

CYPRUS RESEARCH & INNOVATION STRATEGY FRAMEWORK 2019 - 2023



“INNOVATE CYPRUS”

**National Board for Research and Innovation
Republic of Cyprus**



Republic of Cyprus

May 2019

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MEMBERS OF THE NATIONAL BOARD FOR RESEARCH AND INNOVATION

Philippos Patsalis (Chairman) – Professor, Cyprus School of Molecular Genetics, CEO NIPD GENETICS Ltd,

Anastasia Ailamaki – Professor, École Polytechnique Fédérale de Lausanne, Switzerland

Andreas Anayiotos – Rector, Cyprus University of Technology

Evgenios Evgeniou – CEO PWC Cyprus

Marina Hatsopoulos – Entrepreneur and Investor

Vassiliki Kassianidou – Professor, University of Cyprus

Michalis Neoptolemou – Managing Director, Remedica Ltd

Leonidas Phylactou – Professor, Cyprus School of Molecular Genetics, Chief Executive Medical Director of the Cyprus Institute of Neurology and Genetics

Christakis Sergides – Chemist, Medochemie Ltd

FOREWORDS

Message from Prof. Philippos Patsalis, Chairman of the National Board for Research and Innovation



The importance of science, research and innovation as key drivers of economic growth is currently greater than ever. Increasingly complex challenges and opportunities brought along with the new wave of deep and transformational innovations at the international arena, as well as with the integration of the digital world into societies, require a systematic and collective approach on behalf of each country to address them appropriately.

Building on the high quality and tremendous potential of the Cyprus research community is undoubtedly key in this effort, while addressing the challenge of transforming new knowledge into tangible benefit for the local market, the economy and the society. Enhancing the innovation capacity of Cypriot enterprises and encouraging them to “think global” from day one, will support them to aim high, while addressing structural barriers of our local system, such as the small market size and critical mass of resources. Strengthening extroversion of our national innovation system through strategic partnerships and collaborations will broaden the cooperation networks of our scientists and entrepreneurs and benefit all from knowledge sharing, while reinforcing Cyprus as a favorable destination for high-tech investments. Last but not least, targeting our education system from early childhood to university, we can nurture the desired culture for creativity, entrepreneurship and innovation, while paving the way for the younger generation through multiplying success stories.

Political decisions taken at the end of last year to reform the national governance system for research and innovation, are of crucial importance and reflect the commitment of the higher political level to adopt research and innovation as a fundamental pillar of a new model for growth, capable of expanding the productive base of the Cyprus economy. Embarking on a renewed national Strategy for Research and Innovation is expected to drive sustainable growth and social prosperity in Cyprus, while addressing the aforementioned endeavors in a strategic and coordinated manner.

“Innovate Cyprus” is an update and operationalization document of the relevant proposal submitted by the National Committee for Research, Innovation and Technological Development in 2014 to the President of the Republic of Cyprus. It is a strategy framework that aims to act as a vehicle for strengthening Cyprus’ economy in the years ahead through research and innovation. The framework clearly sets out ambitious targets, while, at the same time, defines appropriate fields of action to support achievement of national objectives. In this way we can guide our efforts and investments in research, education and entrepreneurship into fields

of greater value to the local community and fields of enhanced potential for economic and social impact in the medium and the longer term.

On behalf of the National Board for Research and Innovation, I would like to thank the members of the National Committee for Research, Innovation and Technological Development, as well as all public entities, organisations, social partners, enterprises, industry representatives and individuals who provided input to this Strategy Framework and were consulted on a bilateral basis. I would also like to extend our gratitude to the organisations and individuals who contributed with their ideas, time and feedback within the context of public dialogue. The commitment and dedication shown, as well as the willingness of respondents and stakeholders to engage further in the implementation of this Strategy Framework is highly appreciated and is acknowledged as a determinant factor for success.

Message from Mr. Kyriacos Kokkinos, Chief Scientist for Research and Innovation of the Republic of Cyprus



Cyprus has a proven record of generating high-quality scientific knowledge. Centres of scientific excellence, that are gradually being developed within our research and academic institutions, conduct ground-breaking research at an international level. At the same time, a significant number of companies compete at an equal basis and establish partnerships with foreign technology firms and multinational companies. Nonetheless, our country's innovation performance remains at low levels compared to Europe, turning the transformation of scientific knowledge generated by our scientific community into innovation and value into one of the most significant challenges we need to address.

Improving our national innovation performance requires, above all, to develop a functional innovation system, comprised of all necessary building blocks, where stakeholders interact sufficiently with each other and benefit is leveraged by synergies and alignment of objectives. Unlocking our research and innovation potential would necessarily require to address this effort as a new culture, a mindset and a way-of-life.

Innovation and a new knowledge-based society need to be built on contemporary education – in its wider dimension - where our educational system, family and society work in a harmonized and systematic way to foster critical and creative thinking among our young generation, starting early in childhood.

Policy for research and innovation should be forward-looking and guided by an ambitious vision and should target the system efficiently at all levels. It should be developed and implemented, not only for the benefit, but also with the active involvement of all key stakeholders – from the private sector, the academic and research community and the Government -, ensuring that policy responds to the real needs of the innovation actors, and also to ensure their commitment along the way.

The present Strategy Framework facilitates the development of a national research and innovation policy that satisfies the aforementioned requirements, being reflected in an Action Plan for implementation, to be regularly enhanced and updated according to progress.

At this critical time, it is of outmost importance that the key stakeholders of our national research and innovation ecosystem, including government, the academic and research community and the private sector, come together and work collectively and effectively, setting common objectives and mobilizing the necessary resources.

I truly look forward to working with all players in order to achieve the objectives of “Innovate Cyprus” Strategic Framework and the national research and innovation policy.

EXECUTIVE SUMMARY

Research and Innovation (R&I) are major factors for sustainable economic development and social prosperity and can provide significant political, technological, social and financial benefits.

R&I investments generate large and significant returns for enterprises, economies and the society; they contribute, among other, in developing new skills and networks of collaborations, accelerating the development and production of high-technology and added-value products, services and processes and increasing productivity and profitability for the business sector. They also support the development of entrepreneurship and a highly competitive business sector and industry, the attraction of foreign investments, the increase in product exports, and, overall the increase of the Gross Domestic Product (GDP) of a country.

Evidence¹ suggests that about 65% of economic growth in Europe derives from innovation, and the typical return of private investment in research and innovation is estimated to be between 10% and 30%. These returns can be 2-3 times higher for an economy in general, due to positive “spillover effects” that allow other enterprises and stakeholders to benefit from these investments. More specifically, empirical studies carried out for different industries and countries, including several EU Member States, suggest that an increase of 10% in R&D investment in a company results in an increase in sales of a range between 0,2% to 2,5%, with a mean increase of 1%, depending on the specific case. Furthermore, in the case of Europe as a whole, an increase in R&D investment of 0,2% of GDP would be expected to result in an increase of 1,1% of GDP, an increase five times bigger in absolute terms.

Apart from the economic impact demonstrated above, R&I are crucial in addressing key societal challenges and improving social well-being. Such benefits include, among others, the creation of new and better jobs, access to high-quality healthcare services and healthy ageing, improvements in energy and water resource efficiency and mitigation of climate change. R&I contribute, moreover, in building societies that are resilient and inclusive.

The challenges faced by the Cyprus economy during the past decade in addition to the upcoming wave of deep and transformative innovations at the international scene, which is expected to change the way in which enterprises, governments and societies operate and interact with each other, govern the need for a change in the existing model of economic growth; they show the way towards the adoption of a sustainable, innovation-driven model that will support long-term growth and social prosperity, and which will be based on a long-term vision and national strategy for

¹ DG for Research and Innovation, European Commission, “The economic rationale for public R&I funding and its impact”, 10-03-2017, ISBN: 978-92-79-65270-7 (<https://publications.europa.eu/en/publication-detail/-/publication/0635b07f-07bb-11e7-8a35-01aa75ed71a1/language-en>).

technological, social and economic development, based on research and innovation.

