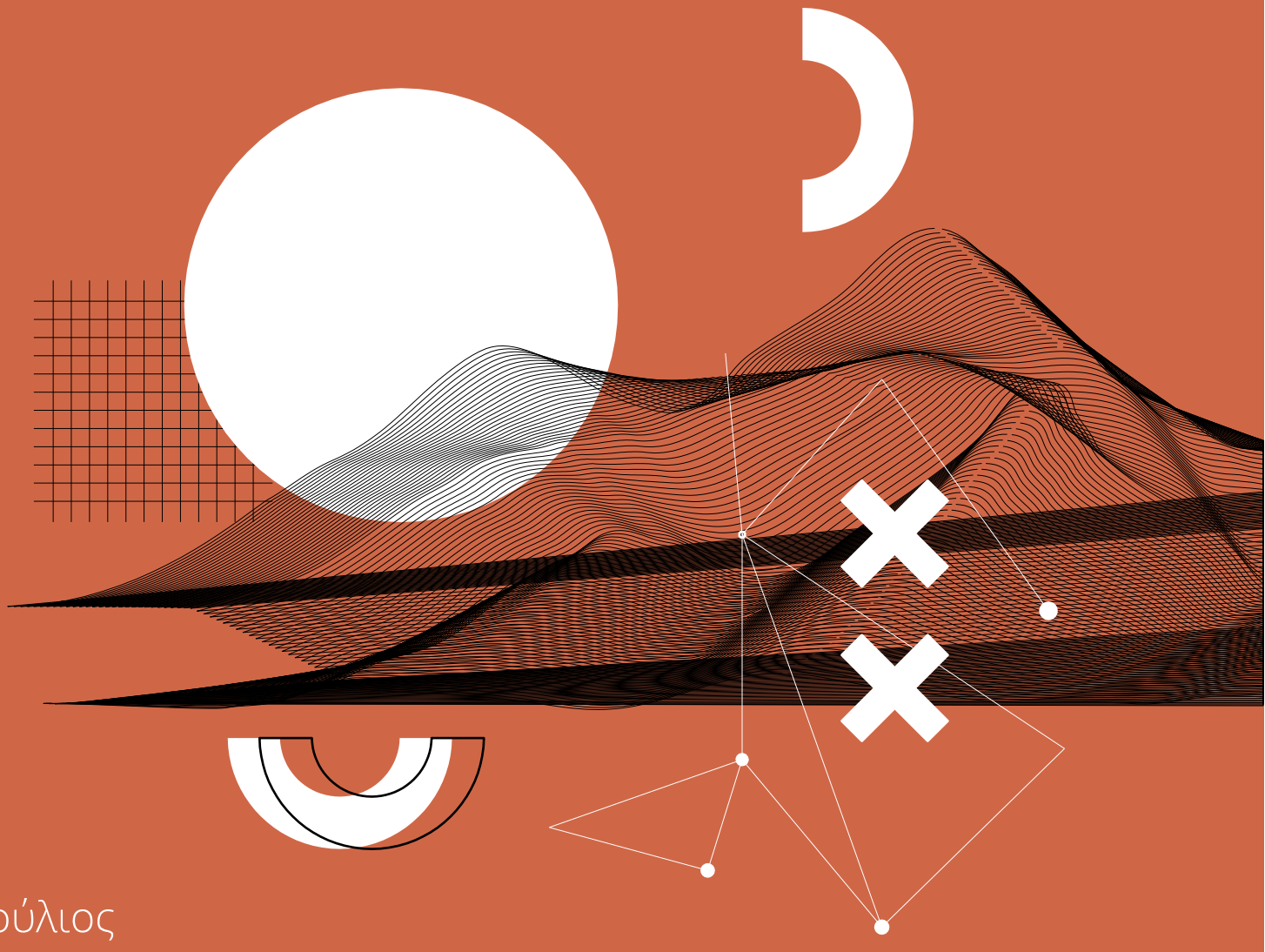
ΠΕΡΙΦΕΡΕΙΑ ΚΡΗΤΗΣ
REGION OF CRETE

RIS3
ΣΤΡΑΤΗΓΙΚΗ
ΕΞΥΠΝΗΣ
ΕΞΕΙΔΙΚΕΥΣΗΣ
Περιφέρειας Κρήτης

Η **Στρατηγική Έξυπνης Εξειδίκευσης** Περιφέρειας Κρήτης την Προγραμματική Περίοδο 2021 - 2027



Ιούλιος
2021

http://ris3.crete.gov.gr

The Smart Specialisation Strategy of the Region of Crete within the 2021-2027 Programming Period

1. The Region of Crete is growing dynamically, yet faces significant challenges due to the pandemic

The Region of Crete exhibits an intermediate level of growth in the EU and remains a dynamic regional economy that requires transformation. In particular, the Region of Crete is:

- Part of a group of 76 Regions with a GDP ranging from 80% to 99% of the EU average.
- 5th in Greece in GDP per capita.
- At the average of Greece in terms of overall competitiveness, with a significant export and outward orientation.
- Strong in the agricultural and food sectors, but with limited transformation of productive activities.
- Internationally competitive in tourism, as it has a strong brand name, but is mostly dominated by summer tourism and is facing serious consequences due to the pandemic.

Crete has been characterised as a strong innovator Region with innovation performance having increased by 30.1% in the period 2011-2019[1], by the European Commission. Based on the analysis of the individual indicators, the Region holds strong advantages in the publications of scientific articles, in Public Expenditure on R&D, in the cooperation of innovative enterprises, while showing disadvantages in business expenditure on R&D, in filing applications for patents and trademarks, as well as in lifelong learning.

Compared to the other Regions of the country, it stands out in a number of parameters, such as total expenditure on R&D (2nd), impact per publication (1st), publications (3rd), patents (2nd, 2012 data), and innovative SMEs (3rd).

The structure of the regional economy is not conducive to the employment of highly qualified scientific workforce; therefore, Crete ranks only 8th in employment in science and technology with 29.9% of total employment. Furthermore, employment in high-tech activities shows fluctuations, moving at low levels (1.2% of the total) and diverges from Attica, which has shown a more dynamic course in recent years. Finally, regarding the employment of researchers, the Region occupies the 3rd place in Greece (2017) with a percentage of 1% of the total[2].

Production of research work in the Region of Crete is particularly dynamic. In the 2014-18 period, Crete ranked 3rd in Greece in publications and

[1] *Regional Innovation Scoreboard (2019) - Kriti (Crete).*

[2] *EUROSTAT-Data Base.*

references with respect to the absolute number while it ranks first in the impact factor (references per publication).[3]

In particular, during this period, the Region of Crete has accounted for 12.4% (7,368) of total publications in the country (Attica 53.1% and Central Macedonia, 22.0%). In terms of citations, Crete has achieved an even higher share of 15.7% (78,674). The relative impact factor of publications of the Region's institutions has been set at 1.53, namely this performance is higher than the global average. Further analysis of the data shows that 122 publications are ranked in the top 1%, 940 in the top 10%, and 2,149 in the top 25%.

