

PORTUGUESE ROADMAP OF RESEARCH INFRA- STRUCTURES

2014 - 2020

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2014 - 2020

JULY 2014

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FOREWORD

Research infrastructures are the backbone of modern scientific and technological systems and are therefore instrumental in increasing the competitiveness of Portuguese research.

As efforts progress to consolidate the European Research Area, the international dimension of the Portuguese research infrastructures cannot be overlooked. As Portugal is setting its strategic priorities in science and technology, research infrastructures of strategic relevance should support consolidated areas of excellence as well as help promoting emerging areas of strategic relevance.

The first Portuguese Roadmap of Research Infrastructures of Strategic Interest sets the country on the map of Europe. Research infrastructures provide the scientific community with essential tools for a more successful participation in European and global frontier research projects. It also provides international political leverage to position Portuguese teams in leading roles, influencing future research agendas and facilitating a closer link with industry.

At the national level, the Roadmap will be an instrument of stability and sustainability, bringing together the efforts of regional and national funding bodies in a fully coordinated manner.

The Roadmap will achieve these goals by underpinning world-class science and encouraging the involvement of a variety of user communities, from the public and private sectors. Furthermore, the implementation of the infrastructures in the Roadmap will contribute to attract the best talent to Portugal, both by providing state-of-the-art equipment and resources to the scientific communities and via the technical and advanced training programmes that are built into the six-year action plan of each infrastructure.

The Monitoring Committee for Research Infrastructures will develop the necessary framework to promote a coherent and resilient research infrastructures ecosystem.

The Committee will identify gaps and prevent redundancies, in order to stimulate progress in science and technological innovation. Wherever relevant, it will ensure the alignment of European and national goals, without losing sight of regional specificities.

NUNO CRATO

Minister for Education and Science

PROX
Date: _____
FEDER



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das Material hochgradig
entzündlich sein kann.
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1.

INTRODUCTION

1. INTRODUCTION

The evolution of science is linked to a growing need of state-of-the-art, open access research infrastructures that enable access to equipment and knowledge-based resources, in order to promote research excellence, jointly address major societal problems, increase efficiency and reduce operation costs. This is why research infrastructures are the backbone of the development of a European Research Area.

The European rationale for the creation of large international single sited and distributed research infrastructures in an articulated and strategically aligned way led to the creation of the European Strategy Forum on Research Infrastructures (ESFRI) in 2002, which developed the first European Roadmap in 2006 and its updates, in 2008 and 2010. Since then, many European countries have developed national roadmaps taking into account the priorities defined in the ESFRI roadmaps.

The first step towards a national roadmap of Research Infrastructures (RI) of strategic relevance was to clearly define what a RI should be. In alignment with the ESFRI definition, a RI is hereby defined as an organisational system used by the scientific community to conduct top-level research and innovation in their respective fields. It may include large scientific equipment or sets of scientific instruments, collections and other knowledge based resources, data files and scientific data, computational and programming systems, communication networks that promote digital open access as well as other infrastructures of a unique nature, essential to achieve excellence in research. Research infrastructures may be single-sited or distributed as organised resource networks. To be included in the national and European roadmaps, a Research Infrastructure is required to have:

- Professional management that guarantees the implementation of an action plan and the accomplishment of the specific aims therein defined, with an efficient and transparent internal management of resources;

- Capacity to relate with, and provide services to, the scientific, educational, business and industrial communities;
- A clear, well defined and widely advertised policy of conditions for access by national and international researchers that are external to the infrastructure, which should be written into the aims and action plan of the RI.

A national research infrastructures roadmap should chart the existing infrastructures, frame them in a national, regional and international context, and on that basis design an action plan for the implementation of the infrastructures.

The assessment of the scientific and strategic components of each infrastructure was considered essential to create the first Portuguese Roadmap of Research Infrastructures of strategic relevance for 2014-2020 (RNIE). This was carried out following the principles of international peer review for the evaluation of scientific merit. The strategic assessment was conducted from the perspective of ensuring that the research infrastructures articulate with the national and regional smart specialisation strategies and other relevant sectorial policies. The international dimension was also taken into account, namely the articulation of the research infrastructures with those in the ESFRI roadmap.

The Portuguese Roadmap of Research Infrastructures of strategic relevance will thus:

- Act as a reference document on a national scale, aiming to guide and prioritise national and regional investments, safeguarding future infrastructures of strategic relevance, fostering their ability for international insertion, and thereby increasing the capacity for research and innovation, both nationally and regionally;
- Provide the Portuguese scientific community with the needed tools and resources that will contribute to improve the quality of science

‘A NATIONAL ROADMAP OF RESEARCH INFRASTRUCTURES SHOULD CHART THE EXISTING INFRASTRUCTURES, FRAME THEM IN A NATIONAL, REGIONAL AND INTERNATIONAL CONTEXT, AND ON THAT BASIS DESIGN AN ACTION PLAN FOR THE IMPLEMENTATION OF THE INFRASTRUCTURES’

produced in Portugal, ensuring its international competitiveness;

- Contribute to increase the participation of the Portuguese R&I community in the different pillars and thematic areas of Horizon 2020;
- Generate brain-gain and contribute to train young talent through easy access to the infrastructures;
- Generate momentum for innovation and creation of value through top-level research and by facilitating the creation of spin-offs as well as providing services to industry.

The current Roadmap provides an overview of the current landscape of research infrastructures, both in terms of geographical distribution and across scientific areas. Nevertheless, this document is not written in stone and the recently created Monitoring Committee will follow up the landscape and analyse gaps, thus providing the basis for regular reviews, as required for a continuously updated, strategy-oriented policy. The Committee, composed of members of scientific boards and reputed international experts (Annex II), was created not only to monitor, support and guide the implementation of research infrastructures, but also to identify emerging areas which require new infrastructure initiatives of strategic interest for the country.

**‘AN ASSESSMENT OF THE
SCIENTIFIC AND STRATEGIC
COMPONENTS OF EACH
INFRASTRUCTURE WAS
CONSIDERED ESSENTIAL TO
CREATE THE FIRST PORTUGUESE
ROADMAP OF RESEARCH
INFRASTRUCTURES OF
STRATEGIC RELEVANCE FOR
2014-2020’**



2. PROCEDURE FOR SELECTION OF THE RESEARCH INFRASTRUC- TURES

2. PROCEDURE FOR SELECTION OF THE RESEARCH INFRASTRUCTURES

Fundação para a Ciência e a Tecnologia (FCT) is the Portuguese national funding agency for all scientific areas of science and technology, promoting excellence, innovation and international competitiveness across all areas. FCT **launched a call in 2013 for the selection of the research infrastructures to be included in the National Roadmap of Research Infrastructures of strategic relevance for 2014-2020 (RNIE)**. This call aimed to:

- a) evaluate existing and emerging RIs in need of support for implementation;
- b) develop a strategic plan for investment in RIs until 2020, promoting synergies and overcoming redundancies;
- c) prioritise funding.

The selection of the RIs to be included in the RNIE was based on the **scientific merit** and **strategic relevance** of the infrastructure.

A scientific panel, composed of 105 international experts, evaluated 121 eligible applications, grouped within seven thematic areas, in line with the ESFRI Roadmap: 24 in Social Sciences and Humanities; 27 in Physical Sciences and Engineering; 17 in Environmental Sciences; 29 in Biological and Medical Sciences; 10 in Materials and Analytical Facilities; 6 in Energy and 8 in e-Infrastructures. The panel focused on the scientific and technological components of the application, on the governance capacity and implementation feasibility, as well as proposed budget and sustainability.

Scientific merit was the basis for the integration of a RI in the national roadmap. The strategic panel, composed of national and regional level representatives, assessed the applications that met a minimum threshold for scientific impact. The strategic assessment took into account the contribution of the infrastructure to the development of national and regional policies, its contribution to strengthening national and international competitiveness,

its potential for economic and social development and for the implementation of public policies for S&T.

In order to promote synergies, avoid redundancies and increase the critical mass of the RIs, both panels proposed articulations and/or fusions between infrastructures, which were taken into consideration in FCT's final decision.

A total of 40 Research Infrastructures, involving 55 applications, were recommended for integration in the national roadmap. All 40 RI demonstrated high scientific impact and were considered to be of high strategic regional and/or national relevance. The selected research infrastructures have the potential to be or to become, in the near future, national and international reference hubs, in close coordination with international infrastructures, notably those included in the European Roadmap (ESFRI). It should be highlighted that of the 40 infrastructures included in the roadmap, 23 (57.5%) are or plan to be linked to the European ESFRI roadmap infrastructures.



**‘A TOTAL OF 40 RESEARCH
INFRASTRUCTURES WERE
RECOMMENDED FOR INTEGRATION
IN THE NATIONAL ROADMAP’**

3.

FOLLOW-UP

AND

EVALUATION

3. FOLLOW-UP AND EVALUATION

To continuously meet the needs of a highly competitive and ever-evolving global community, it is necessary to regularly monitor the pace of implementation of the action plans of each infrastructure. Close monitoring will be essential for further revision of the national roadmap, and the **Research Infrastructures Monitoring Committee** will play a critical role in this.

The above-mentioned Committee is chaired by a member of FCT's Board of Directors, and is composed of Portuguese scientific experts, in the seven thematic areas of the roadmap, and international experts with well-established expertise in research infrastructures, including occupying high-level positions at ESFRI.

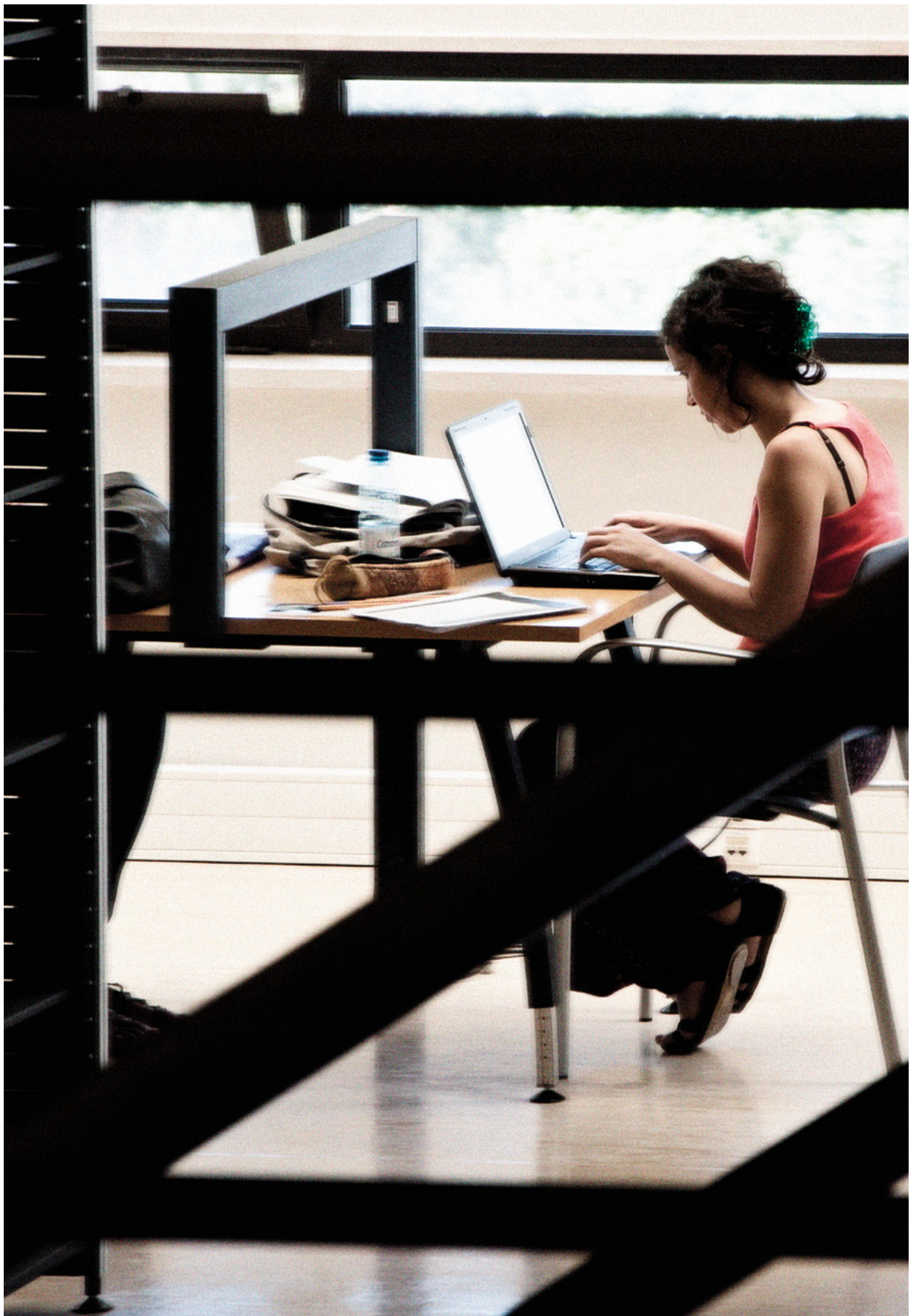
The Committee is mandated to monitor, evaluate and guide implementation and development of the roadmap, including, inter alia, to:

