



# National Research and Innovation Strategy For Smart Specialization 2014-2020

## Executive Summary



## 1. Preface

The recent economic crisis makes it increasingly urgent to improve the whole innovation framework and to boost competitiveness of enterprises, as well as to address the major societal challenges in the areas of health and environment, to confront unemployment and to reverse the increasing "brain drain" trend of the highly qualified human force.

Previous efforts to mobilize key players of the innovation ecosystem through the development of research and innovation infrastructures and through financial support for RD&I activities in the public and private sector, led to an overall improvement of the country's innovation performance. However, there is still a gap from the European average regarding R&D spending and the targets set nationally concerning domestic expenditure on R & D spending have not yet been achieved. The total gross domestic expenditure on research as a percentage of Gross Domestic Product (GDP) increased from 0.57% in 2003 to 0.80% in 2013, while the relevant EU-27 indicator increased during the same period from 1.85% to 2.06 %.

The Greek Research, Technological Development and Innovation (RTDI) System shows strengths, such as good performance in co-financed EU Framework Programmes, a substantial Greek representation in international research networks and projects of the European Roadmap for Research Infrastructures. In addition, there is a strong Greek research community abroad as well as highly educated human resources within the country along with "pockets" of excellence in public research and academic institutions and the private sector, as well as good performance (above EU average) regarding scientific publications.

## 2. Overview of Strengths, Weaknesses, Opportunities and Threats (SWOT)

Building on strengths and opportunities while addressing the weaknesses and threats define the key challenges that the country has to deal with and they form the basis of the National Smart Specialization Strategy. The Table below summarizes the RTDI SWOT analysis of the Greek RD&I system.



Strengths	Weaknesses
<p>S.1 Strong specialization in terms of Gross Value Added (GVA) and employment in the sectors of Tourism, Agrifood, Waterways, Arts, Cultural and Creative Industries (CCI), Waste Management and Health.</p> <p>S.2 Culture and cultural heritage of inestimable value with direct impact on Tourism, Arts and CCI generally.</p> <p>S.3 Relatively high educational level of the population (close to the EU average, percentage of people with knowledge and higher education diplomas).</p> <p>S.4 Rates of R&amp;D personnel (% of total employed) that are close to the EU average.</p> <p>S.5 Very competitive participation of researchers to the European competitive research programs (FP7), especially in the fields of Information &amp; Communication Technologies (ICT), Transportation, Materials, Nanotechnology, Agrifood and Health, and important specialization in KETs such as nanotechnologies, micro/nanoelectronics, advanced materials etc.</p> <p>S.6 High research specialization in national level in the fields of ICT, Health, Agrifood, Materials, Environment and Energy.</p> <p>I.7 Higher than the global average impact factor concerning the publications of Greek researchers in the fields of Natural Sciences and Engineering and Technology Science.</p> <p>S.8 Development of innovative clusters in the fields of ICT, Health, Creative Industry (gaming), Aerospace and Microelectronics.</p> <p>S.9 Increased cooperation among innovative SMEs.</p> <p>S.10 High absorption of organizational innovation by enterprises.</p> <p>S.11 High enterprise birth rates.</p>	<p>W.1 Low RTDI expenditure rate as a percentage of GDP, especially regarding the participation of the private sector.</p> <p>W.2 Lack of purely national funding resources for RTDI activities.</p> <p>W.3 Fragmentation of the research effort and of the infrastructure and lack of critical mass.</p> <p>W.4 Many small businesses of medium/low technology which rely on the acquisition-adoption of mature technology from abroad and not on R&amp;D.</p> <p>W.5 Uneven regional development in terms of GDP and of RTDI performance.</p> <p>W.6 Lower than the EU average rate (% of total) of enterprises with product innovation.</p> <p>W.7 Low contribution of innovative products in total turnover of enterprises with products innovation.</p> <p>W.8 The majority of the expenditures for innovative activities are related to the purchase of machinery and equipment (63.2%) and significantly lower to RTDI.</p> <p>W.9 Extremely low number of patents.</p> <p>W.10 Extremely low funding of business risk (e.g. VCs) and lack of relevant culture.</p> <p>W.11 Extremely low level of innovative activities in public procurement.</p> <p>W.12 Little correlation between demand and supply of RTDI from businesses and research institutions.</p> <p>W.13 Deficiency of intermediate mechanisms and of specialized staff regarding technological collaboration, patent protection and research results utilization.</p> <p>W.14 Non satisfactory diffusion of ICT in the private and public sector.</p> <p>W.15 Delay on issues concerning the bridging of the digital divide with the other EU member</p>

	<p>states.</p> <p>W.16 Insufficient education of employees of Greek enterprises regarding new technologies and low performance in lifelong learning in general.</p> <p>W.17 Innovation unfriendly environment, educational system and culture in general.</p> <p>W.18 Complex bureaucratic framework regarding RTDI management and limited administrative capacity of the public sector. Continuous changes in the governance of research and technology since 2009.</p> <p>W.19 Innovation issues: ambiguity in the management, overlapping of responsibilities and lack of coordination among ministries.</p> <p>W.20 High policy level dependence of priorities and funding of Greek RTDI system on EU (rolling FPs and Structural Funds).</p> <p>W.21 Lack of coordination between RTDI policy and other public policies.</p> <p>W.22 Weakness in actually promoting Research &amp; Technology (R&amp;T) as a policy priority that contributes to growth of economy with specific actions, measures, investments, etc.</p> <p>W.23 Limited society perception regarding added value and benefits of R&amp;T in the quality of life and economy.</p> <p>W.24 The Greek culture is characterized by a high level of uncertainty avoidance. This trait is related to low performance regarding innovation and to increase of bureaucracy (Hofstede Culture Compass).</p> <p>W.25 The looming inability of complementary national funding for the participation to programs etc. of international / intergovernmental organizations makes the costs unprofitable.</p>
<b>Opportunities</b>	<b>Threats</b>
<p>O.1 Exploitation of the country's geostrategic position in the South-East (SE) end of the EU.</p> <p>O.2 The Partnership Agreement (2014-2020) and the formulation of the RIS3 strategy which highlights RTDI in the priority sectors as a driving force for the growth of the country.</p> <p>O.3 New institutional framework for RTDI with positive extensions to development of national strategy and more effective cooperation between the Central Government and the Regions. Trusting relationships between Center-Regions through</p>	<p>T.1 Volatile economic environment, prolonged economic crisis, significant decline in GDP.</p> <p>T.2 High unemployment, particularly among young people.</p> <p>T.3 Constantly changing tax regime.</p> <p>T.4 Exports stagnation.</p> <p>T.5 Growing exodus of scientists, talents etc. (brain drain) inside and outside Europe. Large international mobility of Greek scientists and researchers of all levels.</p>

<p>RIS3 design.</p> <p>O.4 New programming period for European Programmes: RTDI with increased resources (Horizon 2020, COSME)</p> <p>O.5 Redesign of RTDI strategy aimed at improving competitiveness and economic recovery.</p> <p>O.6 Greek scientific community of abroad is highly skilled, and holds valuable experience and networking.</p> <p>O.7 Cultural heritage with significant multiplier effects from the application of interdisciplinary research, implementation and use of ICT and interrelation with tourism.</p> <p>O.8 Development of a brand name in the food processing industry and promotion of the Mediterranean diet.</p> <p>O.9 Internationalized institutional framework for sustainable development and environmental protection.</p> <p>O.10 International expansion of markets of generic drugs and of medical and wellness tourism.</p> <p>O.11 Wide spread of use of mobile - smart devices and penetration in many areas of human activity</p> <p>O.12 Exploitation of the country's participation in international / intergovernmental research &amp; technology organizations and significant opportunities for cooperation with Greek businesses in key sectors.</p> <p>O.13 Existence of intensive knowledge businesses and creativity.</p> <p>O.14 Exploitation of RTDI results.</p>	<p>T.6 Reduction of salaries of research staff and non-renewal of research community.</p> <p>T.7 Looming widening of the gap with the technologically advanced countries.</p> <p>T.8 Tendency of utilization of RTDI results from foreign bodies ("Innovate in Greece, Exploit Elsewhere")</p> <p>T.9 The apparent reduction of the Greek participation to "Horizon2020" actions due to increased competition and to the inability of Greek bodies to participate to actions that require co-financing from purely national funds.</p> <p>T.10 Slow replacement of traditional companies from new, technology intensive, enterprises.</p> <p>T.11 Phobic behavior of the population towards technology and sensitive behavior towards environment and health issues.</p> <p>T.12 Continuing political instability in the wider Mediterranean region, Middle East and Eastern European regions.</p>
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### 3. Conclusions and main challenges stemming out from the SWOT analysis

Summing up the SWOT analysis we can mention the following:

- Greece has excellent human resources and RTDI structures, but they are not well exploited,
- The private sector lags seriously behind in RTDI investment, especially in product innovation and use of new knowledge. However, critical masses of dynamic SMEs are found in both "old" and new production sectors.
- The economic crisis complicates the possibility of exploitation of human resources and the overall development of a national RTDI strategy.
- There are strong challenges and resistances on the role of state and on the mentality towards innovation of both the state and the private sector.

- A well planned policy intervention is needed in order to reinforce and exploit the potential RTDI system (structures and human resources) in the country in order to:
  - restart the economy, through the restructuring of production, and
  - to meet the challenges of social destruction that has taken place as well as the challenges arising from global issues (climate change, refugee and migration flows, environmental disaster, food crisis etc.).

The main aim of this policy is the effort to reinforce RTDI activity in the private sector by strengthening employment, by developing new businesses and clusters and by strengthening the institutional framework.

Based on the SWOT analysis, the following challenges-intervention needs for the new programming period 2014-2020 arise:

- Development of human resources and infrastructure in priority sectors and fields of application of Key Enabling Technologies (KETs).
- Utilization of the intangible capital of public RTDI system and international networking for the benefit of social development in competitive terms.
- Exploitation of the potential of young scientists as the most important investment of the Greek society and inversion of the bleeding phenomenon of 'brain drain'.
- Development of assimilative and innovative capacity of the productive sector (public and private):
  - strengthening of existing capacities of productive institutions, and
  - utilization of scientific and technical potential for the emergence of new productive entities (spin-offs, startups, etc.) and new business models (open innovation, peer production, cooperative knowledge - know-ops, etc.).
- Thickening of the innovation system with institutional development and cooperation skills, communication and interaction to develop meeting 'spaces', development of strong and weak ties and development of innovative collaborative clusters (innovation clusters).
- Support of the extroversion of the innovation system in order to prove to the Greek society the importance, the role and the potential of public RTDI and to develop creativity and innovation culture.
- Strengthening of the internationalization of actors in the innovation system, both in terms of developing partnerships as well as promoting active assimilation and use of scientific and technological developments internationally.
- Development of collective processing mechanisms and configuration of the RIS3 Strategy to remain timely, intelligent and sustainable over time.