The business ecosystem has developed a tendency towards innovation and has made significant investments in integration of new technologies, but this does not translate into enhanced capacity for developing competitive products.

Total expenditure on the development and introduction of innovations amounts to only 0.65% of the regional GDP while business expenditure on R&D is particularly low in the Region. The region ranks 2nd in patent applications (2012 data) with 11.3 patents per million inhabitants, while 52 trademark applications were filed in 2016 (compared to 17 in 2012)[4].

The pandemic severely impacted the regional economy. Given that the GDP of the Region of Crete is estimated to rely approximately 50% on tourism; the decline is expected to be greater than the national average, despite the compensatory measures that have been implemented. In particular, international arrivals between January and September 2020 have recorded a 76.7% decline in total, compared to 2019. At the same time, domestic air arrivals dropped by 50.5% over the same period.

The agricultural sector has been affected by periodic disruptions to distribution systems during lockdowns, as mobility restrictions prevented producers from accessing open markets, while, at the same time, local demand fell due to a decrease in visitor numbers. Seasonal employment in both tourism and agricultural production were most impacted by the contraction in economic activity. The difference in registered unemployed between 2019 and 2020 highlights the pandemic's impact on employment. In particular, in May, the gap soared to 157%, gradually decreasing to 43% in August and September, before narrowing further in October and November 2020. Overall, the data on the decline in tourist activity and increase in unemployment confirm the deeper economic crisis in the region, compared to the rest of Greece.

[3] All research and innovation data for this section have been obtained from the National Documentation Centre.

[4] *Data provided by EUROSTAT*

2. We utilise the design and implementation experience from the current programming period and assess the changes in the economic environment

Smart Specialisation (RIS3) is a place-based development policy-related approach that directs the allocation of public and private investments to selected priority sectors, through the Entrepreneurial Discovery Process (EDP); RIS3 is an economic transformation agenda based on four key principles:

- Choices and critical mass,
- Competitive advantage,
- Connectivity and clusters, and
- Collaborative leadership.

The Entrepreneurial Discovery Process (EDP) serves as the starting point for the prioritisation and resource allocation, enabling entrepreneurs to identify the most promising sectors for future regional development based on their experience, taking into account market dynamics and the structure of value chains; the EDP promotes a bottom-up approach that allows policy makers to learn from the Quadruple Helix stakeholders (government, researchers, industry, and civil society).

In the current programming period, RIS3Crete was systematically implemented in the Region, supported by an extensive Entrepreneurial Discovery Process (EDP) involving a large number of companies and researchers.
During consultation, 300 innovative ideas were submitted across the four Specialisation sectors: Agri-food, Tourism-Culture, Environment-Energy and Knowledge, (thereby largely confirming the choices made regarding the direction of Specialisations), upon the basis of which the areas of implementation related to the actions of the “Crete OP 2014-2020” were defined. For the first time, a dialogue between businesses and researchers was developed on a large scale, while the strategy was extensively disseminated to the general public.

The general environment, combined with the increased potential of the regional research and business potential led to a significant participation of proposals in funding programs. In total, 416 projects, with a total budget of €160 million were included in actions supporting the strategic specialisation sectors (293 under HORIZON 2020, 101 under the EPANEK and 22 under the RIP). Additionally, 31 investment projects focusing on high-tech innovation, amounting to €32.7 million, have been approved under Law 3908/2011. At the same time, relationships between the business and research communities were strengthened, while job retention in research institutions helped slow the brain drain. Finally, the involved administrative authorities strengthened the management and monitoring procedures, while the governance capabilities of the strategy were upgraded.

This significant experience gained during the current programming period constitutes the basis for creating a more flexible consultation mechanism - EDP that will respond more quickly to changing conditions and shall better utilise the possibilities of electronic communication. Towards this direction, the operation of the Innovation Business Observatory, which will serve as an

interactive hub for networking, information, and mobilisation of both business and research potential, with the aim of fostering the development and implementation of innovations as well as creating new employment opportunities in the Region of Crete, can be utilised.

Additionally, the main objective is that the transition from the existing strategy to the new one for 2021-2027 period should, on the one hand, result from the consideration of the experience of the current programming period and, conversely, the changes that have occurred in the (internal and external) economic environment.

To formulate the objectives of the strategy review, a broad public consultation was organised, involving public/private entities, entrepreneurs, and researchers, for which a specific methodological approach was developed.
For more information, see: **ANNEX A: PUBLIC CONSULTATION ON THE STRATEGY REVIEW**

SWOT Analysis

The SWOT analysis indicates that it is advisable to further leverage the accumulated positive experience from the current programming period. At the same time, critical gaps should be addressed to enhance the mobilisation of the business community. This will also require adjusting the specialisations to align with changing trends and stakeholder preferences, as well as shifts in both the internal and external environment.

The appropriation of the improving business climate and the conditions for the development of start-ups by those involved shall contribute to the strengthening of innovation initiatives at the regional level. Clarifying the responsibilities and strengthening the cooperation between the Centre and the Region will contribute to the more effective implementation of the strategy. Lastly, adopting a broader framework to support entrepreneurship in the post-crisis recovery will facilitate the undertaking of more complex and technologically advanced investment projects.

Business activity and trends within the structure of economic activities confirm the choice of the initial specialisation as the Agri-Food and Tourism sectors emerge from the crisis with a significant strengthening of their presence in the regional economy. In the agri-food sector, investments continue, and the export orientation is being reinforced. The enhancement of the sector's competitiveness shall result from the closer connection of primary production with the food industry as well as from the utilisation of new technologies aimed at developing more sustainable production and the introducing precision farming systems.

Additionally, in the tourism sector, significant investments are being made, mainly in high-quality accommodation and in integrated investments, while complementary services are also being strengthened. The pandemic disrupted the sector's positive growth trajectory and recovery is expected to be gradual in the coming years. On a global scale, international tourist arrivals are estimated to have decreased by 60 to 80% in 2020 and tourism expenditures are unlikely to return to pre-crisis levels until 2024[5]. However, the challenges arising from the pandemic's impact create new opportunities for the development of innovations in ICT applications aimed at fostering the transition towards "smart tourism" (and more generally "smart destinations") that shall enhance visitor experience through a digital platform linking all businesses and service providers. At the same time, environmental sustainability in tourism activities and destinations has become a key factor for stability (maintaining their attractiveness) and efficient operation, as costs are reduced, and resources are optimised (through reuse and minimising leakage).

In addition, significant investments in the broader environmental sector continue and are expected to accelerate in the near future, as green transition is promoted, particularly the adoption of circular economy practices. The completion of these investments will lead to an increase in turnover and employment as all new waste treatment plants (Amari, Sitia, Hersonissos and Heraklion) are expected to commence operations by 2023, while business initiatives for the recovery and reuse of materials on a broader scale beyond urban waste are also expected to be undertaken. Lastly, major investments are being promoted for the completion of basic water infrastructure (such as the implementation of the Masterplan of the Organisation for the Development of Crete, etc.) while it is certain that new ones shall also be required in water distribution networks (for irrigation and drinking water).