- a) Monitor implementation of the roadmap, by analysing the annual implementation reports, conducting field visits and other monitoring actions deemed necessary;
- b) Support the strategic orientation of FCT policy on research infrastructures;
- c) Promote and facilitate the development of synergies on an interregional and inter-sectorial level in the scope of research infrastructures;
- d) Facilitate and promote links and synergies with the ESFRI Roadmap for Research Infrastructures;
- e) Analyse the impact of existing research infrastructures and identify gaps in the different scientific domains.

To support the work of the Committee, three permanent Working Groups have been created, with the following responsibilities:

- **WG on Implementation** – develop indicators for monitoring RI implementation, and elaborate an annual progress report, including general recommendations;
- **WG on Regional Issues** – liaise with the management bodies of the Regional Operational Programmes, promote regular mutual information sharing and analyse potential synergies and alignment of priorities;
- **WG on ESFRI** – interact with the working groups of the European Strategy Forum on Research Infrastructures, develop a coherent analysis of the alignment of national infrastructures with ESFRI's priorities, and contribute to the national position in relation to emerging trends and opportunities within the ESFRI.

**‘THE RESEARCH
INFRASTRUCTURES MONITORING
COMMITTEE IS MANDATED
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GUIDE THE IMPLEMENTATION
OF THE ROADMAP’**



4. THE PORTUGUESE ROADMAP

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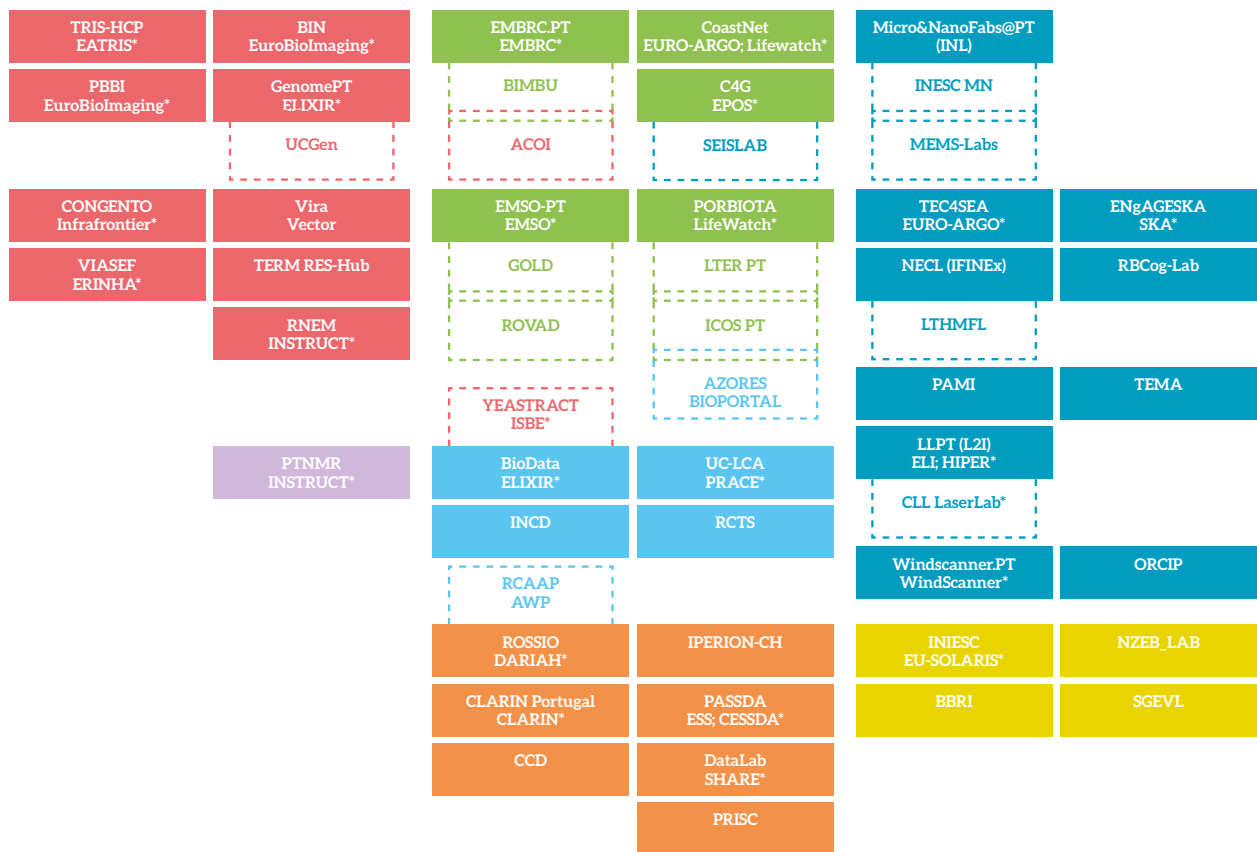
This roadmap aims to implement the research infrastructures herein listed, in such a way as to allow researchers, national and regional funding managers and science policy-makers to work together to promote excellent research environments, identify gaps and nurture future paths.

The roadmap is also a tool for facilitating the international integration of Portuguese teams, and provides the country with an important instrument to negotiate in international fora and influence high-level science and innovation strategies, as Europe strives to implement a European Research Area. The roadmap includes a description of the seven thematic areas and a list of the research infrastructures within each of them. Each research infrastructure is then described in more detail, including participating institutions, main activities and expected impact. In total, the Portuguese Roadmap for Research Infrastructures has 40 RIs, distributed across seven thematic areas: 7 in Social Sciences and Humanities, 9 in Biological and Medical Sciences, 4 in the Energy field, 5 in Environment, 1 in Material and Analytical Facilities, 10 in Physical Sciences and Engineering and 4 e-Infrastructures.

While each research infrastructure has its own specific goals, they are part of a broader ecosystem that helps to structure and shape the national science and innovation system, as well as to ensure its consolidation and resilience. Within each of the thematic areas, some of the RIs are already the result of a merger of two or more proposals. Some mergers occurred between different thematic domains, creating the multidisciplinary collaboration platforms that underpin modern frontier research. Figure 1 illustrates the ecosystem of RIs as it stands now.

In times of increasing need for data production, data handling and virtual access, a central aspect of the current roadmap is to sustain capacity building of Portugal's excellent e-infrastructures. This should be carried out considering two major objectives: 1) development of excellent research in the ICT domain; 2) encouraging service provision to RIs in

other domains, to develop more and better research on a national and international basis. As an example, the Laboratory for Advanced Computing and The Portuguese National Distributed Computing Infrastructure are now starting to provide storage and high performance computing support to RIs in the field of Environmental Sciences and thus bolster their competitive insertion into the correspondent European level ESFRI Research Infrastructure.



- Biological and Medical Sciences
- Environmental Sciences
- Physical Sciences and Engineering
- E.Infrastructures
- Social Sciences and Humanities
- Energy
- Materials and Analytical Facilities

Fig. 1. The ecosystem of research infrastructures included in the Portuguese roadmap.

* Alignment with ESFRI projects

‘THE PORTUGUESE ROADMAP FOR RESEARCH INFRASTRUCTURES HAS 40 RIS, DISTRIBUTED ACROSS SEVEN THEMATIC AREAS: 7 IN SOCIAL SCIENCES AND HUMANITIES, 9 IN BIOLOGICAL AND MEDICAL SCIENCES, 4 IN THE ENERGY FIELD, 5 IN ENVIRONMENT, 1 IN MATERIAL AND ANALYTICAL FACILITIES, 10 IN PHYSICAL SCIENCES AND ENGINEERING AND 4 E-INFRASTRUCTURES’

4.1. SOCIAL SCIENCES AND HUMANITIES

4.1. SOCIAL SCIENCES AND HUMANITIES (SSH)

Over the past two decades, the emergence of new survey and information technologies has been redefining research in SSH, demanding increasingly sophisticated data infrastructures, software tools and collaborative patterns. This allows new opportunities for preserving and exploring both already established and new data collections and archives. New avenues of research have been opened by this increasingly pervasive technological paradigm.

Research infrastructures in the social sciences and humanities cover key strategic areas: databases, accessibility and heritage. These are clearly convergent with smart specialisation patterns, particularly in their potential for social innovation and regional growth, namely in their multiple proposals for citizen capacitation, open access to historical information and social data and outreach. In this respect, it is important to further pursue the process of dissemination as heritage itself.

All RIs in this thematic area make provisions for investment in technological development as a carrier for the broader technological and societal issues addressed by the Social Sciences and Humanities but also for developing the appropriate conditions for frontier research in core SSH domains. These RIs are very important for the international success of Portuguese researchers, as they will promote the integration of national teams in successful and well established networks and open up opportunities for Portugal to influence and set the future research agenda in others. SSH research infrastructures are, therefore, instrumental also in supporting policy making and in bridging both technological and non-technological research domains. A testimony to this is the recurring reference to Computer Science, Materials Science and Electrical Engineering as associated areas in several of these infrastructures.

CCD, the Digital Creativity Center, a single-sited RI.

CLARIN Portugal, the Common Language Resources and Technology Infrastructure of Portugal is a distributed RI and is the national node of the CLARIN European Research Infrastructure Consortium (ERIC).

Datalab, the Social Sciences Data Lab, a distributed RI, which supports SHARE – Survey of Health, Ageing and Retirement in Europe, an established ERIC.

IPERION-CH.pt, the Portuguese Research Infrastructure on Cultural Heritage, a distributed RI.

PASSDA, Production and Archive of Social Science Data, is a distributed RI and is the national node of ESS – European Social Survey, an established ERIC.

PRISC, the Portuguese Research Infrastructure of Scientific Collections, a distributed RI.

ROSSIO, the Social Sciences Arts and Humanities RI, a distributed RI; ROSSIO is the national node of DARIAH – Digital Research Infrastructure for the Arts and Humanities, also already established as an ERIC.