#### **4. RIS3: Vision and Strategic priorities**

The vision driving the National Research & Innovation Strategy for Smart Specialization (RIS3) is a nation prioritizing people and society resulting in a high level of quality of life, low environmental footprint and respect for cultural heritage and creativity.

The main objective of the National RIS3 is a transformation of the productive sector through research, technological development and innovation while mitigating regional disparities and creating sustainable employment.

At present innovation policy goes beyond the simple strengthening of research and technological development of businesses and the research infrastructures. It aims to support



the improvement of the innovation system as a whole. The human factor and the production of new knowledge, businesses, especially those who experiment on new ideas, technologies and business models in order to grow and become more competitive, and the development of a system that creates and diffuses new knowledge dealing systematically with the innovation barriers, form parts of this whole.

In the current international environment, the division of labor in production and exploitation of knowledge is overturned at high speed because of subversive innovations (disruptive innovations). These innovations do not result from a linear continuity of previous cumulative investments in research and development, but stem from radical visions of the issues (and from the exploitation of new knowledge in areas that were previously outside the dominant paradigm and the socio-community's mental map). As emphasized in the methodology of the Smart Specialization Strategy the snare of entrapment must be avoided. In other words, while the RIS3 focuses properly on the development and utilization of critical masses and of competitive advantages, it should not "burn bridges", undermining the development of fundamental scientific and technical areas and restricting the possibility of exploiting new RTDI pathways (underestimation of the importance of innovation produced by the innovative curiosity) and the possibility of actual exploitation of developments that occur internationally.

Therefore, research organizations (Universities and Research Centres) should play an important role in ensuring the robustness of RIS3 as they form the dynamic and internationally recognized part of the national innovation system, which can ensure the connection with scientific and technological developments and the broad technological base that is necessary. One of the concerns of the strategy is not to trap the spectrum of activities of research institutions through sectoral specialization, but to ensure their mobilization, in order for the sectoral priorities " to be combined with RTDI to promote the development and / or transformation of the economy" increasing the synergies between public and private investments. The research institutions are drivers of RIS3, notably concerning the central objective of the reconstruction of the production and the transformation of the development model.

On the other hand, the emergence of new innovative and productive institutions and the strengthening of those who currently persist and distinguish themselves in this effort are important in order for the country not to become victim of the 'creation "invented here, exploited elsewhere" phenomenon. An important factor in this effort is the encouragement of undertaking the risk and of the identification of opportunities arising from the uncertainty of RTDI activities. In this direction, the cultivation of "learning from failure" attitudes and practices are also elements of RIS3. Thus, RIS3 ensures the development of all RTDI types:

- Innovation produced by "market needs" (demand driven)
- Innovation produced by research from scientific curiosity (curiosity-driven) and Innovation produced to fulfill strategic mission (mission-led)

To fulfill the afore presented vision, the country has set a target, in the context of the Medium Term Financial Strategy and the National Reform Program, that investments in

research will reach 1.2% of GDP in 2020 from the current (2013) 0.80%. Respectively, investment in research from businesses is expected to rise from 0.27% of GDP in 2013 to around 0.38% of GDP in 2020. The ambition is these targets will be revised upwards in the update of RIS3.

*Table 1 - Provision of research and technological development objectives for 2020*

<b>Indicators for measuring objectives of the strategy for Research and Innovation</b>	<b>2013</b>	<b>2020</b>
Percentage of spending on Research and Development in relation to GDP	0.80%	1.2 %
Enterprise expenditure on Research & Development in relation to GDP	0.27 %	0.38 %

*Table 2 - Innovation Union Scoreboard Indicators*

<b>Innovators</b>	<b>2013</b>	<b>2020</b>	<b>Source</b>
SMEs introducing product or process innovations as percentage of SMEs	33.7%	To be set at the end of the year 2016	NDC (CIS 2010-2012 results)
SMEs introducing marketing or organisational innovations as percentage of SMEs	45.0%	To be set at the end of the year 2016	NDC (CIS 2010-2012 results)
<b>Economic Effects</b>			
Employment in knowledge-intensive activities (manufacturing and services) as percentage of total employment	12.3%	To be set at the end of the year 2016	IUS 2014
Medium and high-tech product exports as percentage of total product exports	-5.41%	To be set at the end of the year 2016	IUS 2014
Knowledge-intensive services exports as percentage of total service exports	53.0%	To be set at the end of the year 2016	IUS 2014
Sales of new-to-firm innovation as % of turnover (CIS)	6.6%	To be set at the end of the year 2016	NDC (CIS 2010-2012 results)
<b>Finance and support</b>			

R&D expenditure in the public sector as percentage of GDP	0.52%	1,2%	NDC (R&D 2013 results)
<b>Firm investments</b>			
R&D expenditure in the business sector as percentage of GDP	0.27%	0.38%	NDC (R&D 2013 results)

The RIS3 consultation procedures have led to the identification of specific priorities within the following eight fields:

- **Agrofood**
- **Life Sciences & Health - Pharma**
- **Information and Communication Technologies**
- **Energy**
- **Environment and Sustainable Development**
- **Transport and Logistics**
- **Materials - Construction**
- **Culture - Tourism - Cultural & Creative Industries**

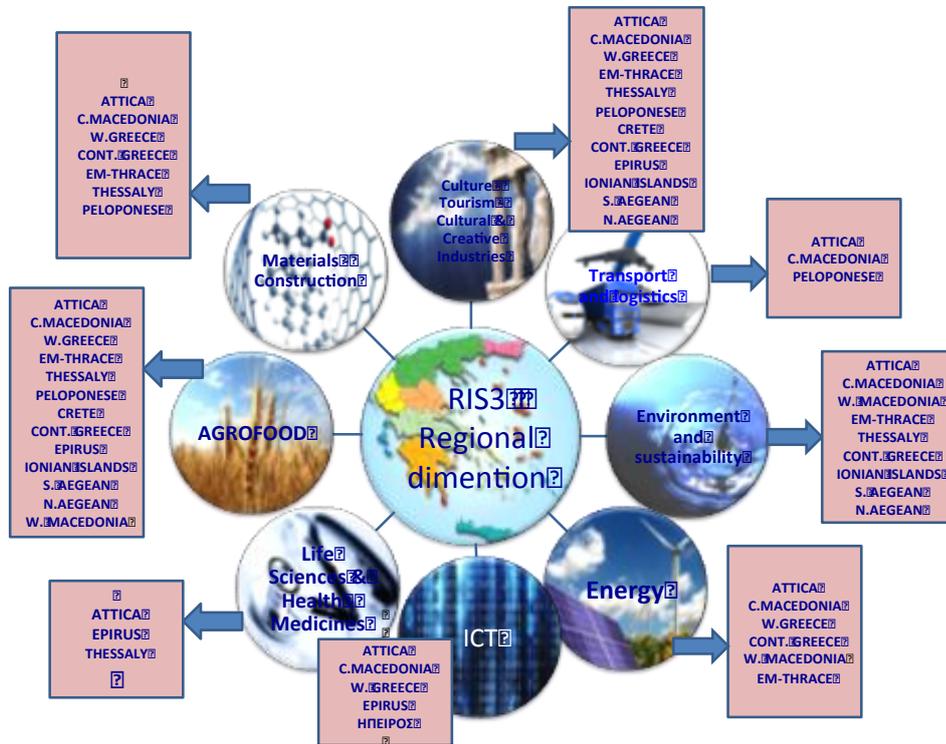
## 5. Priority fields in National Smart Specialization Strategy and Complementarities with regional RIS3

A correlation between regional and national priorities highlights the following remarks:

- Out of the eight national priority fields, Agrofood, Tourism-Culture, Materials and Life Sciences & Health /Medicine are vertical priorities at regional level with direct needs for the relevant private sector. ICT, Energy, Transport and Environment, are more horizontal supporting areas for entrepreneurship and innovation for most regions.
- Another challenge is the low level of implementation of KETs, except ICT. This strongly highlights the role that national RIS3 needs to play in order to further diffuse KETs but also to mobilize RDTI infrastructure in favor of that.
- It seems that regions do not focus enough on processing sectors (except agrofood and food processing). Apart from Thessaly, Central Greece (metal) and K. Macedonia (Textiles and clothing), RTDI targeted interventions in processing are not recommended by the regions. This implies two things: Firstly, that manufacturing is declining and secondly, it proves the low demand for innovation by these sectors and the need for diffusion of technologies to industry.
- Only three regions reveal as their priority to support entrepreneurship (and especially young entrepreneurship) through collaboration between academia and the private sector: Attica, Epirus and Crete. Relevant policy measures should be promoted by other regions with RDTI infrastructure as well. For example, there could be synergies and interaction between the development models between regions (e.g. Crete and Epirus) and central planning should play its role as a facilitator.

A more detailed description of the specific priorities areas in each specialization field and an initial estimation concerning the policy intervention level (regional- national) is presented in the following sections.

Figure 1 – RIS3 regional specialization



## 5.1 Agrofood

Fields	Critical areas for RTD Intervention	Intervention level
Improving the competitive position of agricultural crop product and livestock production in international markets	<ul style="list-style-type: none"> <li>Enhancement and improvement of the characteristics of Greek products of primary production with an emphasis on quality and safety</li> <li>Increase productivity of crop and livestock production and processing</li> </ul>	National & Regional
Improving the competitive position of Greek food to international markets	<ul style="list-style-type: none"> <li>Enhancement and improvement of the unique characteristics of Greek products processed - emphasis on quality and product safety</li> <li>Increasing manufacturing productivity</li> </ul>	National & Regional
A sustainable primary production and processing	<ul style="list-style-type: none"> <li>Reduce the environmental footprint and protecting ecosystems</li> </ul>	National & Regional
Improving understanding of the relationship between nutrition, health and wellness, and the consequences for the agricultural food products and foodstuffs	<ul style="list-style-type: none"> <li>Assessment of the nutritional value of Greek food - Greek food Recommendation tables.</li> <li>The role of traditional Greek food and indigenous food to improve the health of the Greek population.</li> </ul>	National & Regional

## Correlation with the National Roadmap for Research Infrastructures

It is envisaged that the priority area of agrofood will be supported by two national interdisciplinary research infrastructures (RIs) related to biodiversity (terrestrial and marine ecosystems) and plant protection. These RIs are expected to contribute to the further development and promotion of innovation of the agrofood and natural product sectors.