The knowledge sector by its nature, does not constitute a homogeneous field and from the experience of the current period, it is evident that individual sectors develop with differentiated dynamics. The evaluation of the ideas in the 2018-2019 period revealed that ICT - CUTTING-EDGE TECHNOLOGIES (microelectronics and lasers) and HEALTH

[5] Margaux Constantin, Steve Saxon, and Jackey Yu (2020) Reimagining the 9 trillion tourism economy-what will it take? August 5, 2020, https://www.mckinsey.com/industries/travel-logistics-and-infrastructure/our-insights/reimagining-the-9-trillion-tourism-economy-what-will-it-take#

(including Life Sciences) are the sectors with the greatest potential for business development as they attracted the largest number of proposals and the highest average score.

Among the challenges that RIS3Crete continues to face, as identified in the 2nd monitoring report (2020), is **the mismatch of perceptions, aspirations, and Specialisations between the production and research base.** According to data (2017) for 56 export sectors from the European Observatory for Clusters and Industrial Change, the regional economy has specialized in five sectors. The highest level of Specialisation is observed in the Hospitality and Tourism sector (4.62) which is the only cluster at EU28/third country level. Specialisation in the emerging/cross-sectoral sector Experience Industries (3.73) is also important. The three remaining sectors are Food Processing and Manufacturing (2.20), Distribution and E-Commerce (1.30), and Environmental Services (1.09). Notably, the Education and Knowledge Creation sector, despite its low concentration (0.13) and small size (629.27 number of employed FTEs), presents the highest productivity (95,112.83 average salary per employed FTE).

The Region of Crete demonstrates a satisfactory correspondence between the technological base (patents) and research base (scientific publications) with both showing high performance in the fields of Biology, Chemistry, Basic General-purpose Technologies/Strategic Technologies, Information and Communication Technologies, Physics and Astronomy, and Earth and Environmental Sciences. By contrast, the correspondence is small between the technological base and research base with both showing low performance in the fields of Agriculture, Forestry and Fisheries, Biomedical Research, Clinical Medicine, Public Health and Health Services, Mathematics and Statistics, Built Environment and Planning, Economics and Business[6].

Limited appropriation of research excellence to enhance regional Specialisation (absence of support mechanisms, weak start-up ecosystem) comprises an additional challenge. The business ecosystem has developed a propensity for innovation, as evidenced by its classification as a strong innovator in the Regional Innovation Scoreboard, as well as by the value of the "Regional Innovation" composite index (94.45), which is the highest in Greece and has one of the largest positive changes (30.1) in the EU28 in the 2011-2019 period. Within this composite index, the highest performance (> 100 (EU28 average)) is the "Innovative SMEs collaborating with others, as a percentage of SMEs" index (248.51).

However, this does not imply that the regional ecosystem has any increased capabilities for creating new competitive products incorporating advanced technology, as the application of fourth-generation patented technologies in specific fields (such as smart buildings), although improved since the 2000-2009 period, remains

[6] European Commission (2021) The importance of scientific domains for technological diversification in European regions, Ευρωπαϊκή Επιτροπή, Prepared by Pierre-Alexandre Balland and Ron Boschma, 2021.

among the lowest in the period 2010-2015 at EU28/ESPON partner country level[7]. In addition, the performance is also low with respect to the indicators of the Regional Ecosystem Scoreboard, which measures factors that favour the creation of business clusters and industrial change (modernisation). The use of national support mechanisms (mainly seed capital financing instruments) with appropriate advisory guidance shall contribute to the creation of a more dynamic start-up ecosystem at a regional level. In this direction, it is crucial to enhance the visibility of existing structures (more intense promotion in the Region by organising presentations and face-to-face meetings) and provide advisory services to be accessed at a local level (e.g. support for the preparation of reliable business plans). The creation of a regional mechanism for organised advisory and technical support for entrepreneurship would facilitate the participation of businesses and start-ups in funding programs.

A third challenge consists in the lack of coherence in multi-level governance and the absence of coordination with the centre with respect to implementation. The difficulties faced by the Regional Governance System are identified in maintaining the commitment to a continuous and feedback-based business discovery process and monitoring procedures, in the functioning of institutions that have not yet been established and in the lack of specific support units. Monitoring and evaluation mechanisms face difficulties due to the financing of RIS3Crete from multiple sources and different management bodies, complicating real-time tracking of projects. Lastly, the complexity of the approval and financing-related procedures for innovation proposals due to inclusion under state aid schemes, combined with the long time intervals and complex procedures with respect to the evaluation of proposals submitted under the NSRF, creates further challenges for those involved.

The RIS3 transformation for the 2021-2027 Programming Period focuses on the smart and sustainable development of the areas of specialisation

Within the framework of the revised RIS3Crete, there is a need for: 1) focused support for innovative entrepreneurship through collaborative initiatives aimed at developing innovative products and services, also by utilising the momentum generated by the green and digital transition, 2) strengthening the infrastructure of public research institutions and higher education to strengthen research in areas of specialization and existing and/or new centres of excellence, 3) supporting the operation of the Innovation Business Observatory (IBO) of Crete Region and the RIS3 governance structure, with particular attention to post-pandemic business recovery, within the context of the intended transformation of the regional economy.

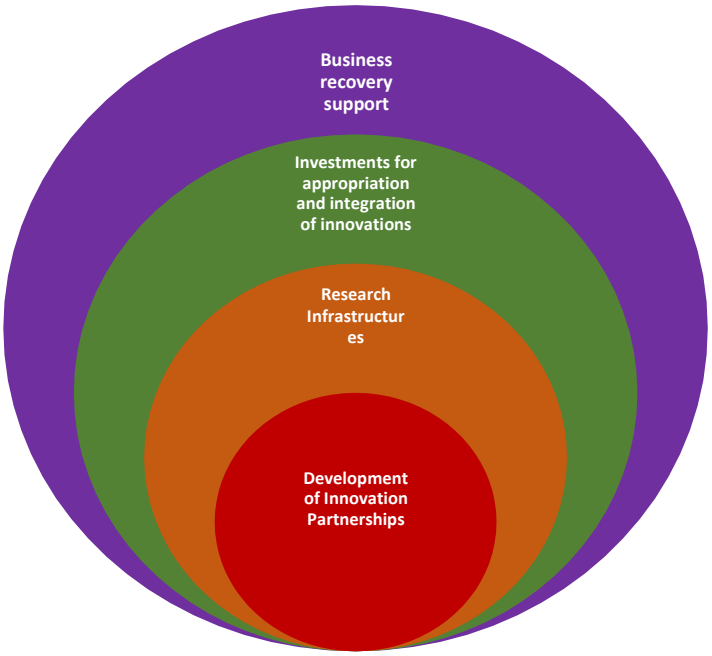
Given this context, the RIS3 strategy 2021-2027 moves at four levels:

1. Development of innovation with emphasis on partnerships between research centres and businesses.

[7] ESPON, T^4 – Territorial Trends in Technological Transformations, 2020.

2. Strengthening research infrastructure to support the areas of specialisation of the regional economy.
3. Undertaking investments to utilise the innovations (as products) that have been developed and/or their integration into production processes.
4. Supporting business recovery through investments in new activities.

