Summary of the

Portuguese ERA Roadmap

Lisbon, 25 May 2016

ERA Priority 1 - More effective national research systems

Overview

- Need to increase the public and private R&D investment, contributing towards the European target of 3% of GDP invested in R&D
  - Investment decreased in recent years;
- Competitive research funding, through international evaluation panels, has been the central mode of research funding allocation
  - International assessment processes not implemented across the system;
  - 'Reflection Group on Evaluation of S&T at FCT' has been implemented;
- Need to undertake regular analysis of the Research and Innovation System
  - Regular publication of the 'Analysis of the Research and Innovation System';
  - External review of the national R&D system;
- Portuguese R&I system considered 'Moderate Innovator' in EU Innovation Scoreboard
  - RIS3 implemented;
- Regular production of evidence on the R&I system
  - Dedicated statistical office (DGEEC);
  - National report 'Analysis of the Research and Innovation System';
- External assessments
  - External institutional assessments;
  - Forthcoming external review of the system by the OECD (last 10 years ago).

Instruments and Policy Measures

Measures to be consolidated

- Stimulating **public and private R&D investment**
- Regular updating of the **Analysis of the Portuguese Research and Innovation System**
- Interim revision of the **National Smart Specialization Strategy**
- Participation in **Mutual Learning Initiatives** in the scope of the *Policy Support Facility* of the European Commission
- Consolidation of **competitive research funding, through international evaluation panels** at different levels across the national research and innovation system

- Advanced training in **S&T communication and management**

Measures to be developed

- **External review of the R&I system (OECD)**
- **Enhancement of the Polytechnic Higher Education Schools and of their impact in the Portuguese society and economy,** namely in stimulating regional development
- Setting-up **Laboratories for Public Participation** and other participatory processes in the R&I system
- Implementation of the recommendations of the **Reflection Group on the Assessment of Science and Technology at FCT**
- Implementation of the Programme '***More science, less bureaucracy***'
- Promotion of the articulation of the S&T system towards ***evidence-based public policies***
- Development of studies supporting the **formulation of public policies and their impact assessment** (e.g. impact of the Portuguese participation in the FPs)

Monitoring Indicators

- Government Budget Appropriations for R&D (GBARD) as % of GDP
- General Expenditures in R&D as % of GDP (2,7% as a goal in 2020)
- Research Excellence Indicator
- Adjusted Research Excellence Indicator
- Innovation Union Scoreboard Composite Indicator
- % GBARD allocated in competitive calls
- Composition of evaluation panels (internationalization)
- Participation of Portuguese evaluators in transnational evaluation processes (H2020, ERC)
- Volume of international competitive funding

ERA Priority 2A – Jointly Addressing Grand Challenges

Overview

- National research community with strong international collaboration networks;
- Relevant national participation in a broad variety of European collaborative instruments, including Joint Technological Initiatives, Article 185, European Joint Programme, ERA-NET and 4 of the 10 existing Joint Programing Initiatives;
- Clear national recognition of the importance of alignment of priorities and strategies at European level, in all the science and technology areas;
- Use of the Joint Programing Process to further promote the internationalization of the Portuguese R&D system.

Instruments and Policy Measures

Measures to be consolidated

- Reinforcing the participation of the national research and innovation communities in the European collaborative instruments by **continuously identifying and removing existing national barriers – legal, administrative, budgetary - that may be hindering participation**;
- **Strengthening interministerial collaboration** in the definition of research and innovation strategies, priorities and programs, thus enhancing the role of science and research in the national development strategies, and providing a more central role to collaborations within the European Research, in every governmental domain.

Measures to be developed

Promoting an **Interministerial Coordination Group for Science and Technology**, to foster the development of a coherent and articulated strategy that recognizes scientific knowledge as the main pillar for development and growth, and that contributes to jointly address the societal challenges that can only be solved through a European, collaborative effort.

Monitoring Indicators

- GBARD[1] allocated to publicly funded European, bilateral or multilateral collaborative instruments in science and technology, as a percentage of GDP (including budget allocated to International Organizations)
- Yearly evolution of the number of European calls for proposals for research and development projects with the participation of national applicants
- Number of national experts involved in Advisory Boards of European Collaborative instruments in Science and Technology

[1] GBARD: *Government Budget Appropriations on Research and Development*, as defined by the OECD's Frascati Manual

ERA Priority 2B – Make Optimal Use of Public Investment in Research Infrastructures

Overview

- National Roadmap of Research Infrastructures created in 2014 through an open, competitive call for proposals;
- Strong articulation between the National Roadmap and ESFRI, and recognition of the importance of fostering the internationalization of the infrastructures;
- The 40 infrastructures included in the National Roadmap cover all areas of knowledge;
- The creation of the National Roadmap stimulated a reorganization of the scientific infrastructures, creating critical mass and fostering a more efficient use of resources.