The current strategic framework adopts the following vision:

“Cyprus to become a dynamic and competitive economy, driven by research, scientific excellence, innovation, technological development and entrepreneurship, and a regional hub in these fundamental areas”

Addressing this vision, the R&I strategic framework under the title “Innovate Cyprus” revolves around nine (9) pillars and enablers of strategic importance, as presented in *Diagram 1* of the next page. The strategy framework will be put into action through a first set of policy measures and activities targeting the aforementioned strategic pillars and enablers, aiming to kick-start this reform and to facilitate a strong boost of the research and innovation ecosystem. For this purpose, an implementation roadmap is designed for the initial period of 2019-2021. Each policy measure is subject to agile implementation and enhancement along the way, in collaboration with stakeholders involved so that to ensure efficient delivery and maximization of impact. Moreover, the roadmap will be updated and further enhanced according to progress and developments in the national R&I ecosystem, as well as with the support of further case-studies and the elaboration of a detailed R&I strategy.

Achieving the objectives of a new national development Strategy would require a significant increase in national investment for research and development (R&D), which is a significant indicator for the maturity and effectiveness of national R&I ecosystems. Adopting an ambitious national target for R&D expenditure to reach 1,5% of GDP by 2023, which translates into approximately 280 additional Mil. Eur channeled annually into the national R&I ecosystem, will intensify R&D activity and will help Cyprus move up from the 25th place to one of the first 12 places in EU in R&D investment intensity. Regarding funding streams required for R&I to achieve the above objective, a balanced (50%-50%) contribution between the public and private sector will be pursued, as a first step, aiming to move to a majority of R&D investment from the private sector, at a future stage. Achieving the target will require specifically designed measures to leverage R&D private investment, while enhancing contribution from public funds and making best utilization of EU funding². It will, moreover, require substantial incentives to encourage private companies

² Including “Horizon2020” / “Horizon Europe”, European Structural and Investment Funds (ESIF) and joint EU - national funding sources.

recording R&D investment in their annual accounts in order to capture the total value of national investment in R&D.

Increasing the funds alone is not enough for achieving the desired outcomes, as this is a complex and challenging endeavor that needs proper orchestration of the R&I ecosystem, supporting policies and measures and -the most challenging- a cultural and mind shifting journey across the ecosystem; and this is what exactly this strategy plan is aiming for - a holistic transformation approach with a clear roadmap and set of supportive actions, governance & steering mechanism.

In addition to the R&D plan, an ambitious goal should, also, be set in terms of innovation performance, aiming to be included in the group of “strong innovators” among EU countries, according to innovation-related performance indicators (such as the European Innovation Scoreboard³). The above will support a strong focus and streamlining of policies and actions aiming to improve Cyprus research and innovation performance.

The implementation of the current strategy, facilitated through the suggested Implementation Roadmap of specifically designed measures and incentives to kick-start the transformation of the Cyprus Research and Innovation ecosystem is expected to contribute substantially to the achievement of the aforementioned ambitious national targets.

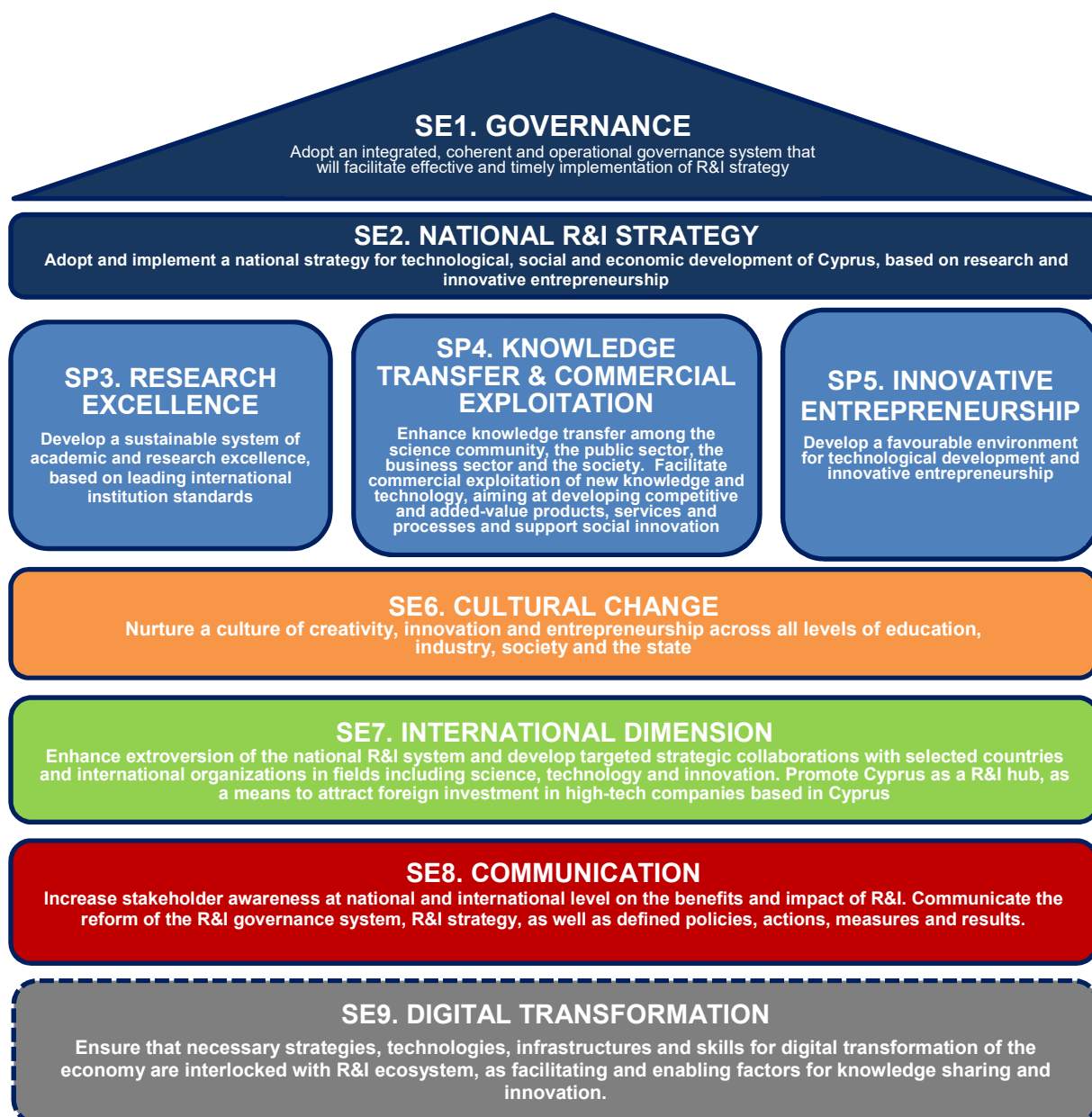
As a small country with a relatively young R&I system and limited resources, Cyprus needs to balance the need for establishing of a fully-developed, functional R&I ecosystem with the need for focusing resources on priority niche areas, selected based on identified strengths and opportunities for the national innovation system, including sector-driven R&I investments. Within this context, there’s a need to define Strategy and policy measures to promote innovation in specific industries and services sectors, as well as to increase the added value of products and services in traditional sectors through new technology, digital transformation and innovation.