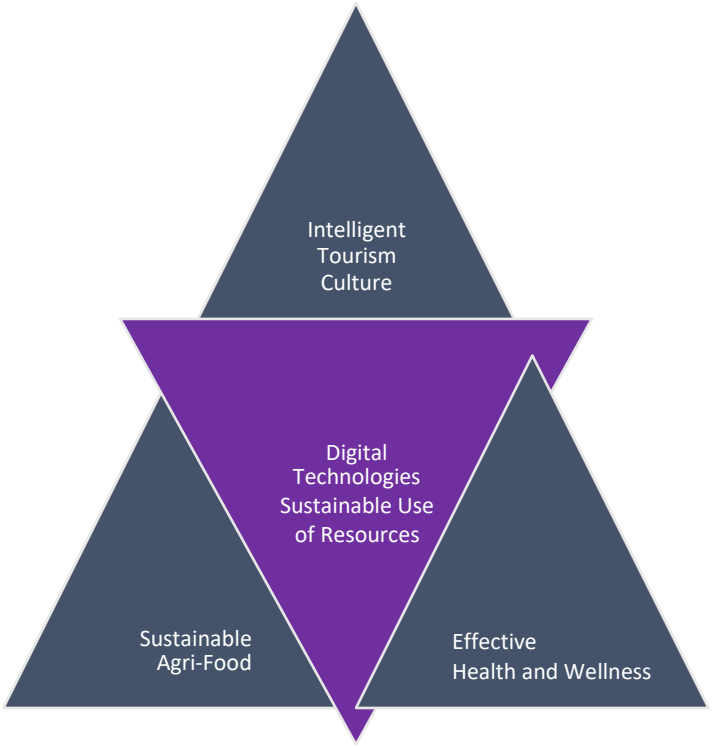
CHART 1: Range of RIS3 Strategy Interventions



The focus remains on the development and appropriation of innovations, the strengthening of research infrastructures, and the strengthening of investments within new business activities or for the modernisation of existing units.

Within this context, it is proposed to preserve, within the new programming period, the specialization sectors of Tourism-Culture and Agri-Food with a clearer orientation, while the Knowledge sector is focused on Health. At the same time, two specialization sectors are introduced: digital technologies and the sustainable use of resources. These areas incorporate the principles of the circular economy, with the environmental sector being more clearly defined. They also act as horizontal catalysts, facilitating the transformation of other productive sectors towards the digital and green transition.

CHART 2: Specialisation sectors



Intelligent Tourism Culture

The development and implementation of innovations for the transformation of the tourism industry addresses a broad range of activities with respect to infrastructure and operation: Attractions, Accessibility, Services (accommodation, gastronomy, and leisure activities), Available packages, Experiences and Ancillary services[8]. "Smart tourism" refers to the application of technology and innovation to facilitate the visitor experience through a digital platform, the appropriation of technologies both in the direction of operations automation and service personalisation. All businesses and service and experience providers involved in the aforementioned activities must be interconnected through an easily accessible common digital infrastructure.

Furthermore, environmental sustainability is key to enhancing the resilience and sustainability of successful tourism destinations.

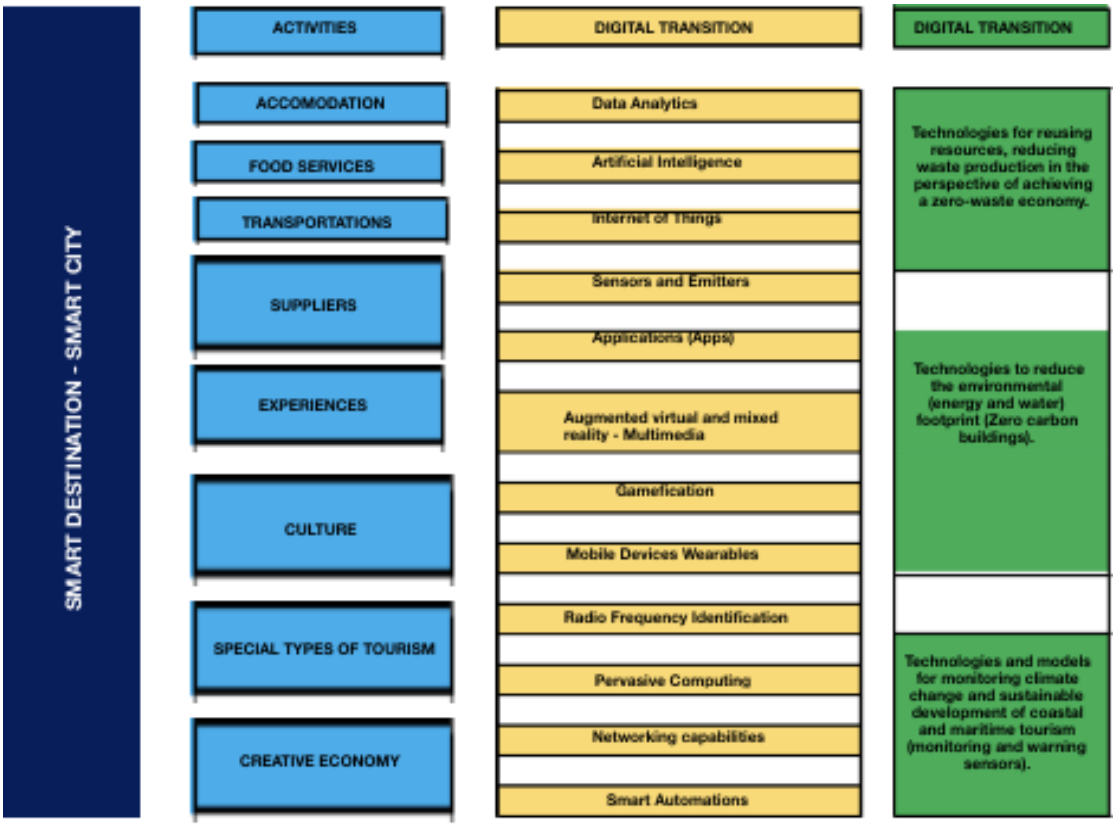
Therefore, individual specialisations should focus on innovations that support the transformation of the sector, especially those related to:

(a) The Internet of Things, ICTs that support the creation of smart cities (mobile travel applications), Data Analytics, Artificial Intelligence, multimedia, sensors and transmitters, Radio Frequency Identification, etc.

[8] Dimitrios Buhalis, Aditya Amaranggana, 2014, Smart Tourism Destinations, Xiang, Z., Tussyadiah, I., (eds) Information and Communication Technologies in Tourism 2014, pp.553-564 https://www.academia.edu/7239447/Smart_Tourism_Destinations

(b) Technologies for resource reuse, reducing environmental footprint (zero carbon buildings) as well as sustainable development of coastal and maritime tourism (monitoring and warning sensors).

CHART 3: Areas of Expertise in Smart Tourism-Culture



The perspective of tourism transformation is critically important for the Region of Crete and the development of focused innovations requires a structured sustainable approach. Exploring the creation of a "Hospitality" laboratory (Host LAB) at the initiative of research institutions and businesses would be a significant step towards the better organisation of these efforts.

