Enabling Technologies' (KET), as the EU defined in its Horizon 2020 programme:

- advanced materials
- industrial biotechnology
- nanotechnology
- Microelectronics and nanoelectronics

- Photonics
- advanced manufacturing technologies

B. BUSINESS SECTORS/CLUSTERS

This reflects the existence of business sectors generating employment, value added and wealth, where good development and orientation of the KET can provide advanced solutions and competitiveness. In the case of the Basque economy, we can highlight the following:

Activities with more relative specialisation that give traction to the economy

- Energy: Electricity + Gas + Oil + New renewable energy as well as the different activities and companies present throughout the value chain: production, transformation and distribution.
- Transport: Automotive + Aviation + Naval + Railway, and the various interactions between them that generate new business opportunities and give traction to the auxiliary associated components industry.
- Machine Tools and Capital Goods: This is a transversal mobilizing, facilitating cross sector area, which also incorporates advanced services related to engineering, installation, maintenance and support.
- Metal and metal transformation: This is the sector with the greatest specialisation of the Basque Country and it also incorporates advanced services related to engineering, installation, maintenance and support.

Activities with less relative specialisation with development potential

- Health: The health sector is specialized from the point of view of the healthcare delivery system and can give a powerful traction to multiple developments related to biomedicine, e-health, or equipment. From a business standpoint, the bioscience cluster is an emerging and developing sector, as part of the BioBasque diversification commitment promoted by the Basque Government sector. Health: The health sector is specialized from the point of view of the healthcare delivery system and can be a powerful tractor multiple developments related to biomedicine, e-health, or equipment. From a business standpoint, the bioscience cluster is an emerging and developing countries, as part of the bet BioBasque diversification promoted by the Basque Government sector.
- Other: Environmental Industry; Agribusiness; Creative and cultural industries; Integrated solutions for urban regeneration and advanced services.

C. MARKETS/DEMAND

This represents the potential application of scientific and technological capabilities and business sectors/clusters to markets of opportunity and greater potential demand. These areas of opportunity are linked to major social demands and future needs, that in the Horizon 2020 programme are summarized as follows:

- Health, demographic change and wellbeing
- Food security, sustainable agriculture, marine and maritime research and the bio-economy
- Safe, clean, efficient energy
- Smart, green, integrated transport
- Climate action, resource efficiency and raw materials
- Inclusive, innovative, reflective Societies

APPENDIX 5. 'Invest in the Basque Country' Strategy

The mission of the "Invest in the Basque Country" strategy (IBC) is to get the positioning of Euskadi as a reference location in Southern Europe in attracting Foreign Direct Investment (FDI), especially for innovative activities and high added value in its priority niches specified in the smart specialisation strategy. The development of this strategy will be carried out without threatening the future development of the most attractive projects and their commitment to the country.

The objectives proposed in the strategy are to increase and strengthen the attractiveness of the Basque Country for quality FDI, creating jobs and wealth, attracting knowledge-intensive projects especially and proactively (multinational R&D centres, technological entrepreneurship, etc.), promoting at all times the location and maintenance of decision centres in the Basque Country.

The strategy of attracting FDI will be proactive towards projects related to priority and unique sectors, which either because of the dimension of the resources invested, or their potential impact, deserve special attention. For these proactive measures to attract investment, IBC will coordinate with all institutions at both operating and strategic levels, especially with the Basque Science, Technology and Innovation Network, those responsible for uptake of direct funds, the Basque capitals on the itinerary of FDI, and in general with all the necessary institutions to respond to the needs of specific projects.

The new "Invest in the Basque Country" strategy contains the following priority lines of action:

- Boost for after care services to extend the activities of FDI firms already established in the Basque Country and increase their value.
- Design and promotion of proactive strategies in priority sectors and areas related to the Industrialization Plan and the strategy of smart specialisation.
- Full use the capabilities of the Basque scientific-technological agents and their infrastructure as allies suitable for development and growth of technology companies.
- Harnessing the potential of the Basque capitals for attracting FDI with an urban component.
- Promotion of formulas for participation in FDI beyond foreign affiliates that will strengthen local projects by fostering partnerships and collaborations and fostering their internationalization.

- Generation, development and updating of tools and materials which will enable people to give an immediate response to the support needs of the process of attracting FDI to the Basque Country.
- Articulation and implementation of an integrated support system for attracting FDI

APPENDIX 6. Reference links

- Basic strategic and economic lines of the PCTI Euskadi 2020
  http://www.irekia.euskadi.net/uploads/attachments/4632/lineas_estrategicas201404_pcti_euskadi_2020.pdf?1400573199

- Strategic priorities for smart specialisation in the Basque Country
  http://www.irekia.euskadi.net/uploads/attachments/4633/prioridades_estrategicas201404_ris3_gobierno_vasco.pdf?1400573225

- Health Plan 2013-2020
  http://www.osakidetza.euskadi.net/contenidos/informacion/publicaciones_informes_estudio/es_pub/adjuntos/plan_salud_2013_2020.pdf

- Public Innovation Plan 2014-2016
  http://www.irekia.euskadi.net/uploads/attachments/4871/PLAN_INNOVACION_PUBLICA_2014_2016.pdf?1403096842

- Industrialization Plan 2014-2016
  https://www.irekia.euskadi.net/assets/attachments/4598/Plan_Industrializacion_2014-2016.pdf?1399902947

- Internationalization Framework 2020 Strategy: Basque Country Strategy
  https://www.irekia.euskadi.net/assets/attachments/4437/EstrategiaBasqueCountry_es.pdf