One of the main actions of the new R&I strategic framework is the implementation and effective operation of the new R&I governance system, which was adopted in 2018 by the Council of Ministers. Among other, the new system adopts a unified and integrated approach to research and innovation at all levels, it facilitates coordination, interaction and synergy among stakeholders and actions and enhances stakeholder participation in policy design. The overall focus of the R&I governance system, strategy and actions will be on delivering results for the national R&I ecosystem, enhancing competitiveness of Cyprus economy and improving social well-being.

³ European Innovation Scoreboard (https://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards_en)

DIAGRAM 1: “INNOVATE CYPRUS” STRATEGY FRAMEWORK

STRATEGIC PILLARS (SP) & ENABLERS (SE)



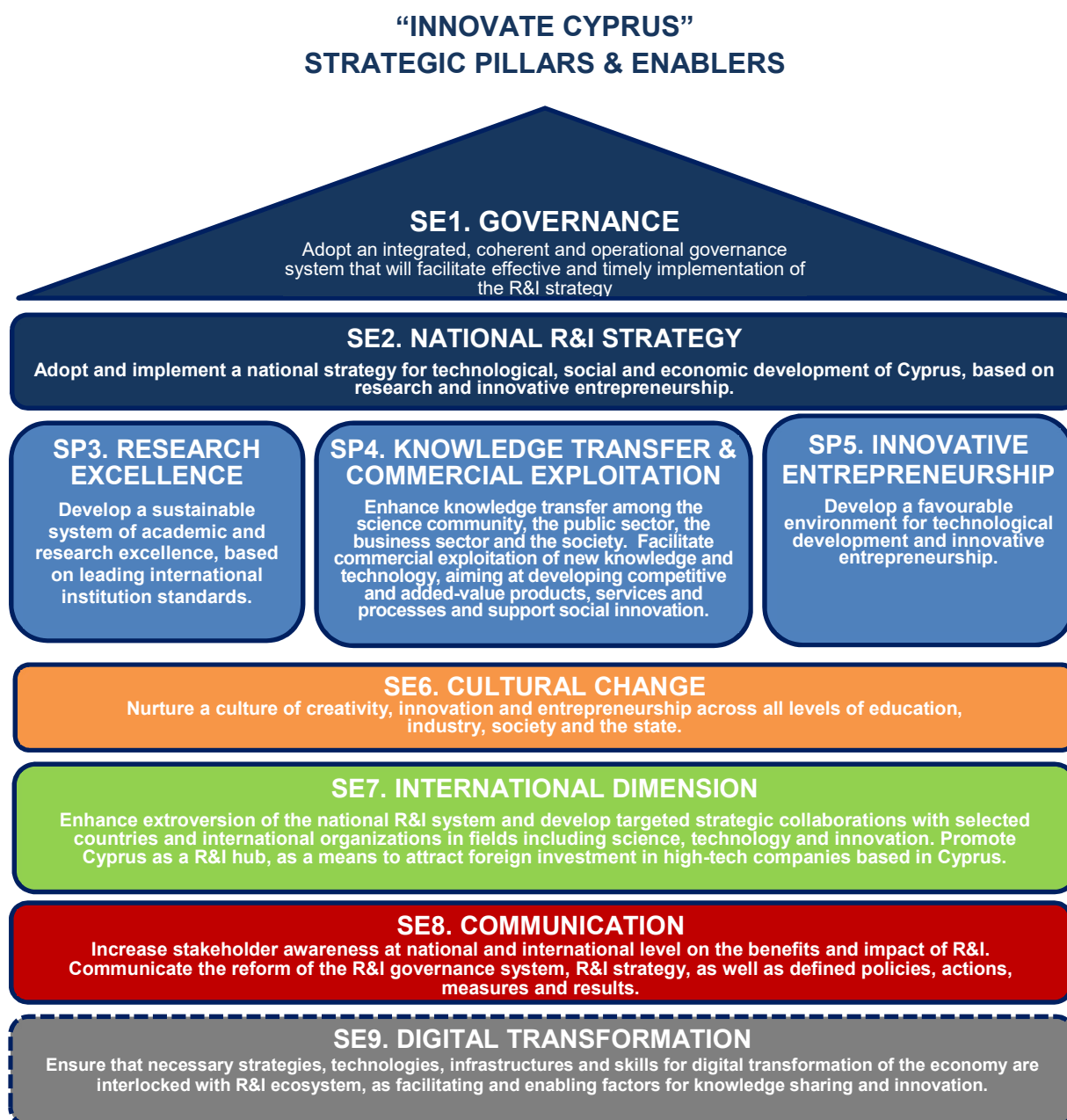
VISION

The "Innovate Cyprus" Strategic Framework embraces an ambitious vision, as a basis to develop an integrated R&I Strategy, providing a long-term perspective in the Strategy Framework, aiming to ensure a focused effort and commitment for implementation, over time, on behalf of the State and stakeholders involved in the national Research & Innovation system.

Cyprus to become a dynamic and competitive economy, driven by research, scientific excellence, innovation, technological development and entrepreneurship, and a regional hub in these fundamental areas.

RESEARCH AND INNOVATION STRATEGIC FRAMEWORK⁴

The following nine (9) Strategic Pillars (SP) & Strategic Enablers (SE) reflect the fundamental elements that will contribute to achieving the Vision of “Innovate Cyprus” Strategy Framework for the period 2019-2023, as defined above.



⁴ As adopted in NBRI 2nd Meeting 19/12/2018

STRATEGIC ENABLER 1 – GOVERNANCE

Adopt an integrated, coherent and operational governance system that will facilitate effective and timely implementation of R&I strategy.

R&I Governance is key to the design and successful implementation of the National R&I Strategy and Policy.

The governance system adopted with decisions taken by the Council of Ministers on Oct. 09, 2018 responds to the need for a modern, integrated and effective structure for R&I strategy and policy design and implementation, aiming to address R&I as a strategic enabler of the national strategy for achieving sustainable economic development and social prosperity.

The R&I governance system is designed to meet the following fundamental requirements:

- Utilization of the maximum possible synergy between the public and private sectors and interconnection of all stakeholders in the knowledge chain;
- Strong guidance, supervision and ownership at policy level;
- Take-up of existing experience and know-how within the R&I ecosystem;
- Ensure sufficient resources and competences for the effective operation of the R&I governance system;
- Adoption of mechanisms to monitor and evaluate system performance.