DIGITAL CREATIVITY CENTER (CCD)

TYPE Single-Sited

COORDINATOR Luis Gustavo Pereira Marques Martins (UCP)

DESCRIPTION

The Digital Creativity Center (CCD), one of the anchor projects of the Creative Industry Cluster in Northern Portugal, is a centre of competence and creative excellence with an infrastructure equipped with cutting edge technology in the areas of Digital and Interactive Arts, Computer Music, Sound Design, Cinema and Audiovisual arts and Computer Animation.

INSTITUTIONAL PARTNER(S) / NODE(S)

Universidade Católica Portuguesa (UCP)

ACTIVITIES

The CCD offers specialized services, such as Motion Capture (MoCap) sessions, sound and music recording/design and post-production, video recording and post-production, digital and Interactive arts consulting and project development, certified advanced training, event production and organisation, and creative business incubation.

IMPACT

The CCD provides unique and state-of-the-art facilities, including the latest digital technologies, equipment, studios and labs, which together with a team of skilled and certified technicians that provide all the required maintenance and support, creates the necessary conditions for the development of cutting edge research at an international level in its areas of activity.

The activity of the CCD is closely aligned with the priority and thematic national and regional plans (e.g. the Regional Action Plan "Norte 2020", specifically the thematic areas focused on the Digital Growth in the Northern Region, and Culture, Fashion Design and Creativity). Considered an Anchor Project in the

area of the Creative Industries by the ADDICT (Agência para o Desenvolvimento das Indústrias Criativas), the CCD has as its main mission the proactive participation in the transfer of knowledge and technology to the creative sector, including the collaboration and articulation with many other entities and community projects (regional or national).

COMMON LANGUAGE RESOURCES AND TECHNOLOGY INFRASTRUCTURE OF PORTUGAL (CLARIN PT)

TYPE Virtual
COORDINATOR António Manuel Horta Branco (FC/UL)

DESCRIPTION

CLARIN PT makes resources and technology available and useful to scholars and experts from all disciplines whose topics of research, development or innovation concern human language, with special relevance to the humanities and social sciences, and to the cognitive and computational sciences. CLARIN PT also provides its users top level technical support to fully exploit such scientific assets. CLARIN Portugal is the national node of the European Common Language Resources and Technology Infrastructure (CLARIN ERIC).

INSTITUTIONAL PARTNER(S) / NODE(S)

Faculdade de Ciências da Universidade de Lisboa (FC/UL); Faculdade de Letras da Universidade de Lisboa (FL/UL); Universidade de Évora (UE).

ACTIVITIES

CLARIN PT provides distribution and reuse of scientific resources, archiving and digital preservation, inventory, online research applications, online processing services, web services for processing, expert technical support (help desk) and advice on licensing of scientific resources.

IMPACT

CLARIN PT serves research, development or innovation related to language and to the handling of language data, in all kinds of modalities – spoken, written, multimodal, etc. –, in all kinds of representations – audio, text, video, neuro-activity records, etc. –, and in all kinds of roles – symbolic object, instrument of communication, reflex of mental activity, cognitive skill to be enhanced, skill to be trained in second language acquisition, carrier of content and knowledge, element of cultural identity, or natural way of interaction with appliances and artificial agents.

An array of socio-economic sectors benefit from this RI, ranging from the education sector related to language learning and second language skills certification, to cultural and creative industries,

and including other sectors such as localisation, translation and interpreting, for instance. A sector more intensively engaged in innovation confluent with the research supported by this RI is the ICT sector, at large, and the Human Language Technology sector, in particular.

SOCIAL SCIENCES DATALAB (DATALAB)

TYPE Distributed

COORDINATOR Luís Miguel Rainho Catela Nunes (FE/UNL)

DESCRIPTION

The Social Sciences DataLab provides access to the most complete set of databases that are essential for conducting advanced research in the Social Sciences. DataLab offers fundamental bibliographic and statistical databases in the areas of Economics, Finance, and Management.

In association with several public institutions, DataLab offers the research community access to unique large datasets with micro-data. DataLab also supports the SHARE-ERIC project, providing comparable data on ageing in Europe.

INSTITUTIONAL PARTNER(S) / NODE(S)

Faculdade de Economia da Universidade Nova de Lisboa (FE/UNL); Universidade do Minho (UM)

ACTIVITIES

The main service of the DataLab is to provide free access to the most complete set of databases for research in the Social Sciences. Almost all of the resources are available onsite for DataLab visitors. SHARE data is distributed online through a dedicated data centre. DataLab also supports public and private institutions by providing an infrastructure where they can make their data available to the scientific community. It also provides research assistance to studies using the databases at the DataLab. Finally, it provides users with training and support, as well as communication services.

IMPACT

The DataLab provides access to the fundamental databases required by Social Sciences researchers. The unique micro-datasets provide opportunities for cutting-edge research in many areas (e.g. education,

entrepreneurship, innovation, business structure, and finance). DataLab supports doctoral and masters programmes in Economics, Finance, and Management. The use of specialised databases by students in their dissertations will contribute to an increased knowledge on relevant economic, social, and managerial issues. SHARE also offers innovative research opportunities in health, ageing, and retirement, from a multidisciplinary perspective, for students and researchers in Demography, Sociology, Epidemiology, and Economics. The participation of the DataLab in the SHARE international network will contribute to launch further international cooperation in major research projects.

The SHARE data provides improved knowledge on the situation and needs of elderly population in Europe, from regional, national, and international perspectives. Databases on financial data (e.g. Compustat, CRSP, Datastream, Thomson ONE) are also major sources for understanding capital markets (e.g. the ability of firms to access financing, invest, and create jobs). For the first time, researchers will have access to micro-data covering several

years, on schools, teachers, and students. These will contribute to study alternative metrics and indicators to monitor the performance of schools, as well as to analyse the impacts of alternate policy measures, educational options, financing decisions, and government systems, at different levels. The *Quadros de Pessoal* database allows a better understanding and design of better policies for the labor market.

PORTUGUESE RESEARCH INFRASTRUCTURE ON CULTURAL HERITAGE (IPERION-CH)

TYPE Distributed

COORDINATOR António José Estevão Grande Candeias (Universidade de Évora)

DESCRIPTION

Cultural Heritage (CH) is the backbone of a nation, bestowing upon it both a sense of belonging and one of permanence, grounded in its history which itself is visibly materialised through its CH. But the importance of CH goes beyond its symbolic significance. CH is also a powerful motor of tourism and thus an important asset of modern societies, particularly in a post-industrial intensive context. Recognising this status, the participants decided to join resources to strengthen the research infrastructure in the field, aiming at a strong competitive position, not only in the national but also in the international context.

INSTITUTIONAL PARTNER(S) / NODE(S)

Direção-Geral do Património Cultural (DGPC); Laboratório Nacional de Engenharia Civil (LNEC); Universidade de Évora (UE)

ACTIVITIES

Access to laboratory equipment; Integrated studies of cultural heritage including museum objects, architectonic/integrated art, and archaeological remains; technical training; access to sample banks; access to scientific databases (conservation-restoration reports, xylotheque and Technical library).

IMPACT

For the first time in Portugal, IPERION-CH.pt makes available a world-class network of facilities and know-how to all researchers in cultural heritage, providing access, support and services to the wider community of scientific researchers, universities, museums and other centres of knowledge. The RI will support the scientific community in conducting top-level research in the cultural heritage field, ranging from art history to the issues posed by the degradation of ancient artefacts and to the overall conservation of architecture with integrated art.

The importance of Cultural Heritage (CH) for the development of Portugal is widely acknowledged. Therefore, the creation of an open infrastructure dedicated to research in material CH

(IPERION-CH.pt) will have important national/regional consequences, namely:

- Recognition of CH as testimony to national identity, as a driver of cultural tourism and a way towards local sustainable economic development
- Support to other research groups and interdisciplinary work with researchers from related areas such as ethnology and anthropology;
- Development of studies aimed at identifying the best rehabilitation or conservation-restoration practices, eventually leading to the development of new, improved and marketable products;
- Support for conservation and rehabilitation professionals through training, counseling and analytical services.

PRODUCTION AND ARCHIVE OF SOCIAL SCIENCE DATA (PASSDA)

TYPE Distributed

COORDINATOR Jorge Manuel Vala Salvador (ICS/UL)

DESCRIPTION

This new infrastructure (PASSDA) aims at the production, analysis and archiving of data in the context of national and international projects in the domain of the social sciences. PASSDA is the national node of the European Social Survey (ESS-ERIC) and associated member of the Consortium of European Social Science Data Archives (CESSDA).

INSTITUTIONAL PARTNER(S) / NODE(S)

Centro de Estudos Sociais (CES-UC);
Instituto de Ciências Sociais (ICS/UL);
Instituto Superior de Ciências Sociais e
Políticas (ISCSP/UTL); ISCTE - Instituto
Universitário de Lisboa (ISCTE-IUL)

ACTIVITIES

PASSDA provides data collection, data analysis, dissemination of research findings, training in advanced methods of data analysis for the social sciences, supervision of all stages of data collection, archive of databases and metadata, sharing information and data across research community, and support for researchers in data searching.

IMPACT

Public attitudes matter in democratic societies. They reflect citizens' beliefs, desires, fears and preferences. They are difficult to measure and they cannot be gleaned from media opinion polls, which tend to give momentary glimpses of opinion formation and change. But long-term changes in the population's attitudes, values and political preferences are as important to governance and social analysis as are shifts in a country's demographic profile, economic outlook, behaviour patterns and cultural norms. The participation of Portugal in some of the most important international research networks allows a deep and wide knowledge of the Portuguese society in a comparative and longitudinal perspective.

With PASSDA, Portuguese social scientists will benefit from a wider and stronger infrastructure promoting methodological cross-fertilisation and enhancing interdisciplinarity (e.g. sociology, social psychology, political science, economy, demography, geography). By establishing an Open Access Social Science Data Archive, PASSDA will contribute to the creation of active citizenship and greater transparency of decision-making processes, particularly in the processes of public policy evaluation.

PORTUGUESE RESEARCH INFRASTRUCTURE OF SCIENTIFIC COLLECTIONS (PRISC)

TYPE Distributed

COORDINATOR Marta C. Lourenço (UL)

DESCRIPTION

Scientific collections - rocks, fossils, minerals, botanical gardens, historical scientific instruments and medical instruments, herbaria, zoology specimens, ethno-botanicals, soil and ice cores, DNA, seed & tissue banks, sound archives and specific documental sources, e.g. seismograms, medical records, meteorological records, scientific drawings - are invaluable sources for the national and international scientific system in a wide range of cross-disciplinary fields. They can only be used, however, if collections are preserved and made accessible according to international standards. PRISC brings together expertise and resources to transform a heterogeneous and dispersed landscape into a coherent and sustainable national infrastructure of scientific collections for national and international users from the sciences and humanities. Through its services, PRISC delivers well-preserved and accessible collections that may be increasingly used in current and future research, post-graduate teaching and science communication for general audiences.