The Host LAB shall bring the regional tourism forces (entrepreneurs, consultants, researchers) together, with the primary aim of integrating and promoting the implementation of innovative ideas in tourism using new technologies. It shall promote interaction among the involved parties, provide consulting services in the areas of tourism and entrepreneurship, improvement of innovative ideas, as well as technical assistance for the development of selected products. The LAB can be hosted in one of the local universities and developed gradually with the participation and support of businesses in the sector, as well as with some initial funding from public sources. In terms of full development, it is advisable to include the following activities:

- Monitoring trends in the field of tourism innovation in Greece and globally. The aim is to record and highlight new applications and good practices along the tourism value chain and at the interface with culture.
- Short education and training courses, specifically for young entrepreneurs in the sectors of the tourism industry and awareness raising on the possibilities of technological innovation in tourism.

- The possibility of experimental applications through scale testing in collaboration with the LAB partners to evaluate tourism products and services. The experiments shall include a real-world evaluation of the functionality of new products, the impacts of their adoption, and an assessment of their long-term sustainability.
- Consulting and incubator services, supporting start-ups in their efforts to design new products. A combination of on-site installation (up to 10 seats) and electronic remote support would be the optimal solution in today's conditions.

The LAB shall be overseen by a small advisory committee representing stakeholders within the sector, while a coordinator shall be the project manager. The provision of services shall be supported by a network of external mentors and educators from higher education institutions.

The pandemic comprises both a challenge and an opportunity for the transformation the sector by highlighting the distinct characteristics of each destination and activity, thereby enhancing the demand for customised innovative solutions. The development and integration of innovations are essential prerequisites for promoting the strategic objectives of the Region in the tourism industry, particularly in fostering a shift towards quality services and the development of new forms of tourism.

Sustainable Agri-Food

Agri-Food faces significant challenges and opportunities for adaptation. Seizing the opportunities requires: (a) Introducing reforms that promote sustainable agriculture and efficient use of resources to enable adaptation to climate change, (b) Accelerating the shift towards quality agriculture in branded products and standardisation with support for the digital transition and the use of technologies, (c) Promoting Cretan food and gastronomy and strengthening ties with tourism.

A climate-friendly agriculture for producing sustainable food production (a) utilises technologies that facilitate the transition to climate-neutral and environmentally friendly agriculture, supports organic production, production based on indigenous plants and alternative protein sources, (b) adopts practices that enhance the efficient processing and use of resources (especially water and soil) and (c) encourages the recovery and utilisation of by-products and waste materials in the production process.

Sustainable Agri-Food systems are highly interconnected and represent the entire value chain, from production preparation and production to supply chains and consumption. Significant opportunities for integrating innovations are identified in all individual links of the value chain aimed at enhancing the sustainability of the production process and the competitiveness of products. The European Commission identifies the need for the European Regional Development Fund to invest, through smart specialisation,

in innovation and cooperation along food value chains.[9] Key application technologies converge and operate in a multiplying manner within agri-food under specific integration conditions, thereby accelerating the transformation within the industry.

The European Commission identifies key research priorities (under the HORIZON Europe strategic plan) proposing an allocation of €10 billion on research and innovation for food, bioeconomy, natural resources, agriculture, fishery, aquaculture and the environment, as well as on the use of digital technologies and nature-based solutions for agri-food. In particular, the EU is focusing on (a) the microbiome, ocean foods, urban food production systems, as well as increasing the availability and sources of alternative proteins, such as plant-based, microbial, marine and insect-based proteins, as well as meat substitutes, (b) soil and food health with the aim of developing solutions to restore soil health and functions, (c) scaling up agro-ecological approaches to primary production through a dedicated partnership for agroecology living laboratories with a primary objective of reducing the use of pesticides, fertilisers, and antimicrobials.[10]

Furthermore, it is foreseen that "the *InvestEU* Fund shall encourage investment in the agri-food sector, de-risking investments by European companies and facilitating access to finance for small and medium-sized enterprises (SMEs) and mid-caps."[11]

Given the European framework for priorities, specializations in Sustainable Agri-Food take into account local research and production capacities and the general business environment. In particular, significant opportunities are identified in:

- Circular Economy of Agri-Food and the perspective of Adaptation to Climate Change: Technologies for sorting, reusing, and utilising side waste and materials (plastic) to prevent the destruction of part of the useful raw materials by allowing nutrient recycling, composting, and recovery of materials and energy. At the same time, solutions to reduce the environmental footprint of agriculture are being strengthened.
- Precision Agriculture: Artificial Intelligence (AI), Big data, and the Internet of Things lead to more effective and timely decisions for optimal resource utilisation (water and soil) while the introduction of automation replaces labor and facilitates crop growth.

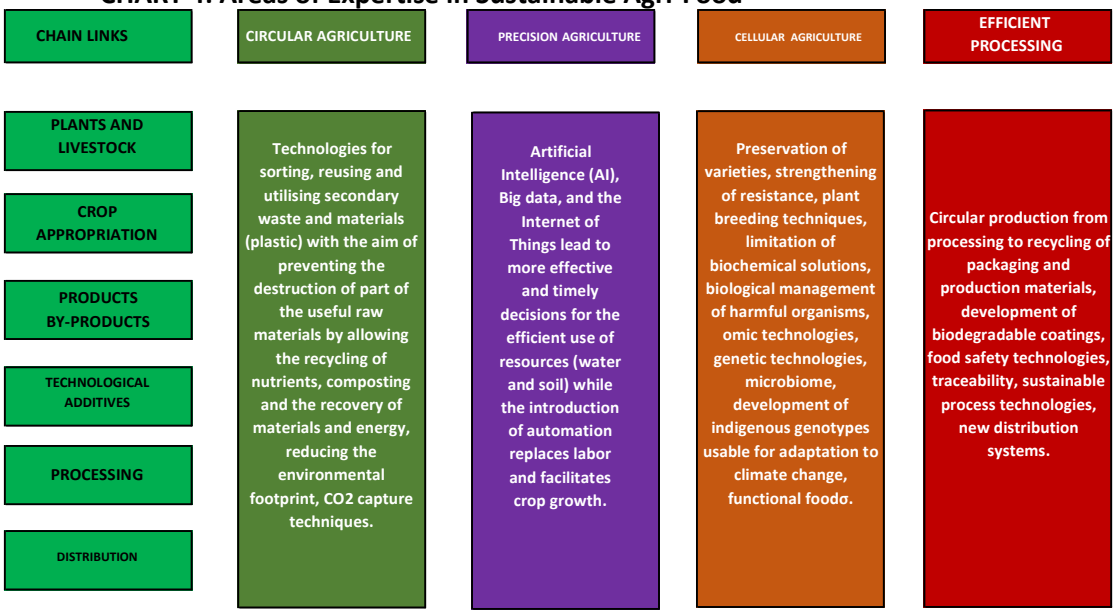
[9] European Commission (2020) From Farm to Fork, A Strategy for a Fair, Healthy and Environmentally Friendly Food System, COM (2020) 381 Final p.18.