More specifically, these infrastructures will support:

- Sustainable exploitation of the wealth of Greek biodiversity and the discovery of natural, products of high added value for the food, cosmetics and pharma industry.
- Protection of plant and crop health through prevention of intrusion from quarantine pests in plants and emerging organisms (HO) - microorganisms, insects, weeds, associated with agricultural and forest ecosystems.
- Sustainable exploitation of marine living resources and protection of the marine environment in the Eastern Mediterranean region with multiple benefits for the aquaculture, pharma and cosmetics sectors.

## 5.2 Life Sciences & Health – Medicine

Fields	Critical areas for RTD Intervention	Intervention level
Pharmaceuticals and medical technologies	<ul style="list-style-type: none"> <li>· Biomedical research focus: <ul style="list-style-type: none"> <li>• the development of technologies and tools for discovering new drugs, therapies and methods,</li> <li>• developing bio-pharmaceuticals and generic drugs with high added value, and</li> <li>• the development of new therapies.</li> </ul> </li> <li>· Translational medical research on the applications of scientific achievements and clinical practice.</li> <li>· Clinical trials.</li> </ul>	National
Systems, applications and services in the health sector	<ul style="list-style-type: none"> <li>· New products for the prevention, diagnosis and treatment of diseases.</li> <li>· Medical, diagnostic and imaging services and bioinformatics services.</li> </ul>	National & Regional
Expanding value chains by developing interactive interfaces	<ul style="list-style-type: none"> <li>· Development of medical tourism.</li> </ul>	Regional
	<ul style="list-style-type: none"> <li>· Diversification of production or research activities together with the development of food and cosmetics industry, materials and environmental technologies.</li> <li>· Development of new medicines.</li> </ul>	National & Regional

## Correlation with the National Roadmap for Research Infrastructures

In the highly competitive field of Biosciences, Health & Pharma the National Roadmap for RIs adopts a "holistic" approach aiming to support the priority sectors and value chains emerging from RIS3 and to stimulate openness of research and business environment of the country by strengthening links with European Research Area. The RIs envisaged for this priority area have an open and cooperative nature to effectively support and promote business cooperation with research organizations and to encourage the interconnection and

integration of collaborative research results and innovation in domestic and global value chains.

Specific research infrastructures of the Roadmap in the fields of Biosciences, Health & Pharma aim to :

- Developing a national network of biobanks and their promote their connection with the corresponding European network.
- Supporting translational research, clinical testing and targeted medical treatment for the rapid and efficient translation of research findings into new products to prevent, diagnose and treat diseases.
- Supporting the bio-pharmaceutical research and the interconnection of basic research and clinical use (development of bioactive small molecules, identifying drug targets, structural biology, bio-medical imaging)
- Supporting effective management and maintenance of a great volume biodata (e-infrastructure and storage centers, bio-molecular data and animal models for human diseases).

### 5.3 Information & Communication Technologies

Fields	Critical areas for RTD Intervention	Intervention level
Content and information management technologies	<ul style="list-style-type: none"> <li>· Open and big data.</li> <li>· Cultural heritage.</li> <li>· Automatic translation.</li> <li>· Development of advanced entertainment software games and innovative technologies and gamification techniques.</li> <li>· Tools for creative content businesses, media, knowledge and learning.</li> <li>· Multimodal and physical interaction with the computer.</li> </ul>	National & Regional
Future Internet	<ul style="list-style-type: none"> <li>· Addressing Internet restrictions.</li> <li>· Development of efficient computational and data management models.</li> <li>· Smart networks and novel internet architectures.</li> <li>· Smart optical and wireless network technologies.</li> <li>· Advanced cloud and infrastructure services.</li> <li>· Tools &amp; Methods for software development.</li> <li>· Collective awareness platforms for sustainability and social innovation.</li> <li>· Advanced 5G network infrastructure for the Internet of the future.</li> </ul>	National
ICT horizontal activities	<ul style="list-style-type: none"> <li>· Internet of Things and Platforms for Connected Smart Objects.</li> <li>· Human-centric Digital Age.</li> <li>· Complex systems</li> </ul>	National
Robotics	<ul style="list-style-type: none"> <li>· New generation robots and supporting technologies with application in industry and services.</li> <li>· Operation in dynamic real-world environments with increased possibilities of autonomy, adaptability and safe interaction with humans.</li> </ul>	National
Factories of the	<ul style="list-style-type: none"> <li>· Process optimization of manufacturing assets.</li> </ul>	National

Future	<ul style="list-style-type: none"> <li>· ICT-enabled modelling, simulation, analytics and forecasting technologies.</li> <li>· 3D Printing.</li> </ul>	
ICT applications in priority areas	<ul style="list-style-type: none"> <li>· Smart, green and integrated transport.</li> <li>· Health, demographic change and wellbeing.</li> <li>· Safe, 'clean' and efficient energy.</li> </ul>	National
Components and systems	<ul style="list-style-type: none"> <li>· Nano-Microelectronics and Embedded Systems</li> <li>· Sensors (MEMS).</li> <li>· Analog electronics.</li> <li>· Digital electronics.</li> <li>· Electronics for video and image management.</li> <li>· Microwave devices.</li> <li>· Optical devices.</li> <li>· Design tools and simulation of microelectronic devices.</li> <li>· Production processes for microelectronic and electronic devices.</li> <li>· Software embedded devices.</li> <li>· Low consumption electronics.</li> </ul>	National

### Correlation with the National Roadmap for Research Infrastructures

It is envisaged that the ICT priority area will mainly be supported by electronic infrastructures (e-infrastructures) targeted to:

- Effective support for research & innovation-driven needs for "big computing" and "big data". These infrastructures capitalize the highly competitive human scientific potential in the field of ICT and enhance the role of the corresponding Greek organizations in the relevant European and global initiatives (Géant, PRACE, OPENAIRE, RDA).
- Support other high added value sectors such as life sciences, with special requirements to computing resources (capitalizing and reinforcing cores of excellence and reinforcing background knowledge and innovation in bioinformatics, bio-imaging etc.) They also address the needs of the scientific community, hospitals, diagnostic centers and biotechnology companies with regard to integrated, state of the art bio-information systems and services.
- Promotion of cultural heritage, the arts and humanities, through development of virtual infrastructures that leverage and expand content management technologies, interoperability of digital repositories and language technologies and applications. These infrastructures are primarily serving the priority areas of culture and tourism, while enhancing the contribution of ICT to horizontal activities, with application mainly in the content industry.

## 5.4 Energy

Fields	Critical areas for RTD Intervention	Intervention level
Energy saving technologies	<ul style="list-style-type: none"> <li>· Energy saving in buildings</li> <li>· Energy saving in industrial and agricultural sector</li> </ul>	Regional and National
Technologies of production and	<ul style="list-style-type: none"> <li>· Solar Energy Systems</li> <li>· Small hydroelectric multipurpose projects</li> </ul>	Regional and National

storage of energy from RES	<ul style="list-style-type: none"> <li>· Wave energy</li> <li>· Production of electricity and heat with geothermal energy</li> <li>· Small wind turbines and subsystems</li> <li>· Hybrid fuels and biofuels</li> <li>· Storage of energy from RES</li> <li>· Fuel Cells and H2</li> <li>· Integrated RES systems for islands and isolated areas</li> </ul>	
Smart grids and transmission and distribution systems	<ul style="list-style-type: none"> <li>· Smart Grids (with application to production, transport, distribution)</li> <li>· Optimization of systems of transmission and distribution of electricity</li> </ul>	National
Reduction of the effects of using conventional fuels	<ul style="list-style-type: none"> <li>· Extraction of hydrocarbons</li> <li>· Thermoelectric plants</li> <li>· Antipollution technologies</li> </ul>	National
Scientific and technological (S & T) support of public energy policy	<ul style="list-style-type: none"> <li>· Scientific and Technological (S &amp; T) support of public energy policy, including the socio-economic dimension in the context of regional, national, european and international challenges of the sector and <b>the socio-technical transition to RES</b></li> <li>· Expansion of the value chains and reinforcement of activities resulting from the interface among sectors (energy - transport, energy - tourism, energy - urban development, <b>energy - materials-constructions</b>)</li> </ul>	National

### Correlation with the National Roadmap for Research Infrastructures

The Research Infrastructures emerging as priorities in the National Roadmap in the field of Energy are associated with a wide range of key priorities in the fields of renewable energy and conventional fuels. Both these areas are characterized by strong links and established partnerships with industry.

More specifically research infrastructures in the energy sector are targeted to :

- Integrated chain of Renewable Energy Sources, energy conversion technologies, transport, energy storage, focusing on solar energy technologies (thermochemical technologies, centralized solar systems for energy production and storage, application of solar technologies into traditional energy production processes) and the use of biomass, clean energy technologies as well as areas that are beginning to gain a strong industrial interest (such as CO2 capture & storage).
- Assessing emissions and fuel consumption in vehicles.

## 5.5 Environment & Sustainable Development

Fields	Critical areas for RTD Intervention	Intervention level
Waste management	<ul style="list-style-type: none"> <li>· Management and exploitation of solid urban waste</li> <li>· Management of agro-pastoral waste</li> <li>· Industrial waste management</li> <li>· Management of excavation, construction and demolition waste</li> <li>· Tire Management</li> <li>· Wastewater management</li> <li>· Management of toxic and hazardous waste</li> </ul>	Regional and National
Prevention, protection and restoration of air, soil, groundwater and marine environment	<ul style="list-style-type: none"> <li>· Pollution prevention / remediation. Restoration of soils and groundwater</li> <li>· Creation of expertise for addressing crude oil spills in deep water</li> <li>· Air pollution</li> <li>· Protection of biodiversity in areas of tourist and agri-food interest</li> <li>· Management and protection of water resources and aquatic environment</li> </ul>	National
Climate change	<ul style="list-style-type: none"> <li>· Mitigation and adaptation to climate change</li> <li>· Addressing the impact on economic activity, particularly in areas of agri-food and tourist interest</li> <li>· Impact of transports on the environment</li> </ul>	National
Standard systems of monitoring and measuring environmental impact	<ul style="list-style-type: none"> <li>· Creation of centers of excellence for monitoring and measuring environmental impact</li> <li>· Ecosystemic approach for sustainable development - environmental indicators / studies</li> <li>· Support and optimization of agricultural production</li> <li>· Integrated marine environment observation-monitoring-forecasting systems</li> </ul>	National

### Correlation with the National Roadmap for Research Infrastructures

It is envisaged that the broad and critical field of Environment and Sustainable Development will be supported by RIs linked to biodiversity (terrestrial and marine ecosystems) and plant protection, seismology and earthquake protection, climate change and observation of the atmosphere, marine & water resources and waste management. It should be noted that a number of the infrastructures in the field of the environment have a strong interdisciplinary character and also support other sectors (agrofood, health, tourism & culture).