INSTITUTIONAL PARTNER(S) / NODE(S)

Instituto de Investigação Científica Tropical, I.P. (IICT) (IICT/MNE); Universidade de Coimbra (UC); Universidade de Lisboa (UL); Universidade do Porto (UP)

ACTIVITIES

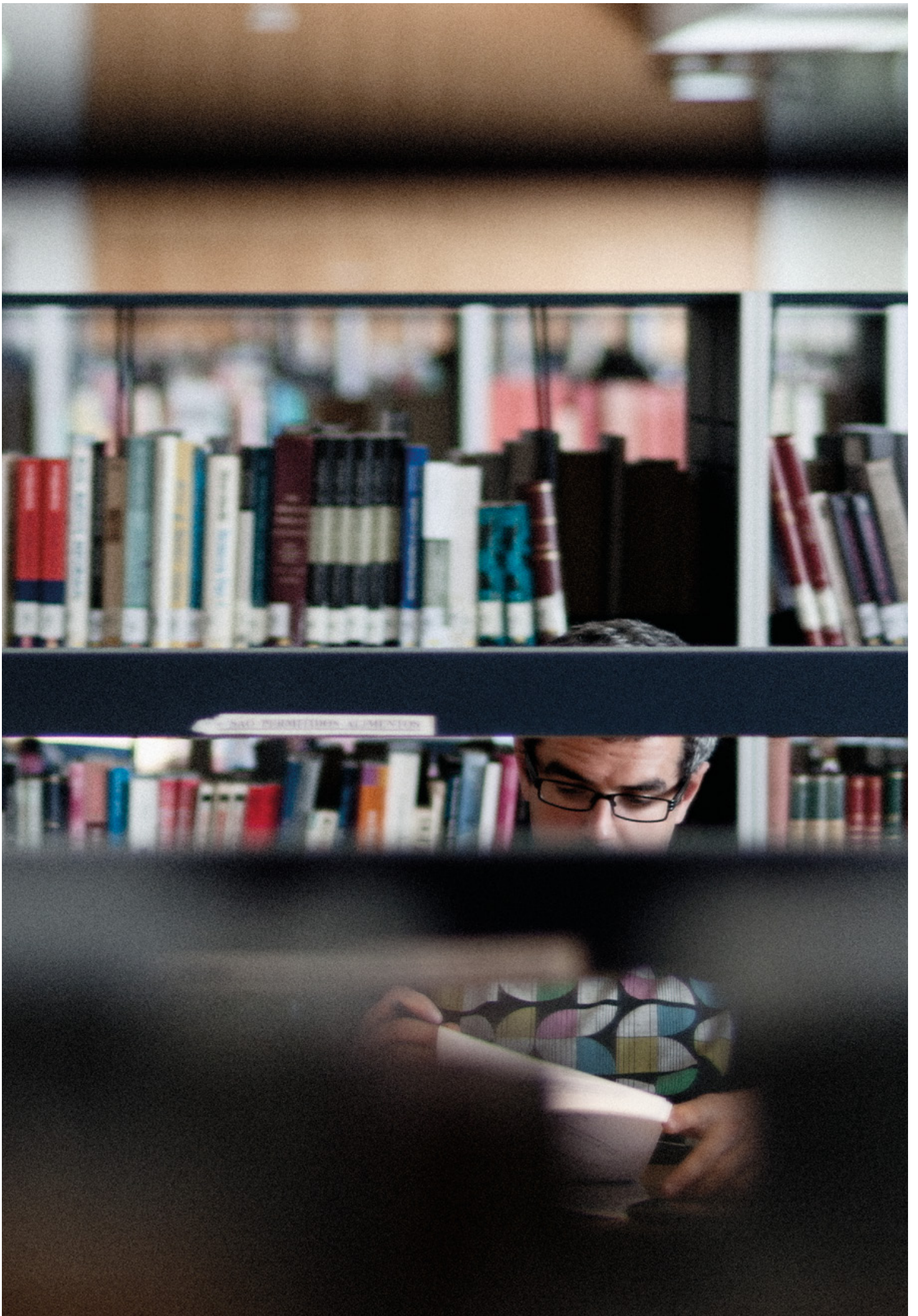
PRISC will provide public and open access to scientific collections, storage space for scientific collections, conservation of scientific collections, consulting on scientific collections, training in scientific collections, and outreach activities.

IMPACT

Portuguese scientific collections are currently largely unknown. Once the universe is defined and good practices implemented, material and immaterial data presently unavailable will be preserved in a secure and accessible form and the impact on new research is expected to be considerable (papers, catalogues, projects). To reach this stage, PRISC will apply for national and international projects (Horizon 2020). Moreover, PRISC may be a pilot for innovative research infrastructure approaches to scientific collections in Europe.

PRISC is strongly engaged with the Europe 2020 strategy. The values of de-centralisation,

openness, simplicity and 'do more with less' lay at its core. These values, combined with a commitment to smart growth based on knowledge and innovation and fostering economic and social development has oriented PRISC towards a strong regional approach to its strategy and operations. Thus, PRISC's impact on social and economic development will be experienced in the core regions (North, Centre, South & Islands), in the cities of Lisbon, Porto and Coimbra and also at national level, since PRISC's actions will promote qualification of, and access to, scientific collections distributed over mainland Portugal, Madeira and Azores. PRISC encompasses collections from all scientific areas. On top of that, one needs to take into account the multiple science vocations inspired by PRISC's collections, gardens and exhibitions through their 500,000 combined visitors per year.



SOCIAL SCIENCES, ARTS AND HUMANITIES (ROSSIO)

TYPE Distributed

COORDINATOR Maria Fernanda Rollo (FCSH/UNL)

DESCRIPTION

ROSSIO is a Portuguese reference infrastructure for Social Sciences, Arts and Humanities (SSAH), a platform for dissemination of digital content that provides a distinctive set of sources and resources representative of the richness and diversity of Portuguese history, society and cultural heritage. Rossio will contribute to excellence and internationalisation of research and training and to the promotion of innovative use of contents for SSAH.

INSTITUTIONAL PARTNER(S) / NODE(S)

Faculdade de Ciências Sociais e Humanas (FCSH/UNL); Câmara Municipal de Lisboa (CML); Cinemateca Portuguesa - Museu do Cinema (CPMC); Fundação Calouste Gulbenkian (FCG); Fundação Mário Soares (FMS); Instituto da Habitação e da Reabilitação Urbana (IHRU); Teatro Nacional D. Maria II, EPE (TNDM II)

ACTIVITIES

ROSSIO will provide Open Access to SSAH digital contents, meta-data and contextual information; Specialised user support for researchers and doctoral students; SSAH activities dissemination service; Virtual Research Environment (VRE); Education and training activities; Innovation interface.

IMPACT

Rossio aims to create a gateway to meet demand for SSAH open access contents, providing a critical mass of digital objects and scientific production, and thereby stimulating and fostering the development of top quality research in SSAH. ROSSIO also aims to build a sustainable network of content providers, strengthen-

ing partnerships and creating new bridges between academic and non-academic institutions, bringing together their heritage, knowledge and skills into a platform that significantly improves the conditions to produce and disseminate scientific knowledge. This infrastructure will ensure the organisation, interrelation, contextualisation and scientific accreditation of millions of digital objects delivered by diverse academic and non-academic, state and civil society, institutions, and will improve content discovery and use by enhancing metadata through innovative methods.

The ROSSIO partners Cinemateca Portuguesa-Museu do Cinema, Fundação Calouste Gulbenkian, Fundação Mário Soares, Município de Lisboa, Rádio e Televisão de Portugal, Sistema de Informação para o Património Arquitectónico, Teatro Nacional D. Maria II and FCSH/NOVA, with its associate content providers Arquivo da WEB Portuguesa, Arquivo de Ciência e Tecnologia da FCT, Arquivo Histórico-Parlamentar da Assembleia da República, Instituto Nacional de Estatística, Arquivo Histórico Diplomático do Ministério dos Negócios Estrangeiros, Instituto Camões,

Museu Bernardino Machado, Rádio e Televisão de Portugal, will deliver an immense stock of resources that are not only invaluable for research in SSAH but also portray the richness and diversity of Portuguese history, society and cultural heritage.

As a research infrastructure for SSAH, and a deliverer of contents portraying Portuguese heritage, culture and society, a crucial impact of ROSSIO will be the consolidation of Portugal's identity, sense of belonging and citizenship among the users of the RI, whether they be researchers, teachers, students or citizens. Such an impact of ROSSIO, albeit hard to measure in quantitative terms, is even more important in times of prolonged crisis.

4.2. PHYSICAL SCIENCES AND ENGINEERING

4.2. PHYSICAL SCIENCES AND ENGINEERING (PSE)

Research Infrastructures play an increasingly important role in scientific and technological development in the Physical Sciences and Engineering. This field of research is characterised by a strong technological capacity and for providing the Portuguese scientific community with access to a wide range of research infrastructures, promoting both basic and applied scientific development.

The close links of many of these research infrastructures with national and international engineering industries is an important indicator of the role these RIs will be playing in the national research and innovation system.

For example, the EngageSKA RI enables Portugal's participation in the global Square Kilometer Array venture, the largest radio telescope of the XXI century; Micro&NanoFabs@PT brings together micro and nano facilities and a laboratory dedicated to biomedical applications, to share access to micro-nanofabrication and to design tools for applications in medical, environmental, electronics/energy, automotive and defense/aerospace areas; PAMI promotes the development and exploitation of bio-inspired layer-by-layer fabrication processes to produce high-value personalised products. These are only some of the many important contributions of these RIs.

EngageSKA, Enabling Green E-Science for SKA – Square Kilometer Array, a distributed RI developing active collaborations with SKA – Square Kilometer Array, a global RI hosted by the United Kingdom.

LLPT, Laserlab Portugal, a distributed RI.

Micro&NanoFabs@PT, the Network of Micro and Nano Fabrication Research Facilities in Portugal, a distributed RI.

NECL, the Network of Extreme Conditions Laboratories, a distributed RI.

ORCIP, the Optical Radio Convergence Infrastructure for Communications and Power Delivering, a distributed RI.

PAMI, the Portuguese Additive Manufacturing Initiative, a distributed RI.

RBCog-Lab, the Robotics, Brain and Cognition Laboratory, a single sited RI.

TEC4SEA, the Modular Platform for Research, Test and Validation of Technologies supporting a Sustainable Blue Economy, a distributed RI.

TEMA, the Centre for Mechanical Technology and Automation, a single sited RI.

Windscanner.PT, the Portuguese Windscanner Facility, a distributed RI, member of the ESFRI Energy RI Preparatory Phase project with the same name.

ENABLING GREEN E-SCIENCE FOR SQUARE KILOMETER ARRAY (ENGAGE SKA)

TYPE Distributed

COORDINATOR Domingos da Silva Barbosa (IT Aveiro)

DESCRIPTION

ENGAGE SKA implements an action plan coupling frontier research and technological development in close collaboration with the Portuguese industry, promoting the participation of Portugal in the Square Kilometer Array, the largest radio telescope of the XXI century, to be installed in Southern Africa and Australia. This platform will stimulate technological development by bringing together advanced training and ICT, Renewable Energy and Space innovation, including the testing of prototypes on national soil.

INSTITUTIONAL PARTNER(S) / NODE(S)

Instituto de Telecomunicações de Aveiro (IT Aveiro/IT); Universidade de Aveiro (UA); Faculdade de Ciências da Universidade do Porto (FC/UP); Universidade de Évora (UE); Instituto Politécnico de Beja (IPBeja)

ACTIVITIES

ENGAGE SKA offers a wide variety of activities, such as advanced training in radio astronomy, radio frequency and core optical technologies for radioastronomy, training in computational astrophysics, characterization and testing facilities with inclusion of Green (Solar) technologies, Aperture Array technologies optimization, solar observations (radio and optical), astronomy software development and E.Science, Cloud Computing and Data Storage.

IMPACT

ENGAGE-SKA main scientific objectives are closely coupled to the SKA project. On the national level, ENGAGE-SKA aims to promote and capacitate national research on front-line scientific and technological problems faced by the academic and industrial community via the use and development of both current radio-astronomy infrastructures, in terms of Big Data and Energy solutions and the new related sensor technology prototypes like the SKA Aperture Arrays (AA) that will be tested as well in Portugal.