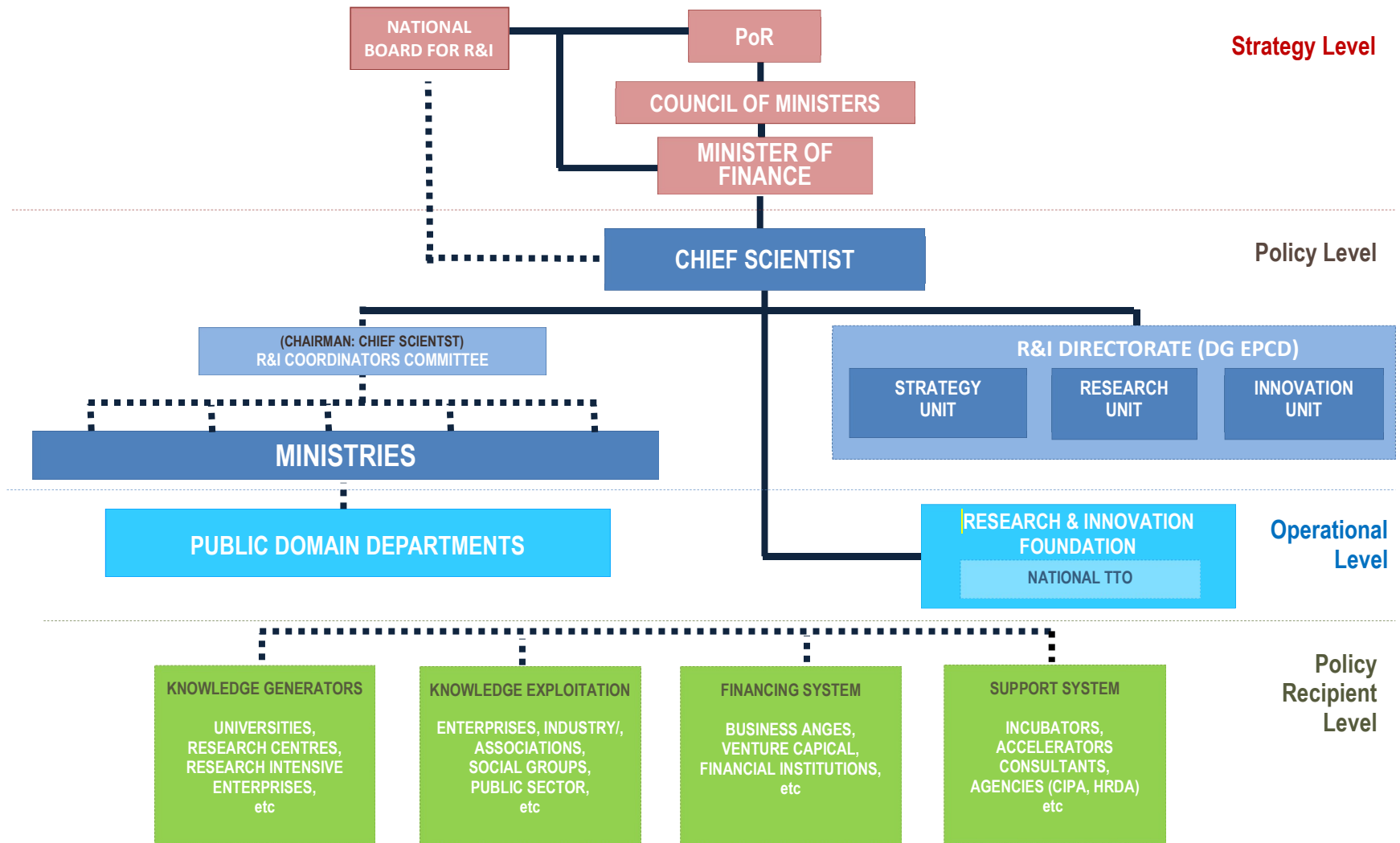
The system includes new institutions and Bodies, such as the National Board for Research and Innovation (NBRI), the Chief Scientist, a dedicated Directorate for Research and Innovation in the Directorate General for European Programmes, Coordination and Development (DG EPCD), a Committee of Ministry Research and Innovation (R&I) Coordinators under the Chairmanship of the Chief Scientist and the Research and Innovation Foundation (formerly known as Research Promotion Foundation).

Additionally, it adopts a unified and integrated approach regarding Research and Innovation at all levels, including the integration of R&I topics under the competencies of the Minister of Finance, and the operation of the Research & Innovation Foundation as the executive arm of the Government for R&I-related issues under the Chairmanship of the Chief Scientist.

The R&I Governance system structure is presented in *Diagram 2*.

Important Note: For the purposes of the new R&I governance system, according to the relevant decision of the Council of Ministers, "Innovation" includes innovative entrepreneurial activity, as well as high-technology entrepreneurship, as an integral part of the value chain that intended to be created through the national R&I strategy. The term refers to the development and adoption of any form of innovation by enterprises, creation of new startups, promotion of incubators and startup accelerators, creation of spin-off companies by universities, research institutes and existing enterprises for commercial exploitation of research results, commercial exploitation of intellectual property rights through licensing or consulting services, etc.

Diagram 2. Cyprus Research and Innovation Governance System (Adopted through CoM decisions in Oct. 2018)



Minister of Finance

Research and innovation (R&I) are included under the competencies of the Minister of Finance. Within this context, the Minister of Finance assumes the role of the political leader for R&I, at national and international level.

National Board for Research and Innovation (NBRI)

The National Board for Research and Innovation (NBRI) is the principal advisory body for defining R&I strategy, under the President of the Republic.

NBRI undertakes the promotion and implementation of national R&I Strategy, based on the suggestions of the “Innovate Cyprus⁵” proposal submitted by the National Committee for Research, Innovation and Technological Development.

The Board submits suggestions and proposals on strategy issues and monitors the implementation of topics adopted at policy level. In addition, the Board has a monitoring and guiding role in the implementation of the new R&I framework and has the possibility to draft corrective and evolutionary actions concerning the operation of the system and the implementation of national strategy and policy measures.

NBRI meets on a regular basis and its operation is supported by the Chief Scientist (*ex-officio* member) and the Directorate for R&I (DG EPCD), which serves as the Board Secretariat.

The members of the NBRI are appointed by the Council of Ministers, based on a proposal submitted by the competent Minister and serve for a three-year term, subject to renewal. NBRI members include highly-regarded individuals, from the public or private sector, with expertise in the fields of research, innovation and entrepreneurship. Participation to the Board is possible for individuals with activities in Cyprus or abroad, as well as for non-Cypriot nationals.

Chief Scientist

The mission of the Chief Scientist is to coordinate and guide the national R&I governance system at policy level.

The Chief Scientist assumes a coordinating and supervisory role in the formulation of national R&I Policy, as well as in the operation of the national R&I governance system, including Departments and Bodies involved at policy and technocratic levels. In addition, the Chief Scientist supports the work of NBRI to formulate suggestions for R&I Strategy, as well as proposals on the structure and operation of the R&I governance system.

⁵ “INNOVATE CYPRUS: Proposal for the development of a new integrated national framework for Research Innovation and Entrepreneurship in Cyprus” was submitted in 2014 to the President of the Republic by the National Committee for Research, Innovation and Technological Development

The appointment of the Chief Scientist aims to enhance efficiency and coordination of the R&I governance system, to enable the smooth transition to the new system, as well as to coordinate the effective operation, development and implementation of R&I strategy and policy. It is, also, expected to contribute to awareness raising and nurturing of innovation culture, to mobilizing stakeholders and to developing the fundamental building blocks of the national R&I ecosystem.

The Chief Scientist is appointed by the President of the Republic and the appointment is effective until the end of the term of office of the President of the Republic, or until terminated by the President.

The Chief Scientist is appointed *ex-officio* as Chairman of the Board of Directors of the Research & Innovation Foundation, whereas administrative support is provided to the Chief Scientist by the Directorate for R&I (DG EPCD), in addition to the support provided by the Research & Innovation Foundation (former Research Promotion Foundation).

Directorate for R&I, DG European Programmes, Coordination and Development

The duties and responsibilities of the Directorate for R&I (DE EPCD) include the following:

- Coordination, support and monitoring of the implementation of national R&I Strategy;
- Design and coordination of R&I policy issues;
- NBRI Secretariat;
- Provision of support to the Chief Scientist, in addition to RIF (former RPF) support.

Coordination of national R&I Strategy and management of R&I policy issues are implemented under the guidance of the Chief Scientist and the competent Minister.

Ministry R&I Coordinator

Each Ministry appoints a R&I coordinator from existing personnel as a central point of communication for science, research and innovation topics. Duties and responsibilities of the Ministry R&I Coordinators include the coordination of R&I under the responsibility of the Ministry, to coordinate the Ministry's contribution in R&I Policy and to catalyze implementation of R&I policy measures designed at policy level.