In particular the research infrastructure in the field of Environment & Sustainable Development will support:

- Off-shore monitoring, monitoring of coastal zones and water resources. The integration of a broad spectrum of activities in the field of Blue Growth) supporting the development of offshore surveillance systems, coastal areas, water resources but also a sustainable exploitation of marine living resources in the Eastern Mediterranean, opening new horizons for the development of entrepreneurship in space, aquaculture and tourism. At the same time, given the strategic importance of marine research in Greece, the OX integrated and

preparatory study for the construction of a modern, well-equipped research oceanographic vessels in accordance with international practices and in specification but also in terms of governance shapes oceanographic fleets .

- Integration of the so far fragmented research infrastructure in the field of Geosciences and Earthquake protection in a distributed research infrastructure of strategic importance for Greece and Europe.
- Development of a monitoring system of atmospheric composition, changes in solar radiation, climate change and related natural hazards by integrating all existing terrestrial networks under the umbrella of a unique and comprehensive research infrastructure.
- Effective management and re-use of waste, which responds to the need to observe the country's commitments on environmental protection and the high potential for strengthening entrepreneurship in this field.
- Protection of biodiversity of terrestrial and marine plant ecosystems and sustainable exploitation of high added value natural products with interdisciplinary character which contributes to the further development of other strategic sectors (agrofood, health, pharma).

## 5.6 Transport & Logistics

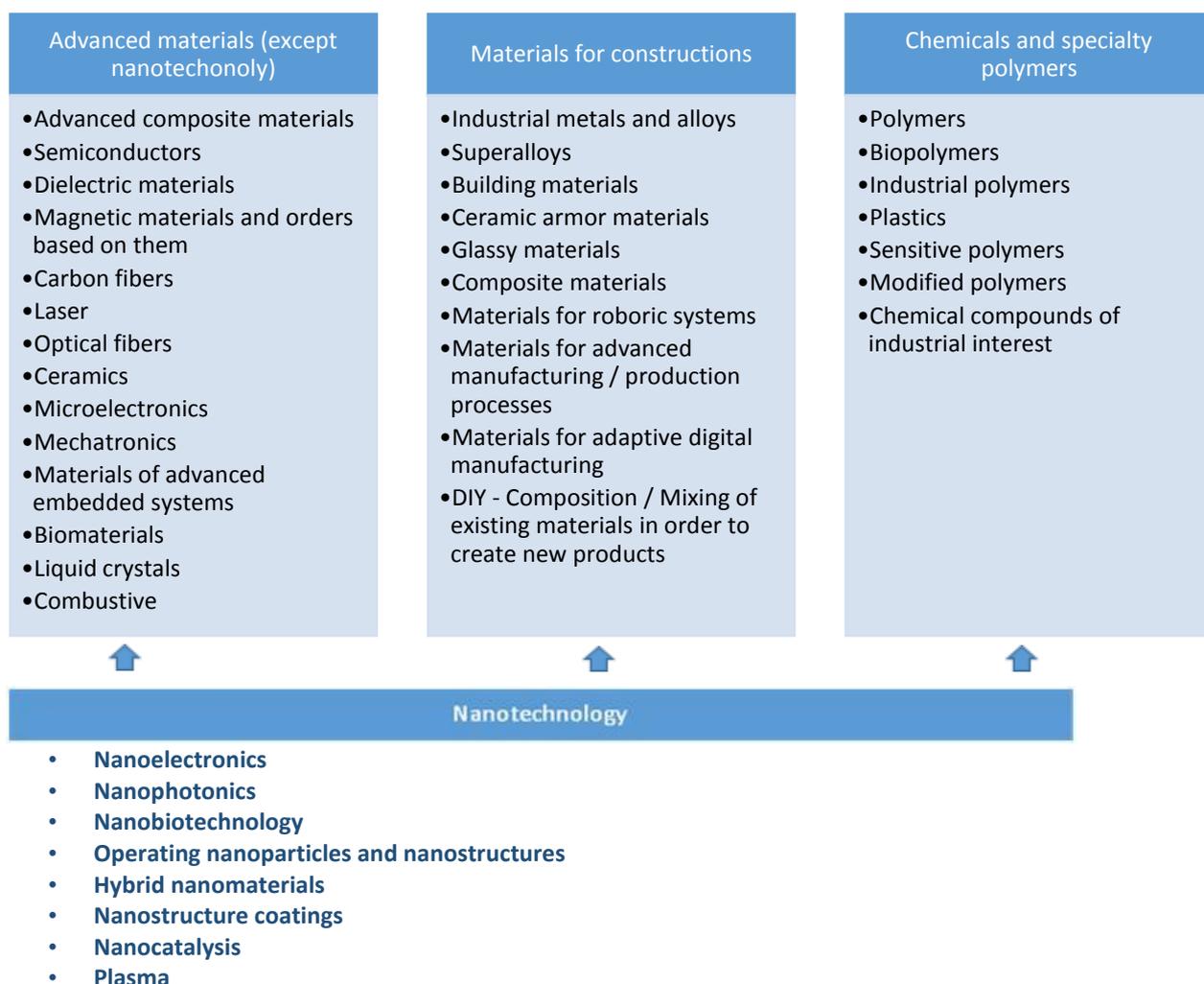
Fields	Critical areas for RTD Intervention	Intervention level
Strengthening of the freight transport and supply chain system in order to increase the added value and the competitiveness	<ul style="list-style-type: none"> <li>· Combined and multimodal transports</li> <li>· Development and use of new technologies for optimal routing, optimal scheduling of the offered freight services and optimal management of (road, sea, air) fleet and of available resources</li> <li>· Technologies and smart materials of self-diagnosis of technical problems and self-repair</li> <li>· Smart auction (auctioning platforms) and freight transport services agency (electronic market places) systems</li> <li>· Development of agrilogistics for supporting the supply of agricultural products on the market</li> </ul>	National
Development of smart infrastructure and transport systems	<ul style="list-style-type: none"> <li>· Use of micro / nano-technologies to increase road safety</li> <li>· Development and implementation of integrated architectures of intelligent transport systems in urban and national level</li> <li>· Design of smart port infrastructures and use of information Port Community Information Systems (PCIS)</li> <li>· Development of research on smart light transports and on smart infrastructure</li> <li>· Development of mobile real time information systems, parking management systems, integrated ticketing systems and cooperative mobility systems</li> <li>· Development and implementation of sensors for low cost and high efficiency mobility management</li> <li>· Development of simulation models and study on the structure and function of urban networks for the implementation of smart mobility systems and infrastructure</li> </ul>	Regional and National

Sustainability in transports	<ul style="list-style-type: none"> <li>· Development of integrated personalized and online services for promoting the use of environmentally friendly means of transport by users for sustainable mobility</li> <li>· Development of energy consumption optimization technologies in port operations</li> <li>· Development of innovative solutions to reduce emissions from ships</li> <li>· Application of innovative interoperable solutions for seamless access to multiple transport services (one stop shop for seamless intermodality)</li> <li>· Development and implementation of big data analytics for mobility &amp; transport</li> <li>· Creation of metropolitan freight management centers at urban level</li> <li>· Strengthening of research on electric mobility and new power plants</li> </ul>	National
Strengthening of the intermodality and autonomy in urban transports of passengers and goods	<ul style="list-style-type: none"> <li>· Provision of mobility from door to door through the system of Public Transport (cover the "last mile" for movement of people)</li> <li>· Autonomous driving in Greek cities: prospects evaluation and pilot actions for passenger and freight transport</li> <li>· Optimum intermodal freight distribution in urban areas</li> </ul>	National
Increase of accessibility and territorial cohesion of Greece	<ul style="list-style-type: none"> <li>· Insularity</li> <li>· Implementation of transport equivalent</li> <li>· Strengthening of the access to isolated sections of Greek land area with the use of combined transports</li> <li>· Increase of the access / accessibility to major road and rail network of the country</li> <li>· Expansion of the value chains and reinforcement of the activities resulting from the interface among sectors (transport - energy, transport - tourism, transport - urban development)</li> </ul>	National

### Correlation with the National Roadmap for Research Infrastructures

The National Roadmap for RIs does not include infrastructures specifically targeted to the Transport & Logistics sector. However the ie-inafastructures supporting “big data” and content technologies also serve the area of transport. Furthermore the transport sector is also supported by the RIs in the field of energy.

## 5.7 Materials - Construction



### Correlation with the National Roadmap for Research Infrastructures

It is envisaged that the Materials – Construction sector will be supported by three research infrastructures which fall within the wider field of Key Enabling Technologies (KETs) of interdisciplinary character and which in parallel to the field of materials also support horizontal and other priority areas such as Biosciences, Health & Pharma, Energy, Environment and Culture.

More specifically they aim to:

- Supporting science needs relevant to the nano scale research and innovation based on selected enabling technologies such as nano-technology, advanced materials, photonics and micro - nano - electronics.
- Promoting interdisciplinary frontier research in the field of lasers and providing access to advanced experimental facilities with potential applications to promotion of cultural heritage and restoration of artifacts.
- Integrate and utilize existing accelerator facilities and, at a later stage, of the unique in Greece research reactor in order to enhance high-level interdisciplinary research in the fields of atomic and nuclear physics, nuclear technology and technology of new materials

(development of analytical methods technological surfaces of materials of interest include nanostructured materials , superconductivity, (bio) catalysts, etc.) and their interdisciplinary applications in health (development of new radiopharmaceuticals, determination of trace elements in biological samples, etc.) in cultural heritage (study of cultural heritage objects and works of art with non-integrated systems destructive techniques), energy and environment (systematic environmental monitoring studies, radiation damage studies, building materials alloys which are required in the future and more clean energy systems).