Bringing part of the SKA construction development and test to Portugal will have a significant

and positive impact at National/Regional ICT and Energy industry. The infrastructure will have impact in many stakeholders in the Big Data, Sustainable Energy Systems and Environmental sensor applications (Forest & water management) arena at diverse levels.

LASERLAB-PORTUGAL (LLPT)

TYPE Distributed
COORDINATOR Gonçalo Figueira (L2I)

DESCRIPTION

Laserlab-Portugal is a distributed research infrastructure providing state-of-the-art laser systems to the scientific and industrial communities. The Lisbon node is specialised in very high power pulsed lasers for the study of the properties of matter at very high light intensities. The Coimbra node specialises in photochemistry, photobiology and photomedicine. This capability covers a vast amount of laser parameters with application in physics, chemistry, materials, biology, medicine and other fields. LLPT is a member of LaserLab Europe, participating in several access, joint research and networking activities.

INSTITUTIONAL PARTNER(S) / NODE(S)

Instituto de Plasmas e Fusão Nuclear do
Instituto Superior Técnico (IPFN/IST/UL);
Universidade de Coimbra (UC)

ACTIVITIES

LLPT offers access to a wide variety of services: access to laser systems and to modelling tools for laser-matter interactions; accompanied access to femtosecond transient absorption with UV/VIS/NIR detection, to picosecond single photon counting, to nanosecond photoacoustic calorimetry, to photochemistry in matrices and to phototherapy and photodiagnosics and to chemical imaging facilities, besides giving access to users of LaserLab Europe, including the training of young researchers.

IMPACT

Laserlab Portugal will, through its Lisbon node, extend its laser capability through two additional laser sources: a high energy, high repetition rate diode pumped amplifier, and a 20 fs ultrabroadband laser. These will allow the development of a state-of-the-art high harmonic generation source at keV energies and a high

photon number source at 10 nm. Other expected impacts include the optimization of plasma channels by field ionization for plasma acceleration, advanced gas cells for wakefield acceleration, the development of a test facility for advanced plasma sources/targets, and new imaging techniques e.g. attosecond holography, for the recording of multi-colored XUV holograms, relevant for biology/chemistry processes. With complementary capabilities, its Coimbra node, aims to maintain leadership in time-resolved photoacoustics (leading the technique to ps resolution and tomography), and in matrix isolation photochemistry and solid-state hot vibrational chemistry; attain international recognition in ultrafast transient absorption spectroscopy; become a reference laboratory for time-correlated single photon counting, fluorescence up-conversion, and chemical imaging (IR, Raman) techniques for applications in materials and biological sciences; and make a strategic investment in time resolved infrared spectroscopy, as a way to follow in real time ultrafast chemical processes involving bond-breaking/bond forming reactions, conformational isomerizations, and

their associated mechanisms of intramolecular energy relaxation/redistribution.

SOCIO-ECONOMIC IMPACT

There is a large potential to be explored in developing these technologies in Portugal in a collaborative frame. The National Network on Lasers and Photonics, bringing together universities, laboratories and industry, has allowed a privileged insight into the regional and national panorama in laser RD&I. These connections will be strengthened and explored in coming years as a mean of finding adequate partnerships for technological development. The technological environment at LLPT has already originated several spin-off companies and has a long track record on technology transfers which will be further developed in the future and contribute to the national research and innovation capacity and international competitiveness.

NETWORK OF MICRO AND NANO FABRICATION RESEARCH FACILITIES IN PORTUGAL (MICRO&NANOFABS@PT)

TYPE Distributed

COORDINATOR Paulo Jorge Peixeiro de Freitas (INL)

DESCRIPTION

The main goals of the Network of Micro and Nanofabrication Research Facilities in Portugal are to share access to micro-nanofabrication and design tools with the research community and with companies, and to increase competitiveness in the current strategic areas linked to the application of micro and nanotechnologies in the medical, environmental, electronics/energy, automotive and defense/aerospace fields.

INSTITUTIONAL PARTNER(S) / NODE(S)

Laboratório Ibérico Internacional de Nanotecnologia (INL); Instituto de Engenharia de Sistemas e Computadores - Microssistemas e Nanotecnologias (INESC MN/INESC/IST/UTL); Universidade do Minho (Center MicroElectro-Mechanics Systems -CMEMS)

ACTIVITIES

Micro&NanoFabs@PT offers a wide variety of services, such as micro and nano device fabrication; spintronics; MEMS fabrication; packaging laboratories; IC design; electron microscopy facilities; structural, surface and interface analysis; spectroscopy laboratory; central bio laboratories; central nanochemistry laboratories; solar cell device characterization laboratory; magnetics laboratories; biosensor and microfluidic laboratories; RF characterization; energy harvesting laboratory.

IMPACT

The Portuguese community working on Nanosciences and Nanotechnologies (both academic and industrial) is already benefiting from the existent micro and nanofabrication infrastructures using occasionally services offered

by the major centres now in the Micro&NanoFabs@PT initiative. Micro and nanofabricated devices are at the heart of cutting-edge technologies in electronics, biotechnology, pharmacy and medicine, and environment and food monitoring. Nanostructures are also widely used in the nanomedicine, food and environmental control domains. Micro&NanoFabs@PT represents a unique opportunity to further open the facilities for national labs and companies, increasing the access to tools not available elsewhere, leading to an overall boost of these research areas, and globally of Portugal in the European context.

Micro&NanoFabs@PT, through INL and INESC MN, has a well-established and well-documented offer of micro and nanofabrication and also nanocharacterization services, which can also involve consulting to external entities. These can be:

- a) academic groups requiring fabrication services;
- b) start-up companies whose products involve microfabricated devices;
- c) established companies;

d) state laboratories involved, e.g., in environmental monitoring;

e) the military.

This infrastructure network provides prototyping and even fabrication of limited series of products. CMEMS-UM complements these offers with design, simulation, prototyping and characterization of particular devices.

Miniaturized devices and structures are central to modern technology. The ability to micro and nanofabricate these devices requires important investments in equipment and human resources. The Micro&NanoFabs@PT state of art infrastructure network offers services and access policies to external users. This infrastructure network will allow a large ecosystem of Portuguese and international researchers to become familiar and work with advanced miniaturized devices. Micro&NanoFabs@PT aims to be one of the leading European centres for advanced training, intellectual property generation, and technology transfer in micro and nanofabrication processes, miniaturized and integrated devices, and nanostructure fabrication.

NETWORK OF EXTREME CONDITIONS LABORATORIES (NECL)

TYPE Distributed

COORDINATOR João Pedro Araújo (FC/UP)

DESCRIPTION

NECL comprises the laboratories in Portugal that have relevant equipment for the study and characterisation of advanced materials under extreme conditions, namely temperature (low and high temperatures), intense magnetic fields (static and pulsed), pressure, ultrafast dynamics (sub-femtosecond), amongst others. The different experimental facilities in the three poles are managed in a coordinated way in order to provide specialised services to industry, and maximise their use in different fields of research, with emphasis on studies of multifunctional and nanostructured materials that have applications in electronics and nanotechnology.

INSTITUTIONAL PARTNER(S) / NODE(S)

Faculdade de Ciências Universidade do Porto (FC/UP), Instituto Superior Técnico (IST/UL); Faculdade de Ciências da Universidade de Lisboa (FC/UL)

ACTIVITIES

NECL offers a wide variety of services, such as local probe structure and lattice dynamics measurements; thermo-physical property measurements; ultrafast spectroscopy of spin dynamics measurements; Service of He collection and liquefaction; electrical transport and magneto transport measurements; magnetic characterization and Mössbauer spectroscopy.

IMPACT

The NECL Laboratories have been playing a strategic role in the development of low temperature and high magnetic fields physical studies at the national level. They are now enhanced by a management as a coordinated network, making possible and supporting the scientific research in various fields, requiring extreme conditions such as low temperatures, high magnetic fields and high pressures. Access to specialized experiments of cross-cutting importance in different areas of materials characterization, materials science and condensed matter research will be provided to the general scientific community, enlarging the utilization of these techniques to other Portuguese researchers

working in different scientific domains.

The NECL Laboratories will continue to contribute in various fields of research, with a clear mission of supporting the research activity in various fields of research with industrial and economic impact and emphasis on advanced materials studies, increasing the competitiveness and allowing access to specialized experiments by a larger community in Portugal.

The infrastructure is instrumental in the development and dissemination to industry of technical knowledge in cryogenics. The expertise in this field has gained accrued interest and dimension among specialised SMEs, which call for technical support and trained personnel that only the infrastructure technical team can provide. The different poles of the network will have specific industrial impacts at regional level providing Key Enabling Technologies, relevant to problem solving of local industrial partners.

OPTICAL RADIO CONVERGENCE INFRASTRUCTURE FOR COMMUNICATIONS AND POWER DELIVERING (ORCIP)

TYPE Distributed

COORDINATOR Paulo Miguel Nepomuceno Pereira Monteiro (IT Aveiro)

DESCRIPTION

ORCIP is an open infrastructure that will allow the scientific community and industry to test, characterise and certify future optical and radio systems. This will allow companies to pursue activities centered on innovation and knowledge, freeing them of the expenditure required for the acquisition of expensive equipment.

The infrastructure will be an instrument to lower the barrier of entry of SMEs into innovation activities in next generation telecommunications.

INSTITUTIONAL PARTNER(S) / NODE(S)

Instituto de Telecomunicações de Aveiro (IT Aveiro/IT); Instituto de Telecomunicações de Coimbra (IT Coimbra/IT); Instituto de Telecomunicações da Covilhã (IT Covilhã/IT)

ACTIVITIES

ORCIP offers a wide variety of services, such as access to Optical Radio Convergence Testbed Infrastructure, Optical and Wireless Simulation tools, Communications Test Equipment support, FPGA development platforms for wireless and optical communications and Training.

IMPACT

ORCIP will allow enhancing capabilities and it is expected to have impact in education both at the undergraduate and graduate levels as well as industry training. It is expected that ORCIP will raise the number of publications and projects coming from research directly related to the infrastructure development.

The infrastructure will also contribute to lowering the entry barrier of regional and national SMEs in research and innovation activities through the availability of a powerful testbed remotely accessible with capacity to cover device to application testing, overcoming significant capital expenses for SMEs in equipment and providing continuity in the innovation chain.

PORTUGUESE ADDITIVE MANUFACTURING INITIATIVE (PAMI)

TYPE Distributed

COORDINATOR Paulo Jorge da Silva Bártolo (IPL)

DESCRIPTION

PAMI focus on the development and exploitation of bio-inspired layer-by-layer fabrication processes to produce high-value personalised products. It aims to respond to a crucial competitiveness challenge and threat to future property, thus closing the gap between R&D activities and the development of technological innovations in manufacturing.

INSTITUTIONAL PARTNER(S) / NODE(S)

Instituto Politécnico de Leiria (IP Leiria); Instituto Pedro Nunes (IPN); Universidade de Coimbra (UC); Centro de Neurociências e Biologia Celular (CNBC/UC); CENTIMFE (Centro Tecnológico da Indústria de Moldes, Ferramentas Especiais e Plásticos).

ACTIVITIES

PAMI offers a wide variety of services that will create and support industry-academic partnerships and expand the number of qualified researchers and engineers in the area.

IMPACT

This infrastructure aims to accelerate innovation in additive manufacturing research through a close relation with industrial partners. A high impact on industry related training is expected during the first six years of PAMI, including 12 industry partnerships training programmes made possible through the development and consolidation of this RI. This will enable an answer to a key bottleneck of the national research and innovation system, the integration of highly qualified human resources in the private sector, thereby boosting the innovation and competitiveness capacity.