R&I Coordinators Committee

A Committee of R&I Coordinators is created, where all Ministry R&I Coordinators participate under the chairmanship of the Chief Scientist. The Committee provides a forum for communication, coordination and cooperation among the Ministry R&I Coordinators aiming to coordinate and align national sectoral policies and activities relating to R&I, and to address inter-departmental and bi-ministerial subjects.

Research & Innovation Foundation

The Research and Innovation Foundation (RIF - former RPF) is the executive arm of the government for Research and Innovation. The Chief Scientist is appointed *ex-officio* as Chairman of the Foundation's Board of Directors.

Based on the decision of the Council of Ministers on the new R&I governance system, relevant amendments have been applied to the Statutes of the Foundation to reflect the provisions of the new governance system.

STRATEGIC ENABLER 2 - NATIONAL R&I STRATEGY

Adopt and implement a national strategy for technological, social and economic development of Cyprus, based on research and innovative entrepreneurship.

Research and Innovation (R&I) are major factors for sustainable economic development and social prosperity and can provide significant political, technological, social and financial benefits.

R&I investments generate large and significant returns for enterprises, economies and the society; they contribute, among other, in developing new skills and networks of collaborations, accelerating the development and production of high-technology and added-value products, services and processes and increasing productivity and profitability for the business sector. They also support the development of entrepreneurship and a highly competitive business sector and industry, the attraction of foreign investments, the increase in product exports and, overall, the increase of the Gross Domestic Product (GDP) of a country.

Evidence⁶ suggests that about 65% of economic growth in Europe derives from innovation, and the typical return of private investment in research and innovation is estimated to be between 10% and 30%. These returns can be 2-3 times higher for an economy in general, due to positive “spillover effects” that allow other enterprises and stakeholders to benefit from these investments. More specifically, empirical studies carried out for different industries and countries, including several EU Member States, suggest that an increase of 10% in R&D investment in a company results in an increase in sales of a range between 0,2% to 2,5%, with a mean increase of 1%, depending on the specific case. Furthermore, in the case of Europe as a whole, an increase in R&D investment of 0,2% of GDP would be expected to result in an increase of 1,1% of GDP, an increase five times bigger in absolute terms.

Apart from the economic impact demonstrated above, R&I are also crucial in addressing key societal challenges and improving social well-being. Such benefits include, among others, the creation of new and better jobs, access to high-quality healthcare services and healthy ageing, improving energy and water resource efficiency and fighting against climate change. R&I contributes, moreover, in building societies that are resilient and inclusive.

Challenges faced by the Cyprus economy during the past decade instigate the need for shifting from the existing model of economic growth, to a sustainable, innovation-driven model, supporting long-term growth and social prosperity. In order to achieve

⁶ DG for Research and Innovation, European Commission, “The economic rationale for public R&I funding and its impact”, 10-03-2017, ISBN: 978-92-79-65270-7 (<https://publications.europa.eu/en/publication-detail/-/publication/0635b07f-07bb-11e7-8a35-01aa75ed71a1/language-en>).

that, it is necessary to adopt a long-term national strategy for technological, social and economic development, based on research and innovation.

National R&I Investment

Achieving the objectives of a new national development Strategy would require a significant increase in national investment for research and development (R&D), which is a significant indicator for the maturity and effectiveness of national R&I ecosystems. Adopting an ambitious national target for R&D expenditure to reach 1,5% of GDP by 2023, translating into approximately 280 additional Mil. Eur channeled annually into the national R&I ecosystem, will intensify R&D activity and will help Cyprus move up from the 25th place to one of the first 12 places in EU in R&D investment intensity.

Regarding funding streams required for R&I to achieve the above objective, a balanced (50%-50%) contribution between the public and private sector will be pursued, as a first step, aiming to move to a majority of R&D investment from the private sector, at a future stage. Achieving the target will require specifically designed measures to leverage R&D private investment, while enhancing contribution from public funds and making best utilization of EU funding⁷. It will, moreover, require substantial incentives to encourage private companies recording R&D investment in their annual accounts in order to capture the total value of national investment in R&D.

Increasing the funds alone is not enough for achieving the desired outcomes, as this is a more complex and challenging endeavor that needs proper orchestration of the R&I ecosystem, supporting policies and measures and -the most challenging- a cultural and mind shifting journey across the ecosystem; and this is what exactly this strategy plan is aiming for - a holistic transformation approach with a clear roadmap and set of supportive actions, governance & steering mechanism.

In addition to the R&D plan, an ambitious goal should, also, be set in terms of innovation performance, aiming to be included in the group of “strong innovators” among EU countries, according to innovation-related performance indicators (such as the European Innovation Scoreboard⁸). The above will support a strong focus and streamlining of policies and actions aiming to improve Cyprus research and innovation performance.

The implementation of the current strategy is facilitated through a suggested Implementation Roadmap of specifically designed measures and incentives to kick-start the transformation of the Cyprus Research and Innovation ecosystem, which is expected to contribute substantially to the achievement of the aforementioned

⁷ Including “Horizon2020” / “Horizon Europe”, European Structural and Investment Funds (ESIF) and joint EU - national funding sources.

⁸ European Innovation Scoreboard (https://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards_en)

ambitious national targets. The impact of the implemented R&I strategy and policy will be monitored and the strategy document and the implementation roadmap will be revisited and re-tuned to allow for improvements and adjustments.

Smart Specialization

As a small country with a relatively young R&I system and limited resources, Cyprus needs to balance the need for establishing of a fully-developed, functional R&I ecosystem with the need for focusing resources on priority niche areas, selected based on identified strengths and opportunities for the national innovation system, including sector-driven R&I investments. Within this context, there's a need to define Strategy and policy measures to promote innovation in specific industries and services sectors, as well as to increase the added value of products and services in traditional sectors through new technology, digital transformation and innovation. This can be promoted through an updated Strategy for Smart Specialization.

Smart specialization has been addressed during the period 2015-2020 through the *Smart Specialization Strategy* for Cyprus (S³CY) adopted by the Council of Ministers in 2015. S³CY prioritized domains, areas and economic activities where the country was identified to have a competitive advantage or the potential to generate knowledge-driven growth through investments in Research and Innovation (including investments co-financed by ESIF), thus upgrading its competitiveness. S³CY included 6 priority sectors: Energy, Tourism, Built Environment – Construction Industry, Transport – Marine, Agriculture – Food Industry and Health. ICT and the Environment were identified as horizontal priorities. The design of funding Programs for the support of R&I during the period 2015-2020 (including RESTART 2016-2020 framework Program announced by the Research Promotion Foundation (currently Research & Innovation Foundation) and the Program supporting innovative entrepreneurship announced by the Ministry of Energy, Commerce, Industry and Tourism) was based on the S³CY strategy.

As per the requirements of the ESIF for the new programming period 2021-2027, a national Smart Specialization Strategy should have as priorities the support of innovation, digital economy and small- and medium- sized enterprises.

Taking into consideration the new developments in the national R&I ecosystem (including new and emerging technologies, companies and sectors of the economy), as well as the requirements of the ESIF new programming period 2021-2027, an updated Smart Specialization Strategy should be developed to identify areas with capacity for innovation and to enhance impact of national R&I investment.

STRATEGIC PILLAR 3 - RESEARCH EXCELLENCE

Develop a sustainable system of academic and research excellence, based on leading international institution standards.

Scientific excellence lies necessarily at the heart of a national R&I strategy. Promoting, recognizing and rewarding research excellence, while developing a critical mass of high-quality human base in science and technology, will enable the development of cutting-edge technologies and leading research performance at institutional and national levels.