## 5.8 Culture – Tourism – Cultural & Creative Industries

Fields	Critical areas for RTD Intervention	Intervention level
Strengthening of the innovation for developing new products and services for visitors of archaeological sites / museums / collections and other poles and cultural activity events	<ul style="list-style-type: none"> <li>· Pre-commercial Procurement - by priority through the utilization of funded research results - for developing new products and services</li> <li>· Strengthening partnerships of RC / Universities / TEIs with media for the development or improvement of relevant applications, especially in ICT (as 'disruptive technologies' / KETs for the wider CCI sector)</li> </ul>	Regional & National
Exploitation of innovation infrastructure for the design and implementation of specialized services of content and educational interactive applications for cultural sites	<ul style="list-style-type: none"> <li>· Exploitation and application of state-of-the-art- tools and methodologies (ICT / content management technologies)</li> </ul>	Regional & National
Promotion and enhancement of digital entrepreneurship in the fields of Culture, Tourism and CCI	<ul style="list-style-type: none"> <li>· Application of research results for improving electronic (cultural) content interoperability, mapping and increasing its reuse, strengthening SMEs - through incubation spaces - to develop innovative, user centric products and services (incl. mobile apps) with personalized features using geospatio-temporal semantic web for CTCL and to strengthen relevant 'research &amp; innovation -driven' start-ups</li> </ul>	Regional & National
Enhancement of excellence in areas of specialization of cultural heritage and contemporary culture, production of new knowledge and opening to creative economy	<ul style="list-style-type: none"> <li>· Enhancement of interdisciplinary knowledge in the fields of classical studies, cultural heritage and contemporary culture in the creative economy and the corresponding pilot actions / Enhancement of the access to research and innovation infrastructures / Enhancement of knowledge for synergies of CTCL with other priority sectors in order to improve cultural and tourist experience</li> </ul>	Regional & National
Provision of integrated innovation services - through the enhancement of the capacity of R&I bodies and the formation of "knowledge networks" - for ensuring sustainability, promoting	<ul style="list-style-type: none"> <li>· Cooperation networks for the development of techniques (diagnostic techniques, archival / digital documentation, maintenance, modeling, protection against natural hazards / threats and climatic conditions, invasive techniques and cultural heritage enhancement techniques) for the integrated management of cultural heritage issues, with</li> </ul>	Regional & National

extroversion and expanding the value chain of the triptych	demonstrative application in cultural sites, operation of open excavations & laboratories and introduction of innovation in monitoring and operational structures of specialized destination management organizations (culture - tourism)	
Development of relevant skills / coverage of respective training needs for the creative economy	· Digital skills, strengthening of research activity in humanities, classics, literature, arts, history for CTCL goals, cultural heritage and contemporary culture management and exploitation skills (e.g. interpretation of cultural resources, museology, management of archaeological sites) , strengthening of interdisciplinary research for serving the needs of special forms of tourism, branding / rebranding, targeted marketing, event management	Regional & National
Strengthening of interdisciplinary collaborations and partnerships of public and private research / innovation institutions in natural and virtual living labs environment	· Interconnection of local needs / SMEs specialized in knowledge networks, acquisition of innovative enterprises, cooperative planning of services	Regional
Encouragement of open innovation for diversifying the cultural product and services and integrating innovation in specific forms of tourism with the contribution of Cultural & Creative Industries (CCI)	· Strengthening of networking and support of open platforms of creative cooperation of representatives of the quad helix by encouraging citizen participation in pilot / demonstrative scale for the culture - tourism / culture – CI complexes, as well as for specific forms of tourism · Support of horizontal activities of dissemination and transfer of knowledge among stakeholders · Application of 'apply here, improve elsewhere' model in introducing innovation into processes and provision of innovative services from cultural institutions to guests	Regional & National
Pilot PPP partnerships that exploit the "knowledge triangle" at interregional level	· Energy coverage and transports in order to ensure visitation of areas of great cultural and tourist interest (e.g. smart grids for energy, integrated transportation and anchorage systems in marine areas, air transports, modern infrastructure for supporting sustainable models of city tourism)	Regional / Inter-regional

### Correlation with the National Roadmap for Research Infrastructures

The Research infrastructures that support the complex culture - tourism - cultural and creative industries have a strong interdisciplinary character, while they also other sectors such as materials, environment, ICT. Some of these may have been described in previous sections, under other priority sectors but for completeness of the description of the areas presented in this section too.

The cluster / triptych culture - tourism - cultural & creative industries will be supported by research infrastructures and flagship initiatives linked to:

a) the protection, conservation and promotion of cultural heritage and natural capital of the country, and critical environmental resources inherent in the tourism sector (e.g the marine ecosystem) - and

b) interdisciplinary research in the sectors of ICT / humanities and arts for the promotion, and optimal exploitation of digital cultural assets.

In particular the research infrastructure that aim to support and the culture - tourism complex aim to :

- Enhancing advanced research agendas of physics and materials science, Lasers, photonics, to develop innovative maintenance and promotion of cultural heritage technologies and analytical methods and tools (the triptych micro-macro-info) supporting research into archaeological, historical monuments, underwater antiquities, etc .
- Monitoring, study and utilization of marine ecosystems for the promotion and protection of marine resources, and to develop appropriate conditions for underwater tourism activities, with respect to marine ecosystems and underwater antiquities.
- The development of virtual infrastructures for the arts & humanities, that leverage and expand content management technologies, expertise on interoperability of digital repositories themes and language technologies and applications, helping catalytic role in strengthening and promotion of our culture and the creative economy (including cultural tourism as a major economic activity).

## 6. RIS3: Strategic Pillars and Intervention Axes

Based on the challenges and objectives emerging from the SWOT Analysis, the following three Strategic Pillars and Axes for Intervention outline the framework of the Smart Specialization Strategy:

1. Strategic Pillar 1: Investing in the creation and dissemination of new knowledge to promote excellence in research. Strengthening mechanisms, networking, human resources in research, research infrastructure and innovation Support of RTDI structures (capacity building), promotion of access to information and research results.
2. Strategic Pillar 2: Strengthening investment in research and innovation, supporting innovative enterprises in international markets through research and innovation, and development of new innovative “players”
3. Strategic Pillar 3: Developing innovative attitudes, institutions and RTDI links with the society to address social challenges.

### and four Intervention Axes:

- a. Develop RTD&I potential in specific areas of expertise (capacity building): development of public RDTI institutions, their personnel, partnerships with businesses, provision of RTDI services, and strengthening of the production ecosystem with new players and financial mechanisms.
- b. Strengthening RTD&I activities: Supporting SMEs and business clusters and RDTI bodies to develop targeted collaborations. Development of RTD&I projects and innovative capacity in the business sector.
- c. Mechanisms and support structures for networking and communication, hatching new players, support of the innovative effort of businesses and shaping entrepreneurial discovery mechanisms.
- d. Develop openness and networking to exploit the productive and innovative potential and the connection to the global RTD&I activities, liaison with the Greek society and

exploration of the effects of technological change on social cohesion and development.

Table 3 - Strategic pillars and intervention axes

Strategic Pillars of RIS3	1. Investing in the creation and dissemination of new knowledge	2. Investing in research and innovation	3. Develop innovative attitudes, institutions and RTDI interfaces with society
National Intervention Axes	National Intervention Categories		
a. Resources development (capacity building)	1.a Develop RTDI potential in the areas of specialization	2.a Hatching new business players	3.a Strengthening mechanisms and institutional framework
b. Strengthening RTDI activities	1.b Strengthening RTDI activities and islands of excellence	2.b Strengthening endogenous research and innovation in businesses	3.b Strengthening demand for innovation from the public administration
c. Mechanisms and support structures	1.c Aid to (Sub)-networking structures	2.c Infrastructure and innovative entrepreneurship support mechanisms	3.c Mechanisms for Business Discovery and Documentation
d. Extraversion and networking	1.d Interface and cooperation in RTDI	2.d Business extroversion	3.d Developing innovative culture

## 6.1 RIS3: Intervention Logic

A key element of the logic involved in the implementation of RIS3 strategy, is the achievement of the fundamental goal of economic transformation through RTD&I. The desired boosting of RTDI activities will result from a well-designed framework of support tools (support actions, grants and financial tools).

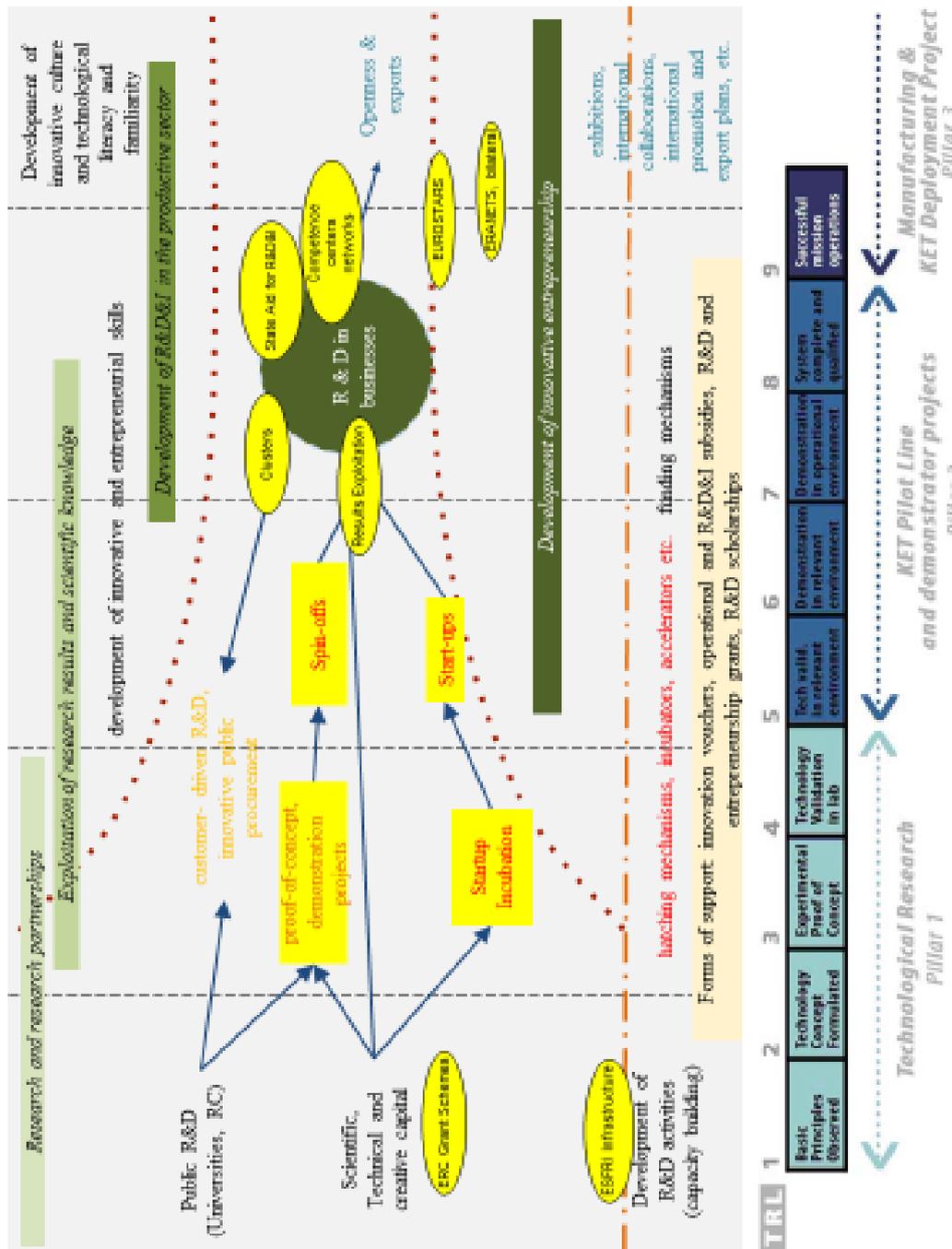
Support actions will include alternative forms of incentives (RTDI scholarships, direct aid (grant), innovation vouchers, business grants) to leverage funding from different funds and programs, tax incentives (depending on type and business needs). This logic seeks to give operational flexibility to companies, focusing on their work and not on funding limitations, evaluating actually the business perspective, while strengthening and developing RTDI services market based on innovation vouchers