Through a close alignment with the regional and national smart specialization strategies, this RI will also contribute to the development of spin-offs and new commercial products of high value-added. It is thus expected to raise the capacity of both national public research

teams and private companies acting in this domain to successfully participate in international research projects and promote the internationalization of the national manufacturing research and industry.

ROBOTICS, BRAIN AND COGNITION LABORATORY (RBCOG-LAB)

TYPE Single Sited

COORDINATOR José Alberto Rosado Santos-Victor (IST/UL)

DESCRIPTION

RBCog-Lab aims to integrate multidisciplinary findings from neuroscience, developmental psychology, cognitive science, perception and machine learning to design methods and representations based on embodied learning and self-exploration. This will allow the development of advanced perception capabilities, thus providing robots with the ability to learn and improve skills through experience and interaction with the environment, with the potential of reaching human like skills in terms of dexterity and adaptability.

INSTITUTIONAL PARTNER(S) / NODE(S)

Instituto Superior Técnico (IST/UL)

ACTIVITIES

RBCog-Lab offers a wide variety of services, such as access to the iCub platform including support equipment, summer schools and training, science fairs, public school demonstrations, media reporting events, training and robotic platform support, and international relations activities.

IMPACT

RBCog-Lab expects to increase the number of co-advised students, with a target of 20 PhD students starting their research in the next 5 years. An average of 10-20 public school visits per year, where 30-40 school students visit the lab and are presented with a platform demo and a relevant educational presentation presenting the research conducted at a high school level of detail. The iCub's state of the art technology is appealing not only to researchers, but also for a more mainstream audience. It is expected that the number of publications in peer reviewed conferences and journals increases with the introduction of new users using the platform, aiming for 200 peer-reviewed publications in the next 5 years. We target 5 funded projects in the next 5 years.

While the research plan to be carried out with the RBCog-Lab infrastructure addresses long-term research goals, there will be a number of results with foreseeable impact in several application domains. This has happened in the past where the research team involved in RBCog-Lab has spawned a number of start-up companies with new products and services in the area of computer vision and medical equipment.

MODULAR PLATFORM FOR RESEARCH, TEST AND VALIDATION OF TECHNOLOGIES SUPPORTING A SUSTAINABLE BLUE ECONOMY (TEC4SEA)

TYPE Distributed

COORDINATOR Manuel Dinis Mónica de Oliveira (INESC Porto)

DESCRIPTION

TEC4SEA is a research infrastructure supporting research, development and testing of marine robotics, telecommunications, and sensing technologies for monitoring and operating in the ocean environment. Within its sites in the North and Algarve regions of Portugal, the infrastructure gathers a set of laboratories, equipment and support facilities for experiments in both controlled and real environments.

INSTITUTIONAL PARTNER(S) / NODE(S)

Instituto de Engenharia de Sistemas e Computadores do Porto (INESC Porto/FE/UP); Centro de Investigação Tecnológica do Algarve (CINTAL)

ACTIVITIES

TEC4SEA offers a wide variety of services, such as access to optical and electronic technologies (OET) laboratory; access to the optoelectronics laboratory for sensing and imaging technologies; access to the robotics laboratories for scientific and technological testing, acquisition of data sets, experimental runs and evaluation; access to the field robotics mobile laboratory in open sea for scientific and technological testing, acquisition of data sets, experimental runs and evaluation; as well as advanced technical training and sub-contracted services.

IMPACT

TEC4SEA RI will increase the scientific production thanks to the validation of new technologies in real-world environments. At the end of the 6-year period it is expected to have 60 journal publications, 7 patents, and 36 prototypes. The RI will represent a great asset to support the participation in H2020 projects and make TEC4SEA proponents relevant players for future projects. The integration of TEC4SEA RI with infrastructures at the European level is already in progress with the integration of

the MARBED component in the context of the Fed4FIRE federation of testbeds. Another example under consideration is the integration in the EURO-ARGO ESFRI Roadmap Research Infrastructure.

The consolidation of the TEC4SEA research infrastructure is a privileged asset in strengthening the established relationships among members of the sea cluster (Cluster do Mar), increasing synergies and creating stronger consortia to act in the global market. This RI will close the gap between research/development and industry in the field of validation and testing of novel solutions. The existence of a common infrastructure, which is accessible by research institutions, companies, and technology end users, will reduce development costs and also the time to market of new concepts. This is particularly relevant for SMEs, which usually cannot afford to have their own test facilities.

CENTRE FOR MECHANICAL TECHNOLOGY AND AUTOMATION (TEMA)

TYPE Single Sited

COORDINATOR António Manuel de Bastos Pereira (UA)

DESCRIPTION

The study and development of new materials and new processing techniques allows for more efficient and sustainable use of resources. TEMA helps companies to transform knowledge into products, processes and services. TEMA develops projects in the areas of mechanics, materials, bioengineering and nanotechnology, e.g., the use of cork in protective helmets, new prostheses for the human body, or production of fuel cells.

INSTITUTIONAL PARTNER(S) / NODE(S)

Universidade de Aveiro (UA); Centro de Tecnologia Mecânica e Automação (TEMA/UA)

ACTIVITIES

TEMA offers a wide variety of services, such as access to mechanical technology, nanotechnology, CVD, flexible production system, product development and prototyping, biomechanics, sustainable energy systems, mechanical testing and welding laboratories.

IMPACT

TEMA's research activities are inspired by the vision that new knowledge generated through research will drive technological innovation - the transformation of advanced knowledge into products, processes, and services - which, in turn, is fundamental to competitiveness, long-term productivity growth, and improvement of society. The fundamental knowledge supporting engineering practice increasingly requires a multi-scale research, from the microscopic level of nanotechnology to the macro level of systems, as well as the full command of new computational tools. Preeminence in technological innovation requires leadership in all aspects of engineering, essentially in engineering research to bridge scientific discovery and practical applications and graduate engineering education to give

new PhDs the skills to create and exploit knowledge, technological innovation; and engineering practice to translate knowledge into innovative, competitive products and services.

TEMA will continue to support the regional efforts based on the region's economic potential and priorities. In this context, TEMA will follow a "Smart Specialisation" strategy that involves a process of developing a vision, identifying competitive advantages through an entrepreneurial process of discovery, setting strategic priorities and making use of smart policies to maximise the knowledge-based development potential of the central region of Portugal.

PORTUGUESE WINDSCANNER FACILITY (WINDSCANNER.PT)

TYPE Distributed

COORDINATOR José Manuel Laginha Mestre da Palma (FE/UP)

DESCRIPTION

The WindScanner facility is a laser-based wind measurement system that can generate detailed maps of wind conditions covering several square kilometres. The facility relies on innovative, remote-sensing, laser-based devices called lidars. WindScanner will be used by the wind energy industry to develop better and more durable turbines, and by the aviation industry to detect wind shear and turbulence along runways, making flying, and especially landing, safer.

INSTITUTIONAL PARTNER(S) / NODE(S)

Faculdade de Engenharia da Universidade do Porto (FE/UP); Laboratório Nacional de Energia e Geologia (LNEG); Instituto de Engenharia Mecânica e Gestão Industrial (INEGI); Instituto de Engenharia de Sistemas e Computadores do Porto (INESC_Porto); Laboratório Nacional de Engenharia Civil (LNEC); Instituto Politécnico de Bragança (IPB); Instituto Português do Mar e da Atmosfera (IPMA); Faculdade de Ciências da Universidade de Lisboa (FC/UL)

ACTIVITIES

WindScanner.PT offers a wide variety of services, such as consultancy to wind energy industry and airport authorities, air pollution studies, access to large engineering structures.

IMPACT

Training programs will involve the cooperation with other members of the European WindScanner.eu ESFRI Roadmap research infrastructure and the participation in all its stages of field measurement campaign. At a societal level, the project's implementation will contribute to social well-being by improving our quality of life, reducing costs of energy and environmental impacts and mitigating climate change.

The WindScanner RI will contribute centrally to the realization of the SET-Plan goals including the European Wind Initiative (EWI) launched in 2010, and The European Energy Research Alliance (EERA). The WindScanner RI will convert its innovation into products and services that, via the nodes, will be disseminated to all regions of Europe where they can create growth and jobs, in accordance with Innovation Union goals for 2020. The overall contribution to Socio-economic impact

is envisioned to result from local users and regional stakeholder's engagement and from direct hands-on contact with the regional distributed nodal facility centres. The regional users of WindScanner.eu will come from regional wind energy research institutes, regional technical universities with a curriculum in wind energy and fluid dynamics, and people working with and anchored within the local wind energy industry.

4.3. ENVIRON- MENTAL SCIENCES

4.3. ENVIRONMENTAL SCIENCES (ENV)

Environmental sciences address major challenges such as the sustainable use of natural resources, preventing pollution and mitigation of natural hazards. Research in this field is inherently based on international collaboration and requires a high level of interoperability between a wide range of research infrastructures, addressing complex systems and human interaction.

The research infrastructures in this roadmap focus on biodiversity, geosciences, monitoring of coastal ecosystems and long-term monitoring of environmental processes. These infrastructures provide extremely relevant support to environmental research, education and training by clustering and networking existing and future facilities at the national level.

The research infrastructures in the Environmental Sciences are fully aligned with the Portuguese strategies for smart specialisation, both at regional and national levels. They will also play a key role within Horizon 2020.

C4G, the Collaboratory for Geosciences, a distributed RI, national node of the ESFRI Roadmap RI European Plate Observing System (EPOS).

CoastNet, the Portuguese Coastal Monitoring Network, a distributed RI.

EMBRC.PT, the European Marine Biological Resource Centre Portugal, is a distributed RI and the national node of the ESFRI Roadmap RI with the same name.

EMSO-PT, the European Multidisciplinary Seafloor and Water Column Observatory Portugal, is a distributed RI and the national node of the ESFRI Roadmap RI with the same name.

PORBIOTA, the Portuguese E-Infrastructure for Information and Research on Biodiversity, is a distributed RI connected to LIFEWATCH, which is its European counterpart and an ESFRI Roadmap RI.

COLLABORATORY FOR GEOSCIENCES (C4G)

TYPE Distributed

COORDINATOR Rui Manuel da Silva Fernandes (UBI)

DESCRIPTION

The Collaboratory for Geosciences (C4G) is a distributed research infrastructure (RI) that promotes networking of researchers and sharing of equipment, data, collections and tools in Solid Earth Sciences (SES). C4G comprises the disciplines of geology, hydrogeology, geochemistry, geodesy, geophysics, geomechanics and geomathematics. It provides services in the crosscutting areas of georesources, natural hazards and the environment, for the Portuguese territory, both onshore and offshore.

INSTITUTIONAL PARTNER(S) / NODE(S)

Direção-Geral do Território (DGT); Faculdade de Ciências da Universidade de Lisboa (FC/UL); Faculdade de Ciências da Universidade do Porto (FCUP/UP); Faculdade de Engenharia da Universidade do Porto (FE/UP); Instituto de Engenharia de Sistemas e Computadores do Porto (INESC Porto/FE/UP); Instituto Português do Mar e da Atmosfera, I. P. (IPMA); Instituto Superior de Engenharia de Lisboa (ISEL/IPL); Instituto Superior Técnico (IST/UL); Laboratório Nacional de Energia e Geologia, I.P. (LNEG); Universidade da Beira Interior (UBI); Universidade de Aveiro (UA); Universidade de Coimbra (UC); Universidade de Évora (UE); Universidade de Lisboa (UL).