Instruments and Policy Measures

Measures to be consolidated

- **Implementing the monitoring and evaluation mechanism** for the infrastructures included in the National Roadmap, as previously defined, through a panel of national and international experts that will monitor the performance of the infrastructures;
- **Implementing a dedicated funding program** for the 40 infrastructures included in the National Roadmap, providing these with the necessary conditions to reach the goals expected through their inclusion in the Roadmap.

Measures to be developed

- **Reinforcement of the participation of the national infrastructures and of the research and innovation community in the European infrastructures** through specific policy measures, such as dedicated national calls for proposals to support those connections, or the creation of specific graduate training programs in areas related to those infrastructures;
- **Implementing a regular revision of the National Roadmap**, taking into account the results of the monitoring mechanism and the dynamic nature of science, assessing the possibility to include new infrastructures or to reorganize existing ones.

Monitoring Indicators

- Number of institutions supported within the framework of the National Roadmap of Research Infrastructures
- Number of institutions supported to participate in a large European or international infrastructure
- Number of participations in ESFRI projects by national infrastructures
- Number of participations from infrastructures in the National Roadmap in European programmes
- Number of foreign researchers working in the national infrastructures
- Number of international co-publications of the researchers working in the national infrastructures
- Number of international co-publications of the researchers working in the national infrastructures, compared to other similar national infrastructures not included in the National Roadmap

ERA Priority 3 – An Open Labour Market for Researchers

Overview

- Very significant increase of the number of PhD holders;
- Employment of PhD holders with weak dynamics in recent years;
- Perception, by PhD holders, of unstable employment conditions;
- Low institutional and sectoral mobility of PhD holders;
- International mobility of postdoc researchers close to the average figures in EU;
- High openness of the country to foreign researchers;
- Limited satisfaction with openness in recruitment process;
- Low perspectives for career advancement.

Instruments and Policy Measures

Measures to be consolidated

- Support to **open and transparent practices of recruitment** of researchers, through a systematic dissemination of opportunities in portals and clear specifications of working conditions and selection criteria;
- Involvement of **firms in the PhD work progress.**

Measures to be developed

- **New employment contracts for PhD holders**, gradually replacing postdoc grants by contracts, thus reducing the precariousness of labour conditions for researchers;
- **Enhancing the development of multidimensional skills in PhD training** through dedicated support to supervisors;
- **Promoting training of PhD students** in areas such as management and innovation, enhancing their entrepreneurial and private sector employment prospects;
- Development of new **instruments to support the employment of PhD holders in firms;**
- Promoting the **systematic dissemination of opportunities** for employment of researchers (including positions in higher education) in the **EURAXESS portal,** in English;
- Supporting the **network of Portuguese researchers abroad.**

Monitoring Indicators

- Number of job adverts published (in English) in the EURAXESS portal
- Number of applications of foreign researchers posted in the EURAXESS portal
- Number of new Post-Doctoral contracts (replacing grants)

ERA Priority 4 – Gender Equality and "Gender Mainstreaming" in Research

Overview

Absence of horizontal segregation…

- Women represent a high share (61,7%) of population with higher education employed in science and technology activities, with a compound annual growth rate (2000-2014) higher than that of men;
- Scientists and engineers balanced in terms of gender equality (women account for 47,1% of the total, with a stronger underlying dynamic compared to men);
- Women represent 45,4% of researchers - placing Portugal as the best performer and with stronger growth rate (10%);
- Higher female representation in total PhDs (56,3% in 2012, maximum value of 62% in 2010), but with a downward trend in the period 2007-2012, which may induce future changes in the balance;
- Under-representation of women in research in the Business sector (35%), but with a relevant growth, and resilient over-representation in Government sector.

Presence of vertical segregation…

- Under-representation of women in the top levels of the career (in 2012, only 25% of the women reached grade A);
- Glass ceiling index (1,75 in PT, in 2013), showing a drawback between the proportion of women in grades C,B and A relative to the proportion of women in grade A;
- Strong under-representation of women as leaders and members of scientific boards (8% and 21%, respectively, in 2014);
- Under-representation of women in assessment panels (members and coordinators) in FCT calls, in all scientific domains and in all instruments (although to a less extent in national panels).