[10] European Commission (2020) From Farm to Fork, A Strategy for a Fair, Healthy and Environmentally Friendly Food System, COM (2020) 381 Final p.18.

[11] European Commission (2020) From Farm to Fork, A Strategy for a Fair, Healthy and Environmentally Friendly Food System, COM (2020) 381 Final p.19.

- In Cellular Agriculture and Gene technology: Synthetic biology, omics and genetic technologies are increasing the pace and precision of biological alternatives to agrochemicals.
- In Efficient Processing: Adopting circular production from manufacturing through recycling of packaging and production materials, development of biodegradable coatings, food safety technologies, sustainable process technologies, Logistics.

CHART 4: Areas of Expertise in Sustainable Agri-Food



More generally, technologies that can be used to enhance sustainability of agri-food are developing rapidly[12]. Due to the size of farms and related industries, adjustments to the innovations are required, so that they can be introduced into local production. As such, a field of research work oriented towards small and medium scale economic activity can be developed. At the same time, it is desirable to explore the possibility of diversifying intensive agriculture-related crops through the development and adoption of modern hydroponic systems. In certain cases, introducing innovations shall be driven by supply, while, in others, by demand. The development of innovations should be focused on PDO products as well as on areas with comparative advantage and emerging growth prospects (relation to the blue economy).

Effective Health and Wellness

The local research potential appears particularly strong in this sector, yet it is noted that there is a small correlation between the technological and research base both of which show low performance in fields such as Biomedical Research, Clinical Medicine, Public Health, and Health Services. Research activity in the sector is at a high level in Crete: the

[12] Mario Herrero et.al. (2020) Innovation can accelerate the transition towards a sustainable food system, Nature Food, https://www.nature.com/articles/s43016-020-0074-1.pdf

University of Crete and the FORTH exhibit a high impact index, both in relation to other institutions and in relation to other scientific fields. Researchers have published over 2,600 papers during the period from 2014 to 2018 across a significant number of fields with considerable impact.

The continuous production of knowledge within the sector has led to the creation of a group of spin-off companies with significant growth prospects, some of which attracted private capital. The activities that have been developed comprise part of different links in the value chain and therefore the conditions for the accumulation of a critical mass are not created. However, value chains are not static; they are increasingly restructured due to cross-border and cross-sectoral cooperation, technological advancements and the diversity of entrepreneurship across different fields. There are emerging opportunities for the development of a small, initially, yet dynamic entrepreneurial ecosystem provided that existing trends are adequately supported, and new initiatives are encouraged. Individual units can join cross-border chains or collaborate with other business initiatives from related or unrelated sectors.

Possibilities for the development of innovation are identified in the health and wellness industry through the development, adoption, and upgrading of innovative digital solutions and practices within a wide scope. Examples include, but are not limited to: artificial intelligence, telemedicine and self-care applications, Data Analytics, bioinformatics, bioimaging, biotechnology, precision medicine (modern diagnostic practices), wearables and telemetry, biosensors, remote exercise monitoring, technological solutions to support exercise for people with disabilities and the elderly, modern dietetics, pharmaceutics, virtual education applications.

CHART 5: Areas of Expertise in Effective Health and Wellbeing

Further development of innovation and its business appropriation in Crete requires increased cooperation and collective addressing of common challenges. The creation of a cluster accelerates the development of an ecosystem and enhances the visibility of the effort. A biosciences cluster (HBIO) has already been created in Greece, and it has been operating since 2006 in the fields of Pharmaceutics, Biotechnology, Diagnostics, Medical Devices, and Special Services. Leveraging Greek experience as well as good practices from other dynamic European clusters

(Norway, Germany,) is crucial for organising a sustainable initiative at a regional level.[13]

The cluster shall offer networking services, advice on national and European funding opportunities for health technologies, support to start-ups (technical and administrative advice, access to capital), as well as the design and management of strategic health projects, should there be common interest. At the same time, the EIT Health infrastructure could be used[14].

In general, it is necessary to create a more favourable environment for innovation development, in order to multiply efforts to create start-ups. In addition to the services provided by the cluster, support is required for the preparation processes prior to attracting capital: providing consulting services, business planning, access to technical and legal advisors, and patent registration. Lastly, a crucial factor for sustainability is access to early funding (seed capital) from existing structures (either national or international).

Digital Technologies

The innovation potential of digital technologies applied in other sectors is enormous and the investment requirements may differ. Some areas would require investments in infrastructure in equipment and computational power, while other areas still need to be digitised before data can be used for research and development.

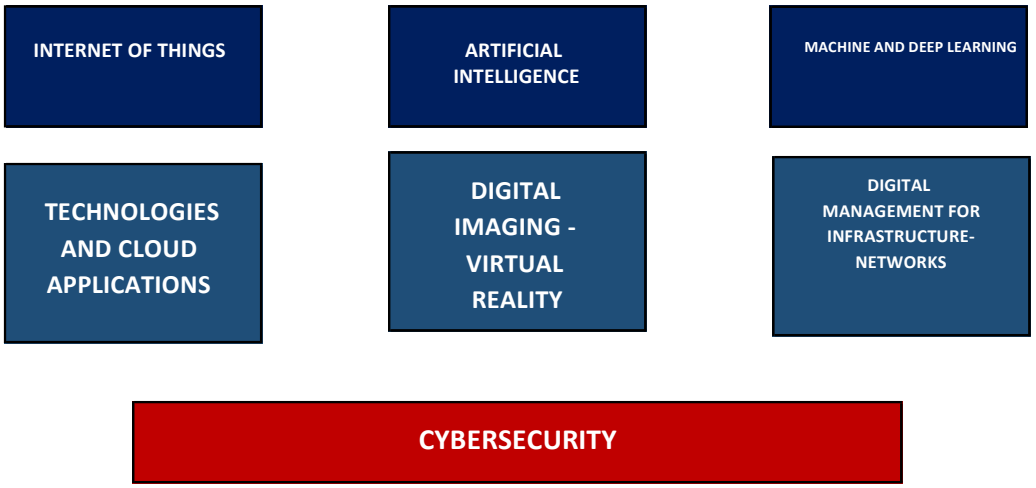
(a) The main priorities to meet the needs in the ICT areas of expertise in general (niche areas), such as, for example, cybersecurity, network security, Big Data and Data Analytics, applications on cloud computing platforms, digital learning applications.

(b) ICT applications with a more general demand from the RIS3 areas of expertise such as, for example, Big Data and Data Analytics at sectoral level, Internet of Things, Artificial Intelligence, e-health, Industry digitalisation, precision agriculture applications, automation and applications in energy management, digital reproductions of monuments of artworks and texts, augmented reality.

[13] Relevant information at: https://www.norwayhealthtech.com/

[14] Relevant information at: E IT H ealt h | E θνι κό Κέν τρο Τεκ μ η ρίωση ς - E KT (ekt .gr)

CHART 6: Areas of Expertise in Digital Technologies



The development and appropriation of innovations in the area requires the existence of quality scalable infrastructures that include fast and secure networks, large-scale computing infrastructures and data centres.