ACTIVITIES

C4G offers access to a wide variety of services related to the Geosciences, including seismic data and networks, geophysical exploration, laboratories of rock physics and geomechanics, geodetic data and networks (including gravity data), geochemical and mineralogical laboratories, magnetic data and observatories, geological data and laboratories, geomathematics, remote sensing and paleomagnetism laboratories.

IMPACT

C4G will create the conditions for scientific, technical, industrial and public administration professionals to answer key questions on georesources, natural hazards, environment and fundamental socio-environmental energy science. C4G will provide the backbone infrastructure to advance the understanding of solid Earth processes across time and length scales, and specialized disciplines. It will contribute to the understanding of the Portuguese Continental shelf in what regards geological resources, natural hazards, and habitat mapping, with emphasis on the study of the main seismogenic-tsunamigenic zone of the Atlantic Europe (the Gibraltar-Gloria Fault Zone), the understanding of the structure of the Azores plateau or the quantification of methane hydrate deposits in the Gulf of Cadiz, among other topics of marine geology is also a major focus of the C4G consortium. By organizing a vast network of resources and making them available in a more organized way to academia and the research community in general, C4G will have a positive impact on advanced training and research excellence, boosting the national capacity to integrate H2020 initiatives.

Topics of expertise within C4G with direct impact on society include: environmental impacts and remediation, detection and monitoring of contaminated areas, CO2 storage, exploration-exploitation-benefiting of mineral resources (both ores and industrial raw materials), evaluation of mineral reserves, development of innovative tools in hydrocarbon exploration and reservoir modeling, evaluation and exploration of other georesources, such as geothermal energy and shale gas, seismic monitoring, assessment and mapping of natural hazards and risks, monitoring of space weather conditions, installation and maintenance of geodetic GNSS networks (several in Africa) and development and setup of e-infrastructures.

PORTUGUESE COASTAL MONITORING NETWORK (COASTNET)

TYPE Distributed

COORDINATOR Henrique Manuel Roque Nogueira Cabral (FC/UL)

DESCRIPTION

CoastNet is focused on monitoring the most important coastal ecosystems through relevant chemical, physical and biological parameters, which will be available in an online database. This information will allow a better understanding of their functioning and variability, assessing long-term trends and spatial variability. Gathering such scientific knowledge is expected to improve socio-economic activities, such as fishing and aquaculture, as well as the conservation of ETP (endangered, threatened and protected) species.

INSTITUTIONAL PARTNER(S) / NODE(S)

Centro de Oceanografia- Laboratório Marítimo da Guia; Centro de Oceanografia - IO/FC/Universidade de Lisboa; Centro de Oceanografia - IO/FC/UL - Estuário do Tejo and other estuarine systems along the Portuguese coast; Centro de Oceanografia - CIEMAR (Universidade de Évora).

ACTIVITIES

CoastNet offers access to a wide variety of services related to coastal monitoring, including research and innovation, advanced training, consultancy, laboratory support and databases and biological collections.

IMPACT

This RI responds to a pressing need of a monitoring network that continuously provides important physical, chemical and biological coastal measurements, which will contribute for the assessment of both long-term trends and spatial variability. The innovative nature of this infrastructure relies on the capacity to monitor environmental and biological components of coastal aquatic systems autonomously, making the collected

data available in real time, which will allow an integrative assessment of the monitored systems. As the main output of CoastNet will be the creation of a virtual network of information that will become available to the scientific community and administration through an integrated web-based platform, the scientific production regarding these crucial ecosystems are expected to increase not only in quantity, but also by increasing the impact factor of the publications and their number of citations. Furthermore, the long-term continuous datasets will also allow for this RI to be integrated in international networks and projects covering a wide array of scientific themes, many of each are important goals for the H2020.

The major socio-economic benefits of CoastNet will be related with the goods and services provided by coastal ecosystems, mainly in the context of the implementation of the EU Water Framework Directive and the Marine Strategy Framework Directive. These benefits include direct and indirect productivity effects (e.g. fisheries), human health effects (e.g. good drinking and bathing water quality),

amenity effects (recreation, cultural heritage) and existence effects (e.g. maintenance of marine biodiversity). Since Portugal is included in the Northeast Atlantic region, integrating the Bay of Biscay and Iberian Coast and Macaronesia sub-regions (Azores and Madeira), these benefits will have a wide geographical impact. This RI will develop as an attractive European and global research pole for many researchers in marine related areas and support private companies working in the marine environment.

EUROPEAN MARINE BIOLOGICAL RESOURCE CENTRE - PORTUGAL (EMBRC.PT)

TYPE Distributed

COORDINATOR Adelino Vicente Mendonça Canário (CCMAR/UAlg)

DESCRIPTION

EMBRC.PT will allow researchers of any nationality (academics and from companies) to study marine biodiversity in its habitat, in tanks and in the laboratory with the latest technologies. It is the national node of the European infrastructure with the same name and it is expected that the foreseen increased scientific activity will potentiate the development of technologies and products, with a positive impact on the regional and national economies.

INSTITUTIONAL PARTNER(S) / NODE(S)

CCMAR - Centro de Ciências do Mar, Universidade do Algarve; IMAR - Instituto do Mar, Universidade dos Açores; Algoteca de Coimbra: Infrastructure for Research in Microalgae (ACOI), Universidade de Coimbra; CIIMAR - Centro Interdisciplinar de Investigação Marinha e Ambiental, Universidade do Porto.

ACTIVITIES

EMBRC.PT provides services in marine sciences: access to marine ecosystems and biodiversity, microorganism collections and model organisms, mesocosms facilities, research vessels and smaller boats, scientific diving, "omics", bioinformatics and chemistry platforms. Facilities include also a variety of aquaria facilities, general laboratories, outdoor experimental facilities, shallow water hydrothermal vents and marine observatories for long term observations.

IMPACT

The RI is the national node of the ESFRI European Marine Biological Resource Centre (EMBRC) and the proposed investments are aimed at leveling capacities and technological attractiveness,

further contributing to finding funding opportunities. Actions will also be taken to train RI scientists in finding European partnerships and to successfully apply to European programmes. It is estimated that both scientific output and funding should double by the end of Horizon 2020 compared to FP7.

EMBRC.PT nodes are located at regions with low average statistics on R&D spending, infrastructures and personnel, and a low number of high tech companies. This high level service infrastructure will create unprecedented opportunities for students from several disciplines – chemistry, pharmacology, biotechnology, marine biology, etc. The fact that the RI will have high visibility and receive a constant stream of international scientists will be stimulating and work as a beacon to attract the best students and scientists.

The main contributions for the beneficiaries include value transferred to users through provision of services, revenues from users of the RI, economic value of new startups and spin-offs expected to be created as a consequence of the RI and other sources of

revenue, namely services' provision. Revenues deriving from the production of intellectual property rights, commercialisation of new products and instruments, organisation of scientific events, and the economic value of the outcomes of scientific research. Additionally, expected results may include important societal benefits from the promotion of R&D, the discovery of new health treatments or medicines, innovation, job creation and increased economic activity, considering the four national nodes of EMBRC.PT.

EUROPEAN MULTIDISCIPLINARY SEAFLOOR AND WATER COLUMN OBSERVATORY - PORTUGAL (EMSO-PT)

TYPE Distributed

COORDINATOR Jorge Miguel Alberto de Miranda (IPMA)

DESCRIPTION

EMSO is a large-scale European Research Infrastructure (RI). It is a network of fixed point, deep sea multidisciplinary observatories, with the scientific objective of real-time, long-term monitoring of environmental processes related to the interaction between the geosphere, biosphere and hydrosphere. It is a geographically distributed infrastructure to be located at key sites in European waters, spanning the Arctic, the Atlantic and the Mediterranean, up to the Black Sea. Portuguese participation is focused on the Azores and Cadiz nodes. EMSO is coordinated with similar initiatives in the US, Canada and Japan.

INSTITUTIONAL PARTNER(S) / NODE(S)

Instituto Português do Mar e da Atmosfera, I. P. (IPMA); Universidade do Porto (UP); Universidade de Aveiro (UA); Universidade dos Açores (UA); Universidade de Évora (UE); Instituto Superior Técnico (IST/UL); Faculdade de Ciências da Universidade de Lisboa (FCUL); Instituto Superior de Engenharia do Porto (ISEP); Estrutura de Missão para a Extensão da Plataforma Continental (EMAM); Instituto de Engenharia de Sistemas e Computadores, Porto (INESC-P); Centro Interdisciplinar de Investigação Marinha e Ambiental, Universidade do Porto (CIIMA/UP); Instituto do Mar (IMAR); Centro de Ciências do Mar, Universidade do Algarve (CCMAR); Centro de Investigação Tecnológica do Algarve (CINTAL); Agência Regional para o Desenvolvimento da Investigação, Tecnologia e Inovação (ARDITI)

ACTIVITIES

EMSO-PT offers access to a wide variety of services related to the seafloor observation, including long-term data series, field operations support, advanced technical on-job training, and consultancy in deep seafloor exploration. This infrastructure will also provide the scientific community with access to experiments in the seafloor, specific ocean instruments, laboratory facilities, deep sea collections and deep sea surveys.

IMPACT

EMSO Portugal integrates the ESFRI Roadmap RI EMSO, which will coordinate and facilitate access to open ocean fixed point observatory infrastructures. It will be the point of contact for observatory initiatives in other parts of the world. Members are open to host visiting scientists, engineers and technicians for collaborations with those directly involved in the EMSO activities in their laboratories. EMSO will also integrate research, training, and information/dissemination activities on ocean observatories around the European waters. EMSO Portugal will benefit from this framework. The country has a large responsibility on the

scientific exploration of its deep sea platform, and there are a number of small research teams that have developed specific skills in some areas of deep sea research. Nevertheless, international cooperation and sharing of experiences are of paramount importance to train the next generation of researchers.

Other impacts include various learning effects, scientific and technological innovation, networking opportunities, better deep sea management, and the availability of a critical mass of scientists and engineers. The economic return in the long term in all the regions of observatory sites or cyber department facilities, as estimated on the basis of previous experience, indicates that over 70% of the operation costs (personnel, supplies, utilities) could end up in the local economy. EMSO will deliver deep-ocean observation services to government agencies and industry in Europe and will compete with the USA, Canada, Japan and India to deliver services to Africa and the Asia/ Pacific Region.



PORTUGUESE E-INFRASTRUCTURE FOR INFORMATION AND RESEARCH ON BIODIVERSITY (PORBIOTA)

TYPE Distributed

COORDINATOR Nuno Ferrand de Almeida (InBIO)

DESCRIPTION

PORBIOTA is a RI which aims to collect, store and manage all kinds of biodiversity data from the entire Portuguese territory. It will be connected to LIFEWATCH, which is its European counterpart. PORBIOTA will promote a national agenda on biodiversity survey and research, providing services to public administration, the scientific community, and society. The consortium includes top national research centres, natural history museums, the Portuguese node of GBIF, the LTER Portugal network, ICOS Portugal, the Azorean Biodiversity Portal, and the Institute for Nature Conservation and Forestry (ICNF).

INSTITUTIONAL PARTNER(S) / NODE(S)

InBIO, Rede de Investigação em Biodiversidade e Biologia Evolutiva; Universidade do Porto (UP); Instituto Politécnico de Viana do Castelo (IPVC); Faculdade de Ciências da Universidade de Lisboa (FCUL) - Centro de Biologia Ambiental (CBA); Instituto de Investigação Científica Tropical, I.P. (IICT/MNE); Universidade de Lisboa - Museu de História Natural; Universidade de Coimbra - Museu de História Natural; Instituto de Conservação da Natureza e das Florestas (ICNF, I.P.); CBAA, ISA, Universidade de Lisboa; Fundação Gaspar Frutuoso; CEF, ISA, Universidade de Lisboa; IN+/ISR, IST, Universidade de Lisboa; CESAM - Universidade de Aveiro; IMAR CMA, Universidade de Coimbra; Sociedade Portuguesa de Ecologia.