Instruments and Policy Measures

Measures to be developed

- **Incentives** (scholarships, prizes, social benefits) in order to **promote and recognize women's participation in research;**
- Further integration of the gender equality dimension in the organization, operation and activity of the employing organizations – universities, R&D units and enterprises – and in employability, through:

- Promoting social infrastructures in the workplace (such as kindergartens);
- Guaranteeing family-work balance and equal opportunities through part time schemes, parental leave, leaky career paths.

Measures to be developed

- **Improving the gender equality** in project coordination and in participation in decision-making bodies (academic and institutional), top career positions and as Heads and Board Members of Higher Education Institutions;
- Recommendation for Universities to annually make public gender balance in academic review panels;
- Promoting gender mainstreaming in research and education contents;
- Stimulating the adoption of **Gender Balance Plans**, fostering a culture of greater balance in this dimension in research institutes and Universities.

Monitoring Indicators

- Women with PhD (ISCED 6) as % of total (Eurostat, She Figures, DGEEC)
- Women as leaders of RPO, as % of total (Eurostat, She Figures, WiS databases; DG Research and Innovation)
- Women in Research Boards, as % of total (She Figures, WiS databases, DG Research and Innovation)
- Women with Grade A in Higher Education, as % of total (SHE Figures) or, to reflect on going dynamics,
- Women in new Grade A positions in Higher Education, as % of total (SHE Figures)

ERA Priority 5A – Optimal Circulation of Knowledge

Overview

- National R&I System has the appropriate intermediaries for knowledge circulation;
- Significant number of partnerships between business firms, universities and R&D centres, through the public incentive schemes;
- More limited collaboration between business firms and other national R&I system stakeholders in international R&D projects;
- Weak practices of knowledge protection and commercialization, in R&D institutes and firms;
- Limited public-private co-publications;
- Limited coordination between the R&I funding programmes and fragmented incentives to public-private research cooperation;
- Weak propensity of firms to hire PhD holders;
- Clusters policy efficiency depending on European support programmes; lack of a systemic approach and of a clear governance model.

Instruments and Policy Measures

Measures to be consolidated

- **Further complementarity in the aims and implementation of R&I funding programs,** in order to foster collaboration between the several R&I system stakeholders;
- **Second phase of the International Partnership Program** (involving namely MIT, CMU, University of Texas at Austin and Fraunhofer);
- **New governance model of the National Innovation Agency (ANI),** reflected namely in the Partnership between ANI and COTEC (Entrepreneurial Association for Innovation), boosting cooperation between academia and firms;
- **Cluster Policy** – acknowledgement of the Competitiveness Clusters;
- **Incentives for the employment of PhD's by business firms;**
- **GAPI** (Intellectual Property Support Offices) **network**: consolidating and deepening skills;
- **Promotion of mobility between universities and firms** (research students and staff).

Measures to be developed

- **Knowledge Transfer Strategy** coordinating policy measures across the different sectoral areas;
- **Public Procurement of Innovation** as a driver of **innovation in SMEs**;
- **University-based innovative enterprise incubators** and reinforcement of the University knowledge transfer and employability teams;
- **Inclusion of Industrial Property modules in higher education curricula**, in order to prepare the next generation of innovators;
- **Programme to reinforce Technological Centres** according to best international practices and in articulation with local partners;
- **Launching Business Innovation contracts** – public financing instrument – to leverage investment devoted to the production of new products or services in partnership between firms, Universities and other stakeholders;
- **Creation of the National Fab Labs Network** (for prototyping), promoting closer ties to entrepreneurship, education and research;
- **Support to action-training programmes and lifelong training** in Universities and Polytechnics, in school or enterprise environment;
- **"Territories of the Future" Programme** – applied research partnerships at the regional level between HEIs, local authorities, firms and other entities;
- **Polytechnic Institutes Modernization and Valorization Programme** - "Cities and regions with knowledge".

Monitoring Indicators

- Innovative Enterprises (Product and/or Process Innovation) cooperating with Universities, Government, Public or Private Research Institutes (%)
- Public Sector R&D (HEIs and Government sector) financed by Business Enterprises Sector (%)
- Public-private co-publications per million population

ERA Priority 5B – Open Access to Scientific Publications

Overview

- Portugal has been very active in promoting Open Access at national level, namely with respect to Green Access (first steps in 2003);
- In 2008, The Open Access Scientific Repository of Portugal (RCAAP) was created. It is an infrastructure that houses and aggregates virtually all public higher education and research institution repositories. Most of the Universities with research activities and research institutions are part of the RCAAP consortium. Authors must deposit their final pre-prints in at least one of the institutional open access repositories of RCAAP;
- In 2013, all MA/MSc and PhD thesis in public universities expected to be deposited in the RCAAP portal;
- The Fundação para a Ciência e Tecnologia (FCT) adopted in 2014 a mandatory open access publications policy and a research data management sharing policy statement;
- Portugal has been very active in key international fora on Open Access policies and participating in relevant international projects, namely at EU level;
- In 2016, the Government decided that all publications benefitting from public funding should be available in Open Access (exceptions apply). Scientific data resulting from public funding are also recommended to be openly shared. A detailed Plan for Open Access Policy is under development.