Excellence, within the context of Cyprus national R&I strategy, is defined according to international benchmark, aiming to develop academic institutions and centers of excellence that comply with the standards of worldwide leading institutions. Moreover, a relentless pursue of excellence is supported to lead the advancement of science and knowledge creation, technological breakthrough and the generation of transformative, disruptive innovation, benefiting the competitiveness of the business sector and the national economy and giving solutions to current and future societal challenges. Research excellence is also pursued to attract high-caliber international students, as well as high-level research activity by multinational companies, thus contributing to the increase of critical mass of human capital and national R&D investment.

Developing a sustainable system of academic and research excellence requires sufficient support to basic, “blue skies” research, as well as coordination, collaboration and interlink of research teams, assigning a complementary role to and enhancing synergy among academic and research institutions. Synergy should also be pursued with research-intensive SMEs and innovative enterprises with a proven record in research excellence. Steps towards this direction can include the following:

- Development of research infrastructures of international excellence, in selected strategic focus areas for the country, making them open and accessible to the research and business community. Such infrastructures will support the implementation of high-quality research activity and will attract interest and opportunities for cooperation with distinguished organizations and research teams from abroad. While utilized also for addressing specific scientific and technological challenges of the industry, they will attract research talent from abroad and contribute to reversing "brain drain" of scientific and research personnel.
- Investment in research human capital that will create a supply stream of scientists and professional to the national R&I system.
 - Upgrade of quality criteria of academic programmes in tertiary education. Encourage and equip the young generation with the necessary competences and skills to become researchers and innovators of the next generation. The strategy assigns central importance to the development of an educational system at all levels -

from primary through to tertiary education and lifelong learning - that provides human capital with the foundation literacies, competencies and character qualities necessary for the workforce of the 21st century. This would include, among others, emphasis on education in STE(A)M⁹ subjects (science, technology, engineering, arts and mathematics), creative thinking, adaptability and cognitive development.

- Promote continuous professional development, accompanied by lifelong learning and training throughout the professional career of researchers and innovators, including entrepreneurial development and business mentoring programs.
- Provide incentives to existing distinguished scientists approached by renown institutions abroad, as well as for expatriate Cypriot researchers to return back to Cyprus to pursue an academic and research career in Cyprus.
- Attract talent from abroad through the availability of high-quality research infrastructures, the availability of an attractive institutional and legislative framework, as well as other incentives, including the widespread availability of English language in academic programs and research support tools and Programmes.
- Review and re-evaluation of the operation of existing academic and research units and their institutional frameworks, especially in publicly funded institutions, taking into consideration their performance and potential. Re-evaluation would require a focus on improvement and upgrading of institutions according to international practices and models, while emphasizing on areas of research excellence and strengthening or developing scientific areas of particular importance for the future of the country. Promising research centres and units should become more independent and restructured for more streamlined and efficient governance and administration procedures. The review would, also, aim to contribute to their success and sustainability and, at the same time, to the development of cooperation among institutions and the promotion of cross-sectoral research activity.
- Linking public institutional research funding with criteria of excellence, defined in accordance with international standards.
- Promotion of mechanisms for career development of academic / research staff on the basis of excellence, exploitation of research and in attracting private funding. Support universities of the public and private sector to develop vibrant research environments that will nurture and attract talent.

⁹ The “A” in STE(A)M is a broad term representing liberal arts, language arts, social studies, physical arts, fine arts and music. It refers to applying creative thinking to STEM projects, and sparking students’ imagination and creativity through the arts. Similarly, it’s about supporting students to utilize their artistic talents to generate innovative thinking.

- Focus on excellent and impactful research. Adopt reliable mechanisms for evaluation of research proposals on the basis of international excellence and benefit for Cyprus.
- Consistency in supporting basic / “blue skies” research, maintaining a balanced approach between research activities with a medium- to short-term potential impact (applied research and experimental development that can benefit the industry, market and society) and activities that contribute to creating conditions for long-term sustainable knowledge-based development.
- Promotion of openness and transparency in research. Open research and open science have a fundamental role in ensuring that research and innovation, particularly the part supported by public funds, has the maximum possible impact, enhancing accessibility, transparency and cooperation.

STRATEGIC PILLAR 4 - KNOWLEDGE TRANSFER – COMMERCIAL EXPLOITATION

Enhance knowledge transfer among the science community, the public sector, the business sector and the society. Facilitate commercial exploitation of new knowledge and technology, aiming at developing competitive and added-value products, services and processes and support social innovation.

Strengthen linkages and collaboration among Universities and research institutes, the public and the private sector, as well as NGOs for effective technology transfer and cross-fertilization of knowledge. Linking the research community to the business sector will direct research activity to areas that better address current and future needs of the industry and the Cyprus economy, contributing to the increase of R&D investments of the private sector.

Critical policy measures that will support transformation of research output to innovation, include the following:

- Redefine the mission of public and private Universities and research institutes to include knowledge transfer along with education and research.
- Effective protection of intellectual property rights.
- Intellectual property right regimes, institutional policies and incentive schemes for technology transfer, with a fair share of income for researchers (in royalties and spin-offs).
 - An institutional intellectual property (IP) policy is a prerequisite for successful collaboration between academia and commercialization partners. Such a policy would be expected to clarify ownership of and right to use the IP resulting from the institution's own or collaborative R&D activities and to set out the rules of the institution on how to identify, evaluate, protect and manage IP for further development and commercialization. It provides a transparent framework for cooperation with third parties and provides guidelines on the sharing of economic benefits arising from the commercialization of IP.

The adoption of a functional IP policy is a prerequisite in every university / research organisation providing legal certainty, encouraging researchers to consider opportunities for exploiting research outcomes, so as to increase the potential flow of benefits to society and providing an environment that supports and encourages innovation and development. It balances the various conflicting interests of universities, industry and society and ensures compliance with applicable national laws and regulations.
 - Supportive to the development of institutional IP policies would be the development of a national “Code of Practice” for the uniform management of IP rights emerging from publicly funded research or through public-private collaborations, contributing to raising awareness

and supporting publicly funded Universities and research institutions, while encouraging the business sector to access and exploit publicly funded research results with greater confidence and convenience.

- In support to the above, the adoption of an institutional IP Policy could be considered as a prerequisite for an institution to receive public funding.
- Legislative frameworks and regimes encouraging the exploitation of research results and the creation of faculty spin-offs and startups, particularly in publicly funded universities and research institutions.
 - Towards this direction, the adoption of a functional national legislation in Cyprus governing research exploitation and the establishment of university spin-offs by public universities is considered of outmost importance to spread innovation culture within public universities and to include innovation activity under a framework, which ensures transparency and avoidance of conflict of interest and conflict of commitment.
- Having in place a dedicated knowledge transfer office, with critical scale, experience and expertise. The development and operation of a central Knowledge Transfer Office (KTO) by the Research & Innovation Foundation, providing support to the main Universities and research organisations in Cyprus funded through public funds, will provide a cost-efficient solution for the support of academic technology transfer, built on the principles of acquiring a critical mass of research output and economies of scale. To this end, it will be necessary to formulate benchmarks to evaluate impact of the KTO and knowledge transfer activities on the economy based on defined precise outcomes and key performance indicators.
- Identify public research infrastructures that can play a central role in the innovation ecosystem, serving as links among the major innovation actors (universities, enterprises, incubators, accelerators, etc) and as a basis to develop clusters and collaboration networks. Optimal use of public investments in research infrastructures could be materialized by facilitating access from the whole spectrum of potential users ranging from the academia, the research community, the business and the public sector. Existing public infrastructures will be mapped, adopting measures to simplify access and remove any obstacles of legal or technical nature.