The RIS3 actions are designed to cover the entire range of pre-competitive stages; creating new products, services or processes from the initial idea and the initial product development, as well as the necessary support of innovative start-ups in order to overcome the so-called "death valley" i.e. to survive and expand to the critical stages after their establishment. Public funding is intended to decrease as the chain goes from research to the research results exploitation, to the creation of new businesses and clusters, and to the enhancement of extroversion and integration in international value chains.

Moreover, the intervention logic is de facto specialized regarding the impact of actions in each sector and region, depending on the characteristics of each sector and region.

However, the final configuration can be better captured after the development of the pilot actions which will function as a learning mechanism.

Figure 2 - RIS3 intervention in RDTI chain



## 7. Action plan: Detailed policy mix

The Table below summarizes the actions of the Smart Specialization Strategy. The numbering of the actions is presented per strategic choice (1, 2, 3), intervention axis (a, b, c, d) and intervention group (1, 2 etc.).

Table 4 - Development of intervention categories of RIS3

Strategic pillars	Investment in the creation and dissemination of New Knowledge	Investment in Research and Innovation	Development of innovative mindset and institutions and RTDI links with society
Intervention axes	<b>National Intervention Categories</b>		
<b>a. Capacity building</b>	<p><b>1.a. Development of RTDI capacity in the areas of specialization</b></p> <ul style="list-style-type: none"> <li>● <b>1.a.1</b> Reinforcement of research infrastructures according to the National Roadmap for Research Infrastructures</li> <li>● <b>1.a.2</b> Specialized competence centres</li> <li>● <b>1.a.3</b> Development of professional knowledge and skills in intellectual property, innovation and technology management, export etc.</li> </ul>	<p><b>2.a. Hatching of new business players</b></p> <ul style="list-style-type: none"> <li>● <b>2.a.1</b> Reinforcement of business groups in the hatching stage</li> <li>● <b>2.a.2</b> Reinforcement of the establishment and development of start-ups</li> <li>● <b>2.a.3</b> Exploitation of research results (proof-of- concept)</li> <li>● <b>2.a.4</b> Development of Spin off/out</li> <li>● <b>2.a.5</b> Reinforcement of existing and establishment of innovative clusters</li> </ul>	<p><b>3.a. Reinforcement of mechanisms and institutional framework</b></p> <ul style="list-style-type: none"> <li>● <b>3.a.1</b> Establishment and reinforcement of new financial tools</li> <li>● <b>3.a.2</b> Patent Pool Fund</li> <li>● <b>3.a.3</b> Register of consultants for issues of intellectual and industrial property</li> </ul>
<b>b. Reinforcement of RTDI activities</b>	<p><b>1.b. Reinforcement of RTDI activities and islands of excellence</b></p> <ul style="list-style-type: none"> <li>● <b>1.β.1.</b> Reinforcement of the human research capacity through the implementation of doctoral research</li> <li>● <b>1.b.2</b> Support of the research dimension of higher education</li> <li>● <b>1.b.3</b> Reinforcement of post-doctoral researchers</li> <li>● <b>1.b.4</b> Funding of proposals that were positively evaluated in ERC Grant Schemes, but not funded</li> <li>● <b>1.b.5</b> Collaborative RTDI initiatives</li> <li>● <b>1.b.6</b> Development of innovative products / services proposed by companies, etc. (Customer- driven)</li> <li>● <b>1.b.7</b> Reinforcement for performing tests of products and services</li> <li>● <b>1.b.8</b> Strategic Plans of Research Institutions</li> <li>● <b>1.b.9</b> Integrated research strategies for Universities</li> </ul>	<p><b>2.b. Enhancement of endogenous research and innovation in businesses</b></p> <ul style="list-style-type: none"> <li>● <b>2.b.1</b> Single Action of State RTDI Aids: RESEARCH - INNOVATE - CREATE <ul style="list-style-type: none"> <li>○ i. Emerging research firms</li> <li>○ ii. SMEs</li> <li>○ iii.1 Partnerships of businesses with other institutions (Small collaborations)</li> <li>○ iii.2 Partnerships of groups of businesses with other institutions (Large collaborations)</li> <li>○ iv. Integration of research results into the production process</li> </ul> </li> <li>● <b>2.b.2</b> Reinforcement of the development of ICT products and services</li> <li>● <b>2.b.3</b> Development of e-business applications by individual companies or groups of companies</li> <li>● <b>2.b.4</b> Reinforcement of investments to existing firms for introducing new products and services to the market and for developing and applying modern production methods</li> <li>● <b>2.b.5</b> Support of businesses for creating and expanding of advanced capacities for product and service development in new areas</li> </ul>	<p><b>3.b. Enhancement of demand for innovation by the public administration</b></p> <ul style="list-style-type: none"> <li>● <b>3.b.1</b> Innovative pre-commercial public procurements – PCPs - TO 2,4,5,6,7</li> <li>● <b>3.b.2</b> Development and implementation of "protocols" or signals</li> </ul>
<b>c. Supporting</b>	<b>1.c Reinforcement of networking</b>	<b>2.c Infrastructure and</b>	<b>3.c Mechanisms of Business</b>

<b>mechanisms and infrastructure</b>	<b>(infra)structure</b> <ul style="list-style-type: none"> <li>• <b>1.c.1</b> Setup and operation of digital research and innovation platforms</li> <li>• <b>1.c.2</b> Technology Validation Offices</li> <li>• <b>1.c.3</b> Reinforcement and expansion of the activity and the role of the Units for Innovation and Entrepreneurship</li> <li>• <b>1.c.4</b> Modernization of internal network infrastructure of all the universities and research centres of the country)</li> <li>• <b>1.c.5</b> Integration of Hospital Units in the national academic network GRNET for supporting research and clinical activities in medicine and biology, in a cloud computing environment - extension to the remaining five regions of the country</li> </ul>	<b>mechanisms that support innovative entrepreneurship</b> <ul style="list-style-type: none"> <li>• <b>2.c.1</b> Reinforcement of the development of digital platforms for business transactions and cooperation among businesses, among businesses and consumers and among businesses and public sector bodies</li> </ul>	<b>Discovery and Documentation</b> <ul style="list-style-type: none"> <li>• <b>3.c.1</b> Mechanism of Entrepreneurial Discovery</li> <li>• <b>3.c.2</b> Installation of Monitoring Mechanism for the implementation of the national RIS3 strategy</li> </ul>
<b>d. Extroversion and networking</b>	<b>1.d. Interconnection and cooperation in RTDI</b> <ul style="list-style-type: none"> <li>• <b>1.d.1</b> Reinforcement of participation in transnational / trans-European networks, programs and initiatives - ERANETS-FETs</li> <li>• <b>1.d.2</b> Actions of bilateral and transnational cooperations</li> </ul>	<b>2.d Business extroversion</b> <ul style="list-style-type: none"> <li>• <b>2.d.1</b> Preparation, implementation and evaluation of sectoral or industrial plans of extroversion</li> <li>• <b>2.d.2</b> Specialized studies for targeting markets (market analysis), products and benchmarking of competition</li> </ul>	<b>3.d Development of innovative culture</b> <ul style="list-style-type: none"> <li>• <b>3.d.1</b> Development of demonstration projects and pilot projects; implementation of research results</li> <li>• <b>3.d.2</b> Reinforcement of the participation in international scientific events, competitions etc.</li> <li>• <b>3.d.3</b> Promotion of the social importance of RTDI project</li> </ul>

## 8. RIS3: Sources of financing

The budget of the Action Plan is provided by the Operational Programme “Competitiveness - Entrepreneurship – Innovation” (EPANEK-Restart) from 2014 to 2020, the Rural Development Programme (RDP) 2014-2020, the Operational Programme Human Resources and Lifelong Learning and HORIZON 2020. In this way, RIS3 creates Synergies and links between thematic priority 1 with other Thematic Priorities and Funds.

The main target is supporting SMEs and encouraging the development of a ‘healthy’, innovative and extrovert entrepreneurship.

For this purpose, more funds and new types of aid will be introduced. The new fiscal measures and structural changes and the introduction of new financial tools, require the mobilization of forces of the science-innovation chain by leveraging opportunities and exploiting the collaboration of public and private resources.

The Table below provides for the estimated contribution of each source of financing in order to reach the goals set.