Sustainable Use of Resources

Sustainable Use of Resources and transitioning to the circular economy comprise a continuation of the efforts made in the Environmental sector. During the 2021-2027 programming period, the green transition aimed at addressing climate change will be in full swing, supported by significant funding. The demand for innovations is expected to increase as applications are required across all productive sectors to achieve the required adaptation. In particular, it is appropriate to explore the possibilities of developing innovations in the following fields:

(a) Sustainable cities and particularly sustainable housing developments, as well as recycling of materials, minerals and urban waste, smart buildings and urban infrastructure equipped with a smart user interface, Artificial Intelligence, Internet of Things offer great potential for reduced emissions while improving working and living conditions. It is essential to develop solutions that align with the product and construction life cycle logic within the framework of integrated circular design, to ensure efficient dismantling and recycling of materials. Furthermore, it is crucial to develop automation in the urban waste management process to enhance the productivity and efficiency of the collection process (introduction of pay as you throw management systems) and the processing and utilisation of recovered materials (network optimisation technologies, waste traceability technologies, sensors, precision measurements of materials and toxic substances, etc.). In addition, the development of new organic waste recycling and management processes is required with the aim of reusing useful materials, as well as innovative waste to energy solutions. Lastly, it is advisable to explore the possibility of developing innovations in smart energy grids and energy management and control applications.

(b) *Integrated water cycle management* through the development and integration of innovations (big data analytics, artificial intelligence, sensors, automation, biotechnology and new water and waste treatment systems and practices) that focus on monitoring water quality, identifying and addressing threats to aquifer pollution, upgrading infrastructure while reducing the environmental footprint and rational water supply management, irrigation and sewerage systems.

(c) *Blue growth* and, in particular, technological innovations across the value chain of aquaculture and the blue bio-economy which includes non-traditionally appropriated groups of marine organisms and their commercial biomass applications (with particular emphasis on the appropriation of invasive alien species), the appropriation of seabed resources, RES (wave and offshore wind) and coastal protection structures and water quality control (recording, mapping, data management, biological and chemical analysis techniques, sensors, real time monitoring platforms and networks, early warning systems).

CHART 7: Areas of Expertise in Sustainable Resource Use

SUSTAINABLE CITIES	INTEGRATED WATER CYCLE MANAGEMENT	BLUE GROWTH
• Sustainable buildings • Waste collection and management (automation) systems •Waste to energy solutions •Network optimisation technologies •Waste traceability technologies • Sensors - precision measurements of materials and toxic substances. •Smart Energy Grids and energy management and control applications.	• Water quality monitoring systems and technologies • Threat detection systems • Reducing the environmental footprint of infrastructures - monitoring systems for the latter • Experienced water cycle management systems.	• Fish farming • Biomass utilisation • Appropriation of seabed resources • Coastal protection • Water Quality Control.

The development and commercial exploitation of innovations in the field of Sustainable Resource Use requires systematic multi-year research and commitment of significant particularly in cases involving the development of industrial products and integrated systems. Attracting private capital following the development of pilot apps is a critical success factor.

Research infrastructures

The implementation of the new RIS3 requires the strengthening of research infrastructures to achieve a high level of competitiveness in research and to enhance the orientation towards RIS3 by providing support to sustainable innovation efforts (laboratory equipment, data centres, observatories, monitoring platforms).

At the same time, it is appropriate to strengthen the creation of flexible cooperation mechanisms for further elaboration of strategic options and the development of targeted solutions as well as to encourage the establishment of new collaborative innovation development initiatives by educational and research institutions (clusters, competence centres, innovation laboratories, upgrading of existing structures).

Lastly, it is crucial to support innovation initiatives already undertaken by those involved in the current programming period, which contribute to enhancing the successful international presence of institutions.

The research infrastructures and structures to be strengthened will be directly linked to the areas of specialization (Chart 8) and shall aim to create local capacities to provide support to innovation development ventures (measurements, issues of technological problem solving, laboratory experiments, high-level consulting, etc.). The presence of a significant number of research entities necessitates better coordination in the development and use of research infrastructures.

CHART 8: AREAS OF RESEARCH INFRASTRUCTURE-RELATED ORIENTATION

The selection of the infrastructures to be supported will be made based on a set of criteria that include:

- The feasibility of the investment and the added value in the innovation development process based on an integrated plan that shall focus on the user and the final recipient of the services which is the broader innovation ecosystem (including users from research communities, the business sector, public administration and other relevant factors).

- Excellence and THE extent to which the infrastructure shall contribute to scientific renewal and broadening of the scope.
- The avoidance of overlapping of efforts or fragmentation and the adoption of an inter-university approach by groups of scientists in specific research fields and particularly through an analysis of how the new infrastructure aligns with existing ones at a European, national, and regional level.

The objective of the strategy is to develop and appropriate innovations in selected sectors, to create a critical mass of high value-added activities and upgrade the production process as a whole. Specifically, the projects to be promoted within the framework of the strategy should be evaluated based on their characteristics in terms of research and innovation from a global perspective, in relation to whether they cover an obvious or latent productive or social need, their economic viability, the scalability of the proposed solution (scaling up), the technical, regulatory, and market risks, as well as their general feasibility. The evaluation shall take into account their contribution to meeting adaptation needs in response to prevailing conditions in the Region, including the composition of activities, production scale, and social environment.

ANNEX A: PUBLIC CONSULTATION ON THE REVISION OF THE STRATEGY

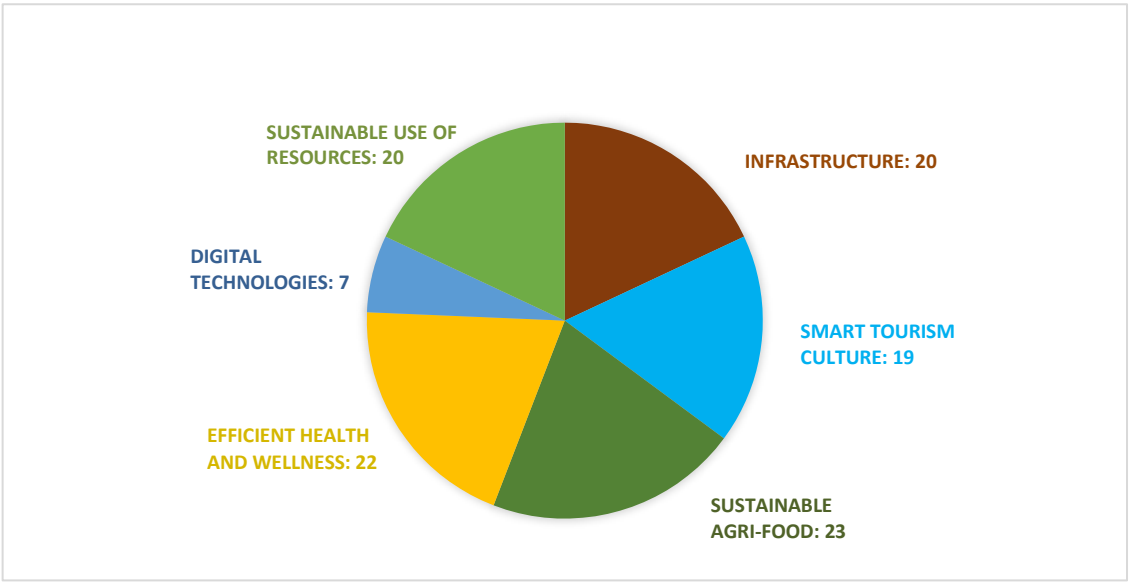
A broad consultation was organised following a specific methodology to formulate the objectives of the revision of the strategy. Initially, the text for the consultation (Concept Paper) along with the guidelines of the revision was formulated and posted on the Smart Specialization Strategy - RIS3Crete website (http://ris3.crete.gov.gr/), which served as a point of reference and information for interested and involved bodies encouraging their participation in the process. The process was publicised through social networks, press releases, emails, and presentations to collaborating bodies including the Regional Research and Innovation Council (PSEK) of Crete, the Special Managing Authority (EYD), research institutions, businesses, Chambers, etc. By decisions of the Regional Governor of Crete, three working groups were established to organise the process in the areas of: Sustainable Agri-Food, Intelligent Tourism and Effective Health and Wellness. In the areas of Digital technologies and Sustainable use of resources, a special invitation to participate in the electronic consultation was addressed to a wide range of involved individuals.