On the industry side, it is essential to support a turn of the investment of our business sector towards innovation (in all forms including business model, organization, planning and marketing innovations), and to high-technology and added-value products and services supporting their competitiveness and long-term sustainability in the market. The role of business associations, chambers and federations within the national R&I should be widened and supported, as it is considered to be instrumental in creating the desired culture as well as the establishment of supporting networks.

Enterprises should be encouraged to invest in digital transformation, as well as in research and development (R&D) activities, either implemented in-house, or in collaboration with other companies, universities or research institutions. Encouragement could take the form of incentive schemes (i.e. tax incentives) for implementing R&D activities, acquiring specialized testing equipment and laboratories and patenting, to support development of new products and services and entering the global market. Facilitating access to existing research infrastructures and laboratories available in public and private Universities and research institutions would also support indigenous innovation capacity of the business sector.

It is necessary that the business sector acquires sufficient access to new knowledge generated at local and international level through establishing collaborations with academic and research institutions, enhancing employment and mobility of highly specialized personnel (such as PhD holders), participation to international R&I collaboration networks, as well as through the development of sectoral or horizontal clusters and collaboration platforms.

Improving the innovation capacity of the business sector, as well as the capacity for scaling-up entrepreneurial activity, is considered vital for generating and transforming new ideas into competitive products, services, and processes. Digitalization, continuous training and capacity building of human resources, will support responsiveness and adaptability of enterprises to the rapidly changing business and technological environment. Encouraging extensive user involvement in the process of product and service development can help minimize risk and optimize development loops, while ensuring that products respond to the real needs of the customers.

Promoting social innovation and social entrepreneurship can enhance the enterprises and ecosystem's focus on the social impact of their activities, while utilizing innovativeness and agility of the business sector to address societal challenges.

Finally, it is important to simplify procedures and remove unnecessary "red tape" in programs, incentives and measures addressing the business sector, including R&I funding programs and procedures for new companies' registration in Cyprus.

STRATEGIC PILLAR 5 - INNOVATIVE ENTREPRENEURSHIP

Develop a favorable environment for technological development and innovative entrepreneurship.

Developing a favorable environment for technological development and innovative entrepreneurship refers, essentially, to the existence of facilitating institutional and regulatory framework conditions and supporting tools to set up and expand R&I activity, as well as to the availability of sufficient funding sources for innovative enterprises at all stages, including startups, scale-ups and established enterprises willing to address the international market with innovative products and services.

High-risk capital, including funding at early stages of a startup (seed funding), but also sufficient funding streams for scaling-up and expansion, is an essential ingredient of a functional innovation ecosystem and will be supported by providing incentives for local fund holders to invest in startups and innovative enterprises with high-growth potential and by co-operating with financial institutions to develop attractive and functional financial instruments, with potential co-financing by European funds (i.e. EIB / EIF / ESF). The collaboration between public and private sector shall be promoted to develop alternative forms of funding, such as a co-investment facility (equity fund) and measures to support venture capital funds and the development of a crowdfunding market.

A Co-Investment facility (equity fund) is a pooled facility managed by a professional asset manager, economically and legally independent from its Supervisory Body. Funds are invested in equity in SMEs in combination with third party independent private investors. The main objective of this instrument should be to:

- Strengthen the equity financing of Cyprus-based SMEs in the development phase (including start-up phase);
- Co-invest with the available market players (business angels, venture capital and private equity funds, and commercial banks depending on their willingness to invest and considering their solvency requirements) already active in Cyprus and to attract, among others, external private equity operators;
- Set up operations based on a commercial logic and establish a long-term sustainable investment capacity.

The existence of favorable institutional and regulatory frameworks will also support the attraction of foreign high-risk investments, including foreign pre-seed, seed and venture capital funds, to set up private or public-private funds channeled towards innovation activity. It will also support the attraction of foreign multinational companies (MNC) willing to set up offices and R&I departments in Cyprus, creating a multiple, spillover effect over the Cyprus innovation ecosystem and economy.

Creating a vibrant community of startups forms a priority and will be achieved by programs and incentives specially designed to respond to the needs of early-stage

entrepreneurship. This would also require the development and implementation of well-designed and sustainable support tools, such as business incubators, accelerators, innovation hubs and co-working spaces, which are of significant importance. Such tools can provide integrated support services for the development of startups and high-technology innovative businesses that include office space, coaching, mentoring, international networking, pre-seed and seed funding and access to professional services.

In addition to the above, it is necessary to develop an evidence-based and strategic policy suggestion on the most successful and effective way to approach the development of a Science Technology Park (STP), exploring also other alternatives (such as innovation hubs, virtual STPs, etc) adopted in other geographies.

Finally, innovative entrepreneurship can be supported through high-quality professional, legal and advisory services on topics relating to entrepreneurship, setting up a new business, protection and exploitation of intellectual property rights and participation to national and European R&I funding programs.

STRATEGIC ENABLER 6 - CULTURAL CHANGE

Nurture a culture of creativity, innovation and entrepreneurship across all levels of education, industry, society and the state.

The Cyprus national education system, including lifelong learning, has a leading and decisive role to play in developing fundamental skills, competences and character qualities required by the workforce of the 21st century, in order to adapt and excel in a rapidly changing technological environment. It is, moreover, instrumental, in developing societal values, perceptions and culture on creativity, innovation and entrepreneurship, defining career choices and future professional behavior of the young generation. At the same time, of equal importance is the role of families and communities in cultivating entrepreneurial culture and in supporting the young generation setting high goals, taking entrepreneurial risks and approaching failure as a learning experience.

Innovation and entrepreneurial capacity of the human capital, can be supported through the promotion of STE(A)M (Science, Technology, Engineering, Arts and Mathematics) education from a young age, providing particular attention to the share of female students following STE(A)M education. Meanwhile, adopting the English language, as a primary working language for research and innovation activities and promoting its excellent command within young generation, will help develop a fundamental skill for communication and knowledge transfer within the regional and international scientific community and the startup ecosystem.

Exposing students to activities promoting creativity, innovation and entrepreneurship at all levels of education (from nursery school to University) will support the development of a desired culture. Enhancing existing private and voluntary initiatives, such as university-wide business and innovation competitions, technology boot camps, hackathons, conferences & workshops, coaching and mentoring schemes, will assist in promoting startup and entrepreneurial spirit.

At the level of tertiary education, adopting Knowledge Transfer, as one of the fundamental missions of public and private Universities, while lifting legislative and other barriers and providing incentives for faculty members, students and research staff to participate in innovation activity and startups (these activities are also promoted under Pillar 4 of the Strategy), will support innovation culture within Universities.

The business sector should be sufficiently educated on the benefits of innovation and knowledge transfer, while strengthening its links with the academic and research community. At the same time, enterprises should be supported in innovation capacity building, through professional consulting, coaching and mentoring programs.

Nurturing a culture of creativity and innovation could not leave out the Government and public sector, as a key, knowledge-intensive sector, with the ability to act as a

multiplier of knowledge and culture in the society. Within this context, the public sector can play a vital role in fostering a wider culture of innovation, through knowledge generation, service delivery and dissemination of information, but also through its role as an important buyer of high added-value products and services. Along the same lines, supporting innovation in the public sector would require to remove current obstacles and provide incentives to employees to participate in collaborative research and innovation activities.

Public awareness and innovation culture can be built gradually, aiming at the medium and long-term objectives; it will be, however, accelerated by having in place an effective and operational national R&I ecosystem, as well as through the first success stories emerging at the national level. Young innovators and aspiring entrepreneurs should have around them examples to look up to in order to invest and start new ventures. To this end, early success stories should be intensively promoted to further enhance a culture of entrepreneurship, while an invitation should be extended to successful Cypriot entrepreneurs living and working abroad, to come in Cyprus and provide inspiration and encouragement to the local community and workforce.