Table 5 - Strategy funding Provision for Research and Innovation for the achievement of Objective 1.2% of GDP in 2020

Year	GDP in bn (€)	National funding		Structural funds		Regular budget		Enterprises		Abroad		Other national sources		Total of R&D expenditures	
		A	% of GDP	A	% of GDP	A	% of GDP	A	% of GDP	A	% of GDP	A	% of GDP	A	% of GDP
2014*	179.1	50	0.03	320	0.18	400	0.22	450	0.25	200	0.11	50	0.03	1420	0.79
2015	184.3	60	0.03	350	0.19	420	0.23	450	0.24	180	0.10	50	0.03	1460	0.79
2016	191.1	120	0.06	150	0.08	470	0.25	530	0.28	150	0.08	55	0.03	1420	0.74
2017	197.8	200	0.10	200	0.10	490	0.25	630	0.32	200	0.10	60	0.03	1720	0.87
2018	204.3	300	0.15	300	0.15	530	0.26	700	0.34	230	0.11	65	0.03	2060	1.01
2019	211.7	400	0.19	300	0.14	570	0.27	760	0.36	260	0.12	70	0.03	2290	1.08
2020	217.5	500	0.23	400	0.18	610	0.28	830	0.38	270	0.12	75	0.03	2610	1.20

A: Amount

Figure 3 - Funding Allocation Prediction for Research and Innovation Strategy

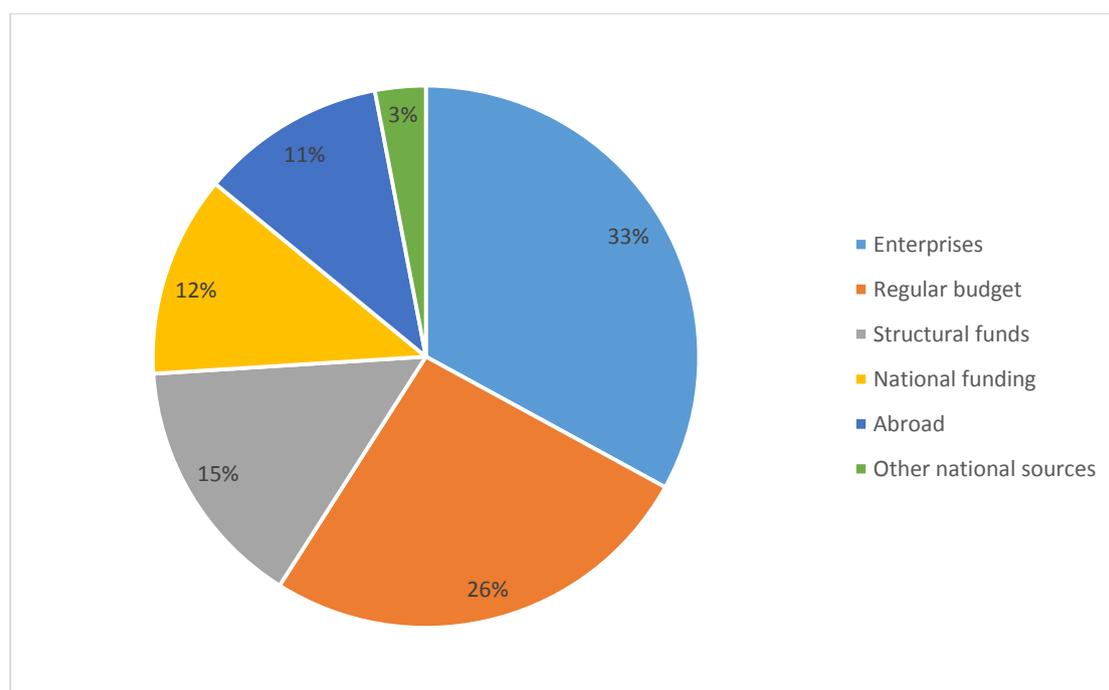
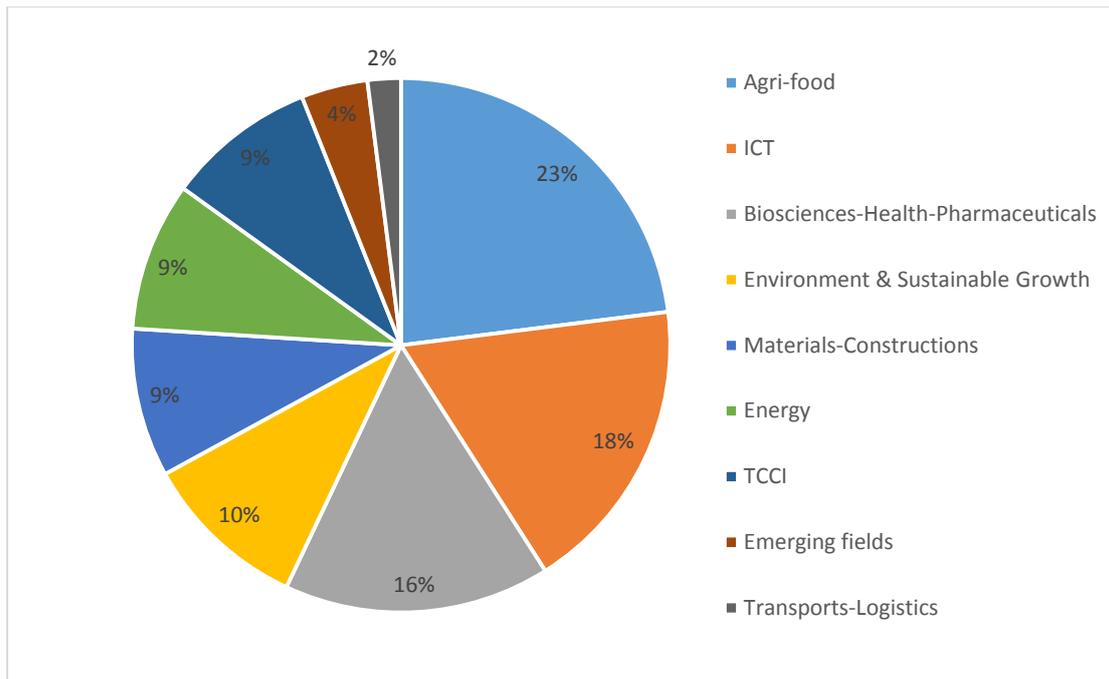


Figure 4 - Public funds per specialization field



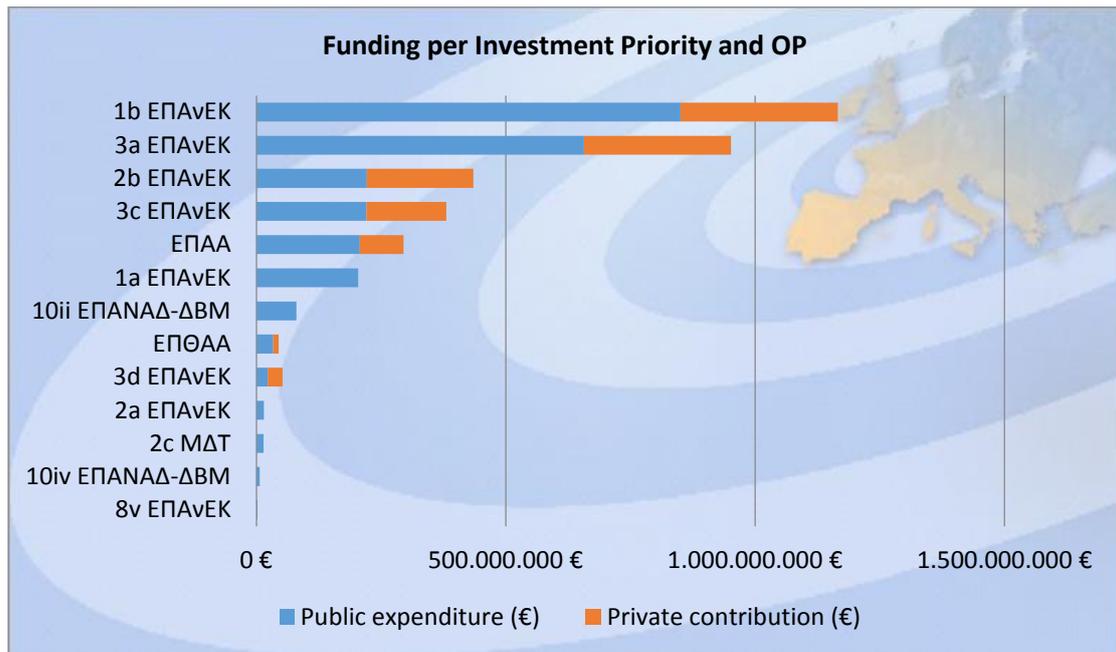
In the framework of the Entrepreneurial Discovery Process, the effort will concentrate on specifying the interventions of the RIS3 Action Plan to the specific needs and performances of the emerging priority areas.

The Strategic Pillar 2 (Investing in Research and Innovation) will focus primarily in supporting business innovation in order to contribute to the reorganisation of production and the transformation of the country's development model.

Table 6 - National RIS3 Financing - Allocation of public resources and estimated private participation

Total Financing of Strategic Options				
	Budget (€)	Public Funding (€)	Private sector (€)	Private sector (%)
<b>Strategic Option 1</b> Investing in the creation and dissemination of new knowledge	981.444.092	834.694.092	146.750.000	14.95
<b>Strategic Option 2</b> Investing in research and innovation	2.374.600.000	1.501.155.000	873.445.000	36.78
<b>Strategic Option 3</b> Develop innovative attitudes, institutions and RTDI interfaces with society	292.800.000	200.800.000	92.000.000	31.42
<b>Total</b>	3.648.844.092	2.536.649.092	1.112.195.000	

Figure 5 - National RIS3 Financing. Breakdown by investment priority & OP



## 9. Governance

To maximize the benefits of the system and achieve smart specialization, it is necessary to define in advance specific roles for those involved in the system.

With the proposed system, the active participation of representatives of all stakeholders and effective coordination between central government bodies and regional levels is ensured. Regional RIS3 strategies, interact with national RIS3 in all priorities of research, technological development and innovation and facilitate the process of entrepreneurial discovery.

### 9.1. Institutions and Roles

#### 9.1.1. Decision Making Level

1. Board of Smart Specialization Strategy.
2. Regional councils in 13 regions of the country.

#### 9.1.2. Executive Level

##### 9.1.2.1. Main Level

1. The National Coordination Authority of the Ministry of Economy, Infrastructure, Marine and Tourism,
2. The General Secretariat for Research and Technology (GSRT) of the Ministry of Culture, Education and Religious Affairs.