Instruments and Policy Measures

Measures to be consolidated

- Implementation of the **policy to deposit scientific publications from publicly funded research** in the RCAAP repositorium;
- Implementation of the policy towards full **deposit of digital copies of master and doctorate thesis** in the RCAAP repositorium;
- **Awareness-raising campaign towards Open Science**, boosting institutional policies towards Open Access;
- Organization of a Conference on Data Management and Curation.

Measures to be developed

- Publication of a **Letter of Commitment on Open Access in Portugal** (as an outcome of the development of a National Policy for Open Science);
- A **Strategic Plan for the implementation of a National Policy for Open Science** in Portugal covering namely the following objectives:
  - Analysis of the current practices of Open Science in Portugal;
  - Promotion of public debate on the challenges associated to Open Science;
  - Identification of best practices in Open Science;
- Definition of indicators to monitor a transparent transition towards Open Science.

Monitoring Indicators

Indicators will be further developed under the definition of a National Open Science Policy.

Preliminary indicators to be considered:

- Degree of compliance on the deposit of publications from publicly funded research in Green Access
- Degree of compliance on the deposit of digital versions of thesis in the RCAAP network
- Evolution of the number of documents deposited in the RCAAP network
- Evolution of the number of publications deposited in Green Access (with EU comparison)
- Evolution of the number of publications available in Golden Access

ERA Priority 6 – International Cooperation

Overview

- International cooperation with third countries has enhanced relevance across recent decades, through the strengthening of the Portuguese research system, both through dedicated financial resources and the intensive effort in advanced training and circulation (inwards/outwards) of human resources;
- Participation of Portugal in relevant international organizations (such as CERN, ESA, ESO, EMBL, EUREKA, COST) has been a driver of the increasing involvement of Portugal in international scientific cooperation;
- Portugal has been actively involved in European instruments of multilateral cooperation in S&T with several regions in the world, namely sub-Saharan Africa, Mediterranean Partner Countries, Latin-American countries, India and China, including participation in bi-regional policy dialogues;
- Such cooperation goes in parallel with bilateral cooperation with a large number of countries in the above mentioned regions with relevant cultural or economic links; this cooperation also reflects priorities of Portuguese foreign policy;
- Openness of the country/system to foreign researchers from across the world is a facilitator of the establishment of strong dynamics of cooperation;
- Particular emphasis has been placed on cooperation with Portuguese speaking countries, in Africa and Latin America, articulating cooperation in R&I and development policies.

Instruments and Policy Measures

Measures to be consolidated

- **Strengthening of the visibility of Portuguese Science and of the Portuguese language as a language of Science** through the following instruments:
  - Participation in European programmes and other international networks and partnerships, mainly of a **transatlantic scope;**
  - Commitment to **science diplomacy and to the scientific diaspora;** mainly involving internationally leading research institutes and business firms;

- Relaunching of the **'Global Science' Programme**, further promoting the **advanced training of researchers from Portuguese speaking African countries**.

- **Development of large-scale thematic mobilizing programmes,** oriented to societal challenges;
- **Boosting the participation of business firms in international R&D networks**;
- **At the bilateral level, reinforcement of the Atlantic relations,** tightening relations with **emerging countries,** namely in Maghreb and Asia Pacific countries;
- Supporting **HEIs internationalization instruments**.

Measures to be developed

- Development of a **Strategy for International Cooperation in Science, Technology and Innovation;**
- **Support to the development of international project applications**, namely for H2020 or EUREKA;
- Development of a cooperation programme involving the **Community of Portuguese Speaking Countries (CPLP)**, in marine research, international trade, coastal area valuing, fishing promotion and economic and sustainable exploitation of marine resources;
- Development of a cooperation programme involving the **Community of Portuguese Speaking Countries (CPLP)**, in energy;
- Cooperation programme with international networks (namely in the **atlantic area**) with a focus on marine robotics, oceanography and vulcanology based in the **Center for Oceanic Observation to be set up in the Azores**.

Monitoring Indicators

- Co- publications with target regions/countries in total international co-publications
- Co-publications, by thematic area, with target regions/countries in total international co-publications, by thematic area