- IV Environmental Framework Programme for the Basque Country 2020

- Basque Vocational Training Plan 2014-2016
  http://www.irekia.euskadi.net/uploads/attachments/5544/iv_plan_vasco_fp_19112014.pdf

- Jakiunde statement about science policy (2013)
  http://www.jakiunde.org/upload/archivos/Declaraci%F3npol%EDticacient%EDfica.pdf

- Socioeconomic Report published by Eustat in May 2014 corresponding to the 2012 Panorama
  http://ec.europa.eu/regional_policy/information/legislation/index_es.cfm

- Innovation Union Scoreboard 2014 (IUS)
  http://ec.europa.eu/enterprise/policies/innovation/files/ius/ius-2014_en.pdf

- Regional Innovation Scoreboard 2014 (RIS)
  http://ec.europa.eu/news/pdf/2014_regional_union_scoreboard_en.pdf

- OECD Report on the Basque Innovation System

http://www.innobasque.com/home.aspx?tabid=1485

- Plan for Science, Technology and Innovation 2015
  http://www.euskadi.net/contenidos/plan_programa_proyecto/plan_03/es_plan_03/adjuntos/PCTi2015%20%20definitivo%2027-12-2011.pdf

- Orkestra Competitiveness Reports
  http://www.orkestra.deusto.es/index.php?option=com_fabrik&view=table&tableid=12&calculations=0&resetfilters=0&Itemid=265&lang=es

- Ikerbasque Science Report 2014
  http://www.irekia.euskadi.net/uploads/attachments/5168/INFORME_DE_CIENCIA_2014.pdf?1411122586

- Europe 2020
  http://eur-lex.europa.eu/legal-content/ES/ALL/;ELX_SESSIONID=5y6mJ7SpxZyB81gQXpc211QydvpP4vDmyhfQ5ThljWVvr5l26R32!-12304477?uri=CELEX:52010DC0546

- European structural investment funds 2014-2020
  http://ec.europa.eu/regional_policy/information/legislation/index_es.cfm

- Innobasque INDIZEA Report
  http://www.innobasque.com/home.aspx?tabid=1058&idElementoBiblioteca=207

APPENDIX 7. Glossary

• ALP	Apparent labour productivity
• Basic research	Experimental or theoretical research work undertaken primarily to acquire new knowledge of the underlying foundations of observable phenomena and facts, without any application or direct commercial use
• BERC	Basque Excellence Research Center
• BIOBASQUE	Comprehensive business development strategy based on Biosciences
• BIOEF	Basque Foundation for Health Innovation and Research
• CCR	Centres for Cooperative Research
• CLUSTER	Set of interrelated companies and organizations that form a system of vertical and horizontal actions that support each other and represent a competitive advantage for a country or region
• CVCTI	Basque Science, Technology and Innovation Council/ Consejo Vasco de Ciencia, Tecnología e Innovación
• EIN	Innovation Survey in companies of the National Institute for Statistics
• ENERGIBASQUE	Comprehensive business development strategy in the field of Energy
• EPO	European Patent Office
• EU	European Union
• EU15	Set of 15 member countries of the European Union January 1, 1995 to April 30, 2004: EU-

	12 + Austria (AT), Finland (FI) and Sweden (SE)
• EU27	Set of 27 member countries of the European Union from January 1, 2007 to June 30, 2013: EU25 + Bulgaria (BG) and Romania (RO)
• EU28	Set of 28 current member countries of the European Union: EU-27 + Croatia (HR)
• European Cluster Observatory	Online platform that provides a single point of access to data and analysis of clusters, cluster organizations and regional microeconomic framework conditions in Europe
• Eustat	Basque Statistics Institute
• Experimental development	The acquisition, combination, configuration and use of existing knowledge or techniques, whether scientific, technological, business or of another nature, with a view to developing new or improved products, processes or services.
• FP7	European Union 7th Framework Programme for Research
• GDP	Gross Domestic Product
• GPT	General Purpose Technologies
• GVA	Gross Value Added
• ICT	Information and Communications Technology
• Ikerbasque	Basque Foundation for Science
• Industrial research	Planned research or critical studies aimed at acquiring new knowledge and skills that can be useful in developing new products, processes or services or that allow significant improvements in existing ones.
• IPFSL	Private Non-Profit Institutions

• IUS	Innovation Union Scoreboard. European Innovation Scoreboard Panel
• KET	Key Enabling Technologies
• Market pull	Research oriented to customer demand
• NEBTs	New Technology-based Enterprises
• OECD	Organization for Economic Cooperation and Development
• PCT	Patent Cooperation Treaty
• PCTI	Science, Technology and Innovation Plan/Plan de Ciencia, Tecnología e Innovación
• Policy mix	The combination of monetary policy and fiscal policy of a country
• PPP	Purchasing power parity
• R&D	Research and Development
• R&D&I	Research, Development and Innovation
• RIS	Regional Innovation Scoreboard. Panel of indicators of regional innovation
• RIS3	Research and Innovation Smart Specialisation Strategy
• RVCTI	Basque Science, Technology and Innovation Network/Red Vasca de Ciencia, Tecnología e Innovación
• Scopus	Bibliographic database of abstracts and citations of scientific journal articles
• SMEs	Small and Medium Enterprises. Enterprises employing fewer than 250 people whose turnover or annual balance sheet total does not exceed 40 and 27 million Euros respectively. They must keep the independence criterion formulated as follows: it is considered an independent

	company provided the share capital or voting rights by other companies or non-SME groups does not exceed 25%
• TCs	Technology Centres
• Technology “push”	Research driven by advances in science and technology
• TFP	Total factor productivity
• TVAA	Annual accumulated variation rate
• UPV/EHU	University of the Basque Country
• WIPO	World Intellectual Property Organization