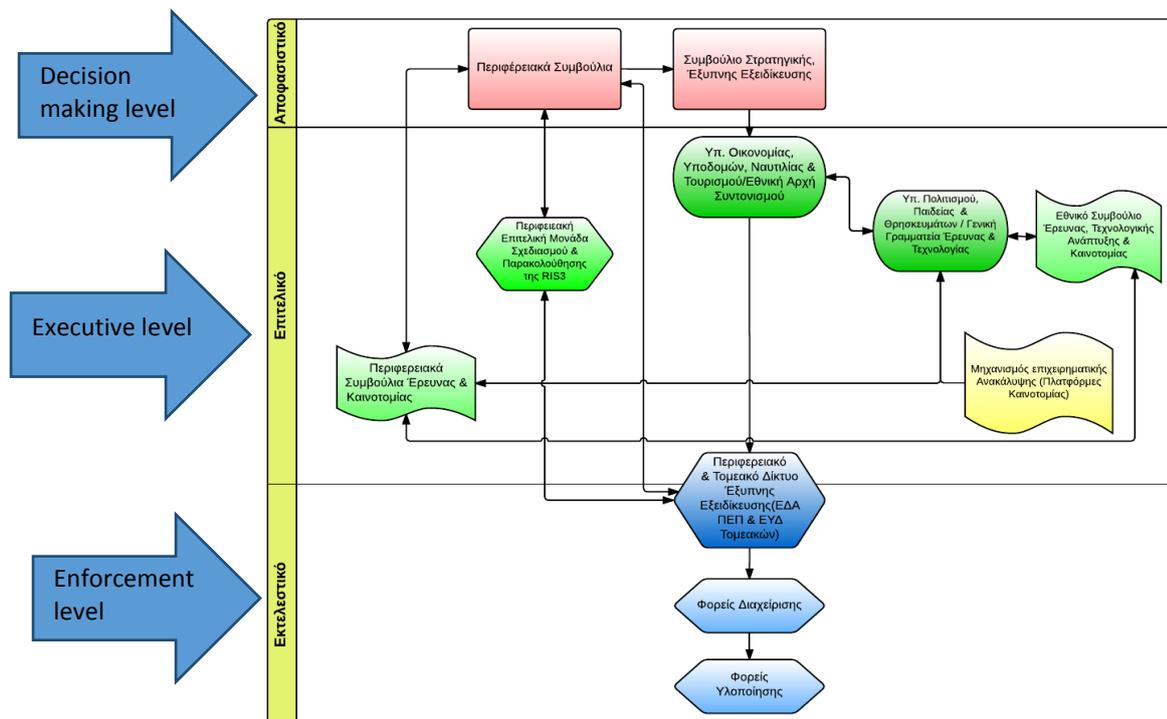
##### 9.1.2.2. Regional Level

1. The executive units or planning and monitoring bureaus the regions. These services can be supported by working groups, which can be established per priority area of the regional RIS3.
2. Regional Councils for Research and Innovation.

### 9.1.3. Enforcement Level

1. Sectoral and Regional Network OP and ROP.
2. Management Bodies.
3. Implementation Bodies.

Figure 6 - Governance scheme for Smart Specialization Strategy



## 9.2 Entrepreneurial Discovery Mechanism

### 9.2.1. Basics of business application discovery

The aim is to identify specific intervention priorities in the relevant value chains. This approach will be throughout the course of implementation of the strategy which is dynamic and extroverted.

A first list of key strategic sectors for Greece and the 13 regions (eight fields of) results from the first analysis of the economic and technological specialization of the country. These results were based on the analysis of technological and business priorities -both from the literature and from consultation



processes- performed by the GSRT innovation platforms. The consultation revealed new areas of interest, latent or emerging. The process of entrepreneurial discovery will continue with more detail analysis, matching financial and technological findings. At this point, pilot actions, are expected to take place.

A key component of effective implementation of entrepreneurial discovery process is the creation and operation of an expanded and enriched mechanism in which to actively involve businesses, academic-research community, the government and the state, and funding mechanisms.

The main conclusions resulting from the analysis of regional RIS are the following:

1. The national strategy has to play a multiple role composing regional impulses with greater cooperation actions at national level. The diversity of each area of specialization (sources of finance ministries and agencies involved, critical masses of business, value chains to investigate, remoteness, insularity, internationalization, extroversion) will require a case by case analysis and a different organization of the entrepreneurial discovery process. For example, the two dominant sectors (agri-foods and culture and tourism), are influenced by many institutional and non-institutional actors who will be asked to cooperate on the basis of joint future strategic decisions.
2. The national organization for the collection and analysis of data on entrepreneurial discovery must collaborate with the regional structures. Regions are called for the first time to design and fund RTDI actions and to develop their own short and long-term strategies to enhance innovation.
3. All regions must continue to actively participate in an ongoing pursuit of policy priorities and developing each one its own structures and procedures for data collection and ongoing consultation. It is not expected from all regions to provide equivalent amount of information on all priority areas, since they are characterized by their own areas of specialization.
4. In addition to the above, it is important that the process of entrepreneurial discovery be combined with suggested policy scenarios at regional or national level. It is assumed that research infrastructures can serve a larger number of regions and structured development of new projects should be based on cooperation with ideas also from other regions.
5. Finally, the research infrastructures should encourage their entrepreneurial potential by collaborating more with the business sector and by offering new ideas.

### 9.2.2. Methodological elements for the implementation of the entrepreneurial discovery process

The policy issue that must be addressed through smart specialization, is not only where to invest the funds, but how to support businesses, - especially those who experiment on new ideas, technologies and business models - in order to develop and to become more competitive so as find out themselves where to invest in the future. The process should be decentralized and bottom-up.

So the process of entrepreneurial discovery of Greek RIS3 will reflect the following features:

1. The business discovery is not a list of technologies / sectors where Greece and its regions have an advantage, but a process that will be subject to a continuous and repetitive cycle (analysis-typing-initiative) of value chains, technological development, clusters, groups of products, new products or sectors.
2. The core effort will focus in discovering the innovations resulting from the creative combination of technologies and / or sectors where the country has a high level of

- specialization / competitiveness and which are potential carriers of new business opportunities for jobs and prosperity.
3. The business discovery does not respond to a unique design, solely sectoral or technological, but to a combined one.
  4. The business discovery will establish mechanisms for identifying those innovations that could lead to new development initiatives.
  5. The national and regional mechanisms will act as an intermediary for identifying further the conditions that generate and systematize business breakthroughs and as a mechanism that limits the imperfections of the system, especially in regions with less favorable growth conditions.
  6. The entrepreneurial discovery mechanism will help correlating between national and regional RDTI policies. More specifically, the analysis of value chains in technological priority areas will lead to more effective allocation of funds and prioritization of measures.

### 9.2.3. Methodological tools

#### **Foresight**

Foresight is not a study predicting the future, or a development study, but a tool for identifying discontinuities / continuities in Greek society and economy and identify opportunities - challenges in relation to technological and economic developments, the geopolitical situation and the existing obstacles. The main idea of the method is to stimulate the creativity of individuals, groups and institutions to formulate objectives and policies. The exercise should be performed regularly, at national and regional level. Also, the methodology should enrich the tools of innovation platforms.

#### **Upgraded Innovation Platforms**

Upgraded innovation platforms will provide a basic means for consultation at national level, bringing together representatives from the business sectors, research centers, universities, institutions, Ministries and Regions. They contribute to the identification of critical activities focusing on research, technology and entrepreneurial effort. In the new programming period platforms will be used as a continuous feedback to national and regional smart specialization strategies. They will also contribute to the implementation and the evaluation of policy interventions. GSRT, through the mechanism of entrepreneurial discovery, will update the corresponding base texts and data collected in the eight areas of specialization.

#### **Comparative assessment (benchmarking)**

As part of the methodology of the platforms a standardized method for collecting and presenting significant economic and technological data will be developed. This will allow the comparison of the performances of different organizations or programs in order to identify best practices, problems and strengths. It is a process of data collection, performance comparison, diagnosis of problems and planning improvement measures. Two types of benchmark will be used:

- Benchmarking Strategies
- Good practices

#### 9.2.4. Roadmap of activities for 2015

	Jul.	Aug	Sept.	Oct.	Nov.	Dec.
Initial approval of national RIS3						
A detailed presentation of the methodology of upgraded platforms						
Call for participation in the platforms – announcement of work program						
Establishment of open working groups						
First platform meetings cycle						
Draft entrepreneurial discovery report						
Update of the Regions						
Second round of platform meetings						
Final entrepreneurial discovery report						
Update of the Regions						
Organization of support mechanism at national and regional level						
Enrichment of relevant indicators for monitoring and evaluation						
Revision of the Action Plan of the National RIS3						
"Translation" and homogenization of regional action and further relevance of these at national level						
Foresight initiation and fine tuning of the ED mechanism	Early 2016					
Duration of system application	Until the 2017 revision - System Review					
Number of reports per year	2 per platform and 2 total					

### 9.3. Monitoring and evaluation of RIS3

The Monitoring and Evaluation Mechanism of RIS3 will be implemented at national and regional level and will be based on indicators which allow monitoring the progress of each priority area of smart specialization and the effectiveness and efficiency of operations.

At National level, the mechanism is related mainly to actions relevant to RIS3 priorities of (mostly to the thematic objectives of 1, 2, 3 of EPANEK) and also includes additional actions and from other regional and national Operational Programmes financing RTDI actions.

The Monitoring procedure of RIS3 also includes documentation studies, field surveys, consultation procedures with business and research community as well as evaluation studies of the actions by independent experts.

Monitoring and evaluation are two complementary processes. Monitoring provides part of the empirical basis for the assessment and evaluation may create needs for improving the monitoring indicators.

Monitoring of the implementation of the strategy RIS3 will be conducted by the competent bodies of the state, and will be assessed by independent experts.

#### System of indicators

The development and implementation of an appropriate system of indicators is the basis of the operation of the Monitoring and Evaluation Mechanism of RIS3 at national and regional level. The aim is to ensure that strategic planning is implemented in pursuit of the objectives set and that funding allocated in accordance with the design promoting the production of the desired outputs, direct results and impacts.

The indicators of the mechanism will measure and monitor the achievement of the objectives of the individual strategies of development programs / actions of RIS3 and will play a key role in decision-making by providing information timely. The procedure of use of indicators is the establishment of a system of measurable parameters that will function as a directional guide to identifying objectives and priorities at national and regional level to achieve the objectives of smart specialization. The indicators will also allow conducting comparative evaluations, horizontal (e.g. between different regions in the same reference year) or vertical (e.g. between different time intervals for constant spatial reference level).

Output indicators measure the progress of actions undertaken in order to achieve the expected results and selected through the system of Common Indicators (common indicators) set by regulations of the Structural Funds ERDF and ESF. The base price for the output indicators is 0 while output prices indicators are measured at the level of actions and projects. Result indicators measure the changes taking place in the area of support and reflect the impact of the funded activities.

The indicators to be used concern all OPs (Sectoral and Regional) 2014-2020 including actions related to the strategy of smart specialization (RIS3), besides EPANEK included the EPDVM and Operational Programmes for Rural Development and Fisheries. It is possible to incorporate additional indicators to be included in national and regional RIS3 depending on the further specialization of the actions and the implementation progress.