The Directorate of Development Planning sent an invitation for information and participation in the public consultation (via e-mail) to:

- Participants in the consultation / entrepreneurial discovery of the previous period.
- Businesses and researchers implementing integrated programs in the Regional Operational Programme (ROP), the “Competitiveness, Entrepreneurship, Innovation” Operational Programme, and Horizon 2020
- Businesses and researchers from the registry of the Innovation Business Observatory (IBO) of Crete Region.
- In registries of researchers and businesses created by our service (in collaboration with other Directorates such as those for the Environment, Rural Economy, Tourism - Culture) including those related to the fields of Digital Technologies and Sustainable Use of Resources.

The main activities and actions for the implementation of the public consultation process are shown in more detail In **APPENDIX B**, while **APPENDIX C** presents more detailed data with respect to the participation of the involved bodies, researchers, and businesses in the working groups and workshops that were conducted.

PROPOSAL DISTRIBUTION PER AREA/SECTOR



A multitude of proposals were submitted to the consultation with satisfactory participation from the business community, research and collective bodies and public administration; 76 involved individuals participated in the workshops, while a total of 111 proposals and opinions were submitted through the electronic consultation and within the context of more comprehensive texts from institutions and other bodies.

No major deviations from the strategic orientations of the initial consultation text were identified. The consultation showed that Digital Technologies and Effective Health and Wellness have a distinct dynamics; Sustainable Agri-Food has potential, but also limitations; Intelligent Tourism and Culture offers opportunities that have not been fully revealed yet and the business community's involvement is limited at this stage (perhaps due to the current situation). In contrast, Sustainable Resource Use faces challenges in specifying fields with a prospect of developing new activities or products. Regarding infrastructures, serious proposals were recorded, as they arose from the relevant workshop that was organised, as well as from texts submitted by institutions, and a choice should have been made for the laboratory equipment and support mechanisms within the framework of the infrastructure based on the proposed criteria.

APPENDIX B: ACTIONS AND ACTIVITIES ΚΑΙ ΔΡΑΣΕΙΣ FOR THE IMPLEMENTATION OF THE PUBLIC CONSULTATION PROCEDURE

Date	Activity/Action
5/4/2021	Announcement for the launch of Public Consultation for the revision of the Smart Specialization Strategy of the Region of Crete and posting of an informative article, consultation text on the strategy website (Concept Paper) Provision of an electronic form for submitting proposals during the public consultation. Sending of informational messages to collaborating bodies/services and sending of invitations for participation in the public consultation to business and researcher registries.
9/4/2021	Formation of a Working Group of the **Culture - Tourism Sector**, in the context of the Consultation for the Revision of the Smart Specialization Strategy of the Region of Crete (RIS3Crete), during the new 2021-2027 programming period
14/4/2021	Informing the Regional Research and Innovation Council (PSEK) of Crete about the public consultation process for the revision of the strategy, within the context of its online meeting
15/4/2021	Workshop of the **Culture - Tourism Sector** working group, held via videoconference
20/4/2021	Formation of the **Agri-Food Sector** Working Group, within the context of the Consultation for the Revision of the Smart Specialization Strategy of the Region of Crete (RIS3Crete), during the new 2021-2027 programming period
21/4/2021	Workshop with representatives and researchers from all **educational and research institutions** of the Region of Crete, held via videoconference
22/4/2021	Formation of a Working Group on the proposed **Health and Wellness** sector, within the framework of the Consultation for the Revision of the Smart Specialization Strategy of the Region of Crete (RIS3Crete), during the new 2021-2027 programming period
26/4/2021	Workshop of the **Agri-Food Sector** working group, held via videoconference
06/05/2021	Workshop of the **Health and Wellness** sector working group, held via videoconference
31/5/2021	Completion of the public consultation on the revision of the Strategy

APPENDIX C: INFORMATION ON THE PARTICIPATION IN THE WORK GROUPS AND WORKSHOPS

Consultation-related information for the revision of the RIS3Crete (April - May 2021)

Working Groups / Participation in Videoconferences - Workshops

Intelligent Tourism - Culture

Workshop held via videoconference: 15/04/2021

Capacity	Participations in the Working Group	Participations in the Workshop	Bodies
Region of Crete Officials	3	3	
Researchers	5	5	FORTH, MAIC, Technical University of Crete και 2 from the HMU
Entrepreneurs	7	5	
Bodies	0	0	
Representatives of PSEK of Crete	0	1	

Sustainable Agri-Food

Workshop held via videoconference: 26/04/2021

Capacity	Participations in the Working Group	Participations in the Workshop	Bodies
Region of Crete Officials	5	5	
Researchers	5	5	FORTH, MAIC, Technical University of Crete και 2 from the HMU
Entrepreneurs	8	7	
Bodies	3	3	
Representatives of PSEK of Crete	0	1	

Health - Wellness

Workshop held via videoconference: 06/05/2021

Capacity	Participations in the Working Group	Participations in the Workshop	Bodies
Region of Crete Officials	3	3	
Researchers	5	5	FORTH, MAIC, Technical University of Crete και 2 from the HMU
Entrepreneurs	8	8	
Representatives of PSEK of Crete	0	1	

Research Infrastructure

Workshop held via videoconference: 21/04/2021

Invitation to all institutions of Crete - NO Working Group was formed

Body	Number of Participants
University of Crete	2
Hellenic Mediterranean University	2
Technical University of Crete	2
Hellenic Centre for Marine Research	1
Foundation for Research and Technology (FORTH)	1
Mediterranean Agronomic Institute of Chania (MAIC)	1
Hellenic Agricultural Organisation Dimitra (ELGO DIMITRA)	2
Science and Technology Park of Crete	2
PSEK of Crete	2
Agri-Food Competence Centre	1
Special Management Service of the Region of Crete	1
Planning and Development Directorate - Region of Crete	6
General Secretariat for Research and Innovation (GSRI)	1