STRATEGIC ENABLER 7 - INTERNATIONAL DIMENSION

Enhance extroversion of the national R&I system and develop targeted strategic collaborations with selected countries and international organizations in fields including science, technology and innovation. Promote Cyprus as a R&I hub, as a means to attract foreign investment in high-tech companies based in Cyprus.

The globalization of knowledge and the small scale of Cyprus in terms of market size and resources, imposes the need for the further development of the international dimension of our national R&I system. Developing and maintaining links and efficient collaborations with countries and institutions from abroad contributes to the increase in the quality and critical mass of research activity is a way to support the sustainability of the R&I system in the long term. At the same time, it supports developing channels for international knowledge transfer, including access to latest scientific and technological breakthroughs and research exploitation.

Within this context, it is essential to further support scientific and research collaboration with EU member states and countries of the Mediterranean region, as well as with European and international Organisations and Institutions in support of science, research and innovation activities. Moreover, it is essential to promote targeted strategic collaborations on R&I with specific countries with successful innovation ecosystems, building on synergies and enhancing potential impact and mutual benefit.

Supporting access of Cypriot institutions, companies and researchers to European Programs for R&I will enhance access of Cypriot teams to world-class research networks, state-of-the-art technologies and scientific knowledge, while attracting additional funds to support R&I activity.

Enhancing international orientation of Cypriot enterprises, particularly startups, as well their ability to “think and act global” from day one, will support them in overcoming significant barriers, such as the small size of the market and availability of highly specialized workforce. Through this effort, startups’ access to international networks, as well as facilitation of international partner search and delegation visits to institutions abroad, will substantially enhance capacity for international collaboration.

Cyprus presence and contribution at EU strategy and policy design should be strengthened, aiming to ensure maximum benefit in areas of strategic importance to the country. Within this context, we should ensure active and high-level representation in EU decision-making bodies, working groups and committees in support of the Cypriot organisations, enterprises and members of the R&I community. At the same time, representation in EU bodies works vice versa, in implementing updated and new EU policies at national level and in enhancing national work programmes with contemporary sources and European vision,

including the development of Strategic Research and Innovation Agendas (SRIAs) at national level, and national strategies for addressing societal challenges.

Finally, attracting foreign investment in R&I should be at the heart of national R&I strategy), covering a gap in the local high-risk capital market and generating, beyond this, a widespread and multidimensional benefit for the local economy and society. Foreign investment in R&I may include investments by foreign multinational companies (MNC) to establish local R&D departments, as well as investment funds for early-stage entrepreneurial activity (seed funding, business angels, venture capital funds).

Business angels and VC funds from abroad are of particular importance to early-stage entrepreneurial activity, covering the investment needs of startups, while enhancing availability of know-how and expertise and, subsequently, their chances to succeed.

The presence of MNCs developing R&I activity in Cyprus will strengthen the country's science and technology base through extensive knowledge transfer and will enhance capacity of the labor market to absorb highly-qualified human capital. Moreover, it will enhance availability of high-risk capital and channels to absorb new technologies generated by local scientific teams and startups.

Attracting significant investment by MNCs to set local R&I departments is critical to achieving objectives of the present strategy as far as it regards private investment in R&D and would require the availability of substantial financial, tax and other incentives and supporting facilities, as well as framework conditions supportive to the establishment of constructive partnerships with local businesses and research institutions. Moreover, it will be supported by a stable financial environment, accessibility to high-quality support services (accounting, legal, advisory, etc) and the availability of a functional and transparent framework for transactions with the public sector.

STRATEGIC ENABLER 8 – COMMUNICATION

Increase stakeholder awareness at national and international level on the benefits and impact of R&I. Communicate the reform of the R&I governance system, R&I strategy, as well as defined policies, actions, measures and results.

Increasing stakeholder awareness at the national level on the benefits of R&I, its impact to the national economy and contribution in addressing local and international social challenges would require the design and implementation of a comprehensive branding and communication (B&C) strategy.

The B&C strategy will aim to address stakeholders at all levels, ensuring their contribution and commitment to the implementation of the national R&I, as a collective effort. It should be crafted on a professional basis with the support of external agencies and should be holistic and comprehensive for above and below the line communication, promotional and branding activities. The Research and Innovation Foundation (RIF) will undertake the crafting and execution of the B&C.

While addressing the international dimension of communication, the design of a targeted international campaign will support in promoting Cyprus as a regional hub of scientific excellence and innovation. At the same time, building on economic and science diplomacy, we can promote Cyprus' interests in R&I overseas. Such effort could include mobilization of Cyprus' Embassies abroad, as well as Cypriot scientists and innovators, to promote Cyprus science and entrepreneurship at the international scene.

Finally, the design of policy measures will be done based on the principles of stakeholder participation and consultation. This will support stakeholder collaboration and ownership of activity, while ensuring that policy responds to their actual needs and maximizes impact.

STRATEGIC ENABLER 9 – DIGITAL TRANSFORMATION

Ensure that necessary strategies, technologies, infrastructures and skills for digital transformation of the economy are interlocked with R&I ecosystem, as facilitating and enabling factors for knowledge sharing and innovation.

Digital transformation marks a radical rethinking of how a company, an organization, the public sector and the society uses technology, people and processes to radically change performance. It is, essentially, not just moving all processes into a digital format, but fundamentally shifting thinking to accommodate the digital environment into all products and processes (online and offline). In this way, digital transformation is a fundamental enabler, facilitator and in some cases prerequisite for innovation (particularly in technology-enabled innovations), whereas in some cases can even coincide with innovation. The role of digital transformation is, moreover, instrumental in enhancing communication and knowledge sharing among stakeholders within ecosystems of research and innovation.

Innovation related to digital transformation, and particularly e-Government, is particularly important to support the currently slow pace of public sector reform in Cyprus, generating multiple benefit including:

- reduced bureaucracy and enhanced transparency,
- improved quality and efficiency of service to citizens and businesses
- improved citizens' satisfaction and enhanced credibility for the public service,
- reduced operational cost through increasing productivity and saving resources and time,

In view of the above it should be ensured that necessary Strategies, Technologies, Infrastructures, Skills and Competencies for digital transformation of the economy are interlocked with the national R&I strategy and ecosystem, as facilitating and enabling factors for knowledge sharing and innovation. Current initiatives undertaken under separate frameworks, associated and interlocked with the national R&I strategy and ecosystem include the following:

- Adoption of strategies such as the National Digital Strategy and E-Government Strategy;
- Focus on leading technologies, such as Artificial Intelligence (AI), Distributed Ledger Technologies (DLT), Big Data and Internet of Things (IoT);
- Support of infrastructures related to Electronic Communications and Information Technology;
- Development of skills and Competencies required to support the fast pace in which technology is adopted in everyday life and the widespread disruption expected to occur in business models and the labour market within the next decade.

NATIONAL R&I STRATEGY FRAMEWORK – IMPLEMENTATION ROADMAP

The national R&I strategy framework will be put into action through a first set of policy measures and activities targeting the selected nine (9) strategic pillars (SP) and strategic enablers (SE), aiming to kick-start the reform and to facilitate a strong boost of the research and innovation ecosystem.

For this purpose, an initial Implementation Roadmap has been designed for the period 2019-2021. Policy measures included in the Implementation Roadmap are subject to agile implementation and enhancement along the way, in collaboration with stakeholders involved so that to ensure efficient delivery and maximization of impact. Moreover, the Implementation Roadmap.

Moreover, the Implementation Roadmap will be updated and further enhanced by the NBRI and the Office of the Chief Scientist (OSc), according to progress and developments in the national R&I ecosystem, as well as with the support of further case-studies and the elaboration of a detailed R&I strategy.