ACTIVITIES

PORBIOTA offers access to a wide variety of services related to biodiversity, ranging from biodiversity databases and analytical tools to policy implementation and evaluation.

IMPACT

PORBIOTA will contribute very significantly to advance scientific knowledge in biodiversity and to raise the international impact of Portuguese research in this field by increasing the number and impact of scientific publications, increasing the number and impact of PhD, MSc and BSc theses, and fostering the internationalization of Portuguese research and its representation in international initiatives and consortia. PORBIOTA will also foster applied research, contributing to a more rapid improvement of policy implementation and evaluation by national and regional administration agencies (e.g. SMART specialization), and supporting such institutions to comply with international obligations, strategies and initiatives. The distributed and evolving development of PORBIOTA will facilitate its replication elsewhere, with an emphasis on Portuguese-speaking African countries and Brazil.

This constitutes a major boost for Portuguese science and technology, namely to the field of natural sciences.

4.4.

BIOLOGICAL

AND

MEDICAL

SCIENCES

4.4. BIOLOGICAL AND MEDICAL SCIENCES (BMS)

Biological and Medical Sciences research infrastructures play a key role in addressing the societal challenges Europe is facing. They are taking on an increasingly multidimensional nature, supporting diverse disciplines and providing services to promote research that will answer pressing and essential issues for the prevention, diagnosis and development of therapies of diseases affecting the world population. Some of these research infrastructures are more focused on the development of innovative methodologies and technologies, which will pave the way to a new level of well-being.

The biological and medical sciences research infrastructures in the present roadmap integrate and network nodes and research sites that cover a wide range of objectives and disciplines: from the study of molecules to tissues and biospheres, prevention to prediction of diseases, from basic to applied research. They encompass facilities, technologies and frontier scientific knowledge. For example, cutting edge bio-imaging technology is a rapidly advancing field, here covered by the Portuguese Platform of BioImaging and the Brain Imaging Network, both playing a key role in translating the achievements of molecular biology into early diagnosis, efficient follow-up of therapeutic treatments and prediction of therapeutic response, as well as minimising the invasive nature of some difficult treatments which may be guided by enhanced imaging technologies. These national RIs are fully articulated at European level with the ESFRI RI EuroBioImaging.

Structural biology is another scientific area where research and innovation develop at a high pace. The maturity of classical tools such as x-ray and NMR have enabled generalised use of these technologies and broadened the possibilities derived from the use of improved equipment. Moreover, the integrated use of these and other technologies, such as electron microscopy, mass spectrometry and biocomputation are expected to be at the core of future frontier research and technological solutions.

Other scientific areas, related with the use of (micro) biological resources are developing world class RIs that are key to the investigation of human diseases. The National Facility for Genome Sequencing and Analysis, the Tissue Engineering and Regenerative Medicine RI, the Vira Vectors for Gene Transfer Core Facility, the Consortium for Genetically Tractable Organisms and the *In Vivo* Arthropod Security Facility are good examples of how the Portuguese teams are well articulated and have strong potential for competitiveness and societal relevance.

The RIs in this roadmap also address the process of biomedical research that aims to bridge the gap between research carried out in laboratories and medical or clinical practice. This is the case of the Translational and Clinical Research Infrastructure Specialisation Platform.

BIN, the National Brain Imaging Network, a single-sited RI which is part of the national node of the ESFRI Roadmap RI EuroBioImaging – Research Infrastructure for Imaging Technologies in Biological and Biomedical Sciences.

CONGENTO, the Consortium for Genetically Tractable Organisms, a distributed RI associated to the ESFRI Roadmap RI INFRA-FONTIER – The European Infrastructure for Phenotyping and Archiving of Model Mammalian Genomes.

GenomePortugal, the National Facility for Genome Sequencing and Analysis, a distributed RI.

PPBI, the Portuguese Platform of Bioimaging, a distributed RI which is part of the national node of the ESFRI Roadmap RI EuroBioImaging – Research Infrastructure for Imaging Technologies in Biological and Biomedical Sciences.

RNEM, the Portuguese Mass Spectrometry Network, partnered with PTNMR, the Portuguese Nuclear Magnetic Resonance Network, to participate in INSTRUCT – Structural Biology.

TERMRES-Hub, the Tissue Engineering and Regenerative Medicine Research Infrastructure, a distributed RI.

TRIS-HCP, the Translational and Clinical Research Infrastructure Specialisation Platform - Health Cluster Portugal, a virtual RI associated to the ESFRI Roadmap RI EATRIS – European Infrastructure for Translational Medicine.

VIASEF, the *In Vivo* Arthropod Security Facility, a single-sited RI.

ViraVector, the Vira Vectors for Gene Transfer Core Facility, a single-sited RI.

NATIONAL BRAIN IMAGING NETWORK - CORE INFRASTRUCTURE (BIN)

TYPE Single Sited

COORDINATOR Miguel de Sá e Sousa de Castelo Branco (IBILI/UC)

DESCRIPTION

The Brain Imaging Network focuses on basic, translational and clinical neuroscience by designing new molecular probes for human imaging of structure, chemistry and function, with a focus on the human brain.

INSTITUTIONAL PARTNER(S) / NODE(S)

Instituto de Ciências Nucleares Aplicadas à Saúde (ICNAS) - Universidade de Coimbra.

ACTIVITIES

BIN provides access to a wide variety of services in imaging, including human brain imaging, high density EEG/ERP, simultaneous EEG/fMRI, human PET brain imaging in particular using ¹¹C and ¹⁸F compounds, and multiorgan imaging in chronic diseases affecting the brain and other organs.

This infrastructure also offers radiopharmaceutical production, data analysis and archiving, advanced training (in data analysis and data acquisition), psychophysiological studies, and animal imaging in translational research studies using MR and other modalities.

IMPACT

BIN has R&D knowledge transfer partnerships with the pharmaceutical industry, equipment suppliers and industrial partners. With the collaboration of IBILI, ICNAS is working on the development of

new radiolabelled molecules for basic and clinical research and also services to the local pharmaceutical companies regarding pre-clinical testing of new, candidate drugs currently under development.

The BIN RI has proven ability to study large cohorts of healthy volunteers and patients (in several national and international neuroimaging/phenotyping projects on neurodegenerative diseases), with probes for imaging of structure, chemistry and function in the living human brain. Multimodal studies in basic and clinical neuroscience help unravel molecular mechanisms of disease as well as to develop novel diagnostic imaging biomarkers to better define and detect early disease processes and test new therapies. We focus on MR and PET based imaging probes based on Dopamine, GABA and Glutamate, which have been related to developmental, ageing, neurological and psychiatric diseases. Based on human and animal imaging (in animal models of human disease), BIN aims to implement a novel data-mining biomedical facility that will have enormous impact in the development of novel diagnostic tools and therapeutic targets.

BIN offers advanced courses in experimental design and data analysis; advanced lab courses in biosignal acquisition including multimodal techniques and user driven tutorships in experimental design, data acquisition and analysis (on a continuous basis, two tutors available full time) and co-supervision of PhD and Master students. It also fosters scientific interchange through Symposia and Scientific Meetings. BIN infrastructure and its research plan are recognized by the EU to be an integral part of "European Innovation Partnership on Active and Healthy Ageing (EIP-AHA)" - The Region of BIN Core is a Reference European Region for Healthy and Active Ageing. The sustainability plan allowed entering a market of radiotracer distribution that is worth 5 million in Portugal and allows for self-sustainability.

BIN aims to keep academic, R&D and spin-off activities with the already established national scientific infrastructures and industrial partners, expecting to maintain all current R&D contracts and Work-in-Progress packages with the main companies, and extend them.

CONSORTIUM FOR GENETICALLY TRACTABLE ORGANISMS (CONGENTO)

TYPE Distributed

COORDINATOR Rui Manuel Marques Fernandes da Costa (FC)

DESCRIPTION

The advent of model organisms where genetic manipulations became standard procedures revolutionised biomedical research. Among these organisms, fruitflies (*Drosophila melanogaster*), zebrafish (*Danio rerio*), and mice (*Mus musculus*) have been the most widely used. CONGENTO aims at supporting research in these organisms, and is a unique infrastructure that integrates the expertise in fruit-flies, zebrafish and mice in one research supporting facility.

INSTITUTIONAL PARTNER(S) / NODE(S)

Fundação D. Anna de Sommer Champalimaud e Dr. Carlos Montez Champalimaud (FC); Faculdade de Ciências Médicas (FCM/UNL); Fundação Calouste Gulbenkian (FCG); Instituto de Medicina Molecular (IMM/FMUL).

ACTIVITIES

CONGENTO provides access to a wide variety of services related to model organisms, including maintenance and breeding of animal lines, generation of new transgenic animal lines, cryo-preservation, drug screenings, primary cell and tissue culture, and development of state-of-the-art genome editing technologies. This RI will also offer animal stock database management, as well as education and training in Laboratory Animal Science.

IMPACT

CONGENTO will be the first RI in the world to combine expertise across the 3 main model species in biomedical research. This will enable Portuguese research to rise to a stronger position in getting grants/funding and attracting top researchers, enlarging the pool of experts and attracting

new users and companies into biomedical research. CONGENTO will contribute to education at several levels along three types of activities: courses, workshops and continuous formation.

CONGENTO will also have a strong focus in new technology development and implementation. Results of this effort will be published in international Journals, impacting on the development of other fly, fish and rodent facilities worldwide. Discoveries made by users of CONGENTO will participate in raising health and wellbeing of human kind.

CONGENTO will create new work positions and provide the associated professional formation in research Institutions of great recognition, both nationally and internationally. It is expected that administrative staff, technicians and post-doctoral fellows involved in CONGENTO will develop attractive CVs that will raise their competitiveness for the next step in their careers. It is expected that for profit private institutions will request CONGENTO services, e.g. for the generation of specific genetically modified animal models or for large-scale drug screens.

Through this activity, CONGENTO will help to raise the success and visibility of Portuguese biotechnology companies.

By operating as a distributed infrastructure, building on the existing resources of four leader Institutions in biomedical sciences in Portugal, CONGENTO will benefit and capitalise the investments made previously in each Institution (notably national re-equipment, equipment grants, as well as “Laboratórios Associados”) and develop a strategic economy of scale that will decrease the costs of national research. CONGENTO will build on the institutions’ previous success at attracting international funding, further engaging the European Community. The network will have a major impact in innovation, by advancing novel strategies within H2020.

NATIONAL FACILITY FOR GENOME SEQUENCING AND ANALYSIS (GENOMEPORTUGAL)

TYPE Distributed

COORDINATOR Manuel António da Silva Santos (UA)

DESCRIPTION

GenomePortugal is a distributed genome sequencing and analysis RI for basic/applied genome research and advanced services, which aims to potentiate the participation of Portuguese scientists in national and international genome projects, and to promote genome research in important fields such as healthcare, drug discovery, environment, marine and freshwater resources, agrofood biotechnology and green chemistry. GenomePortugal congregates researchers and technical personnel from several national research centres, will put Portugal on the map of the countries with technological capacity and expertise to sequence and analyse complex genomes and will engage the Portuguese research community in the genome revolution.

INSTITUTIONAL PARTNER(S) / NODE(S)

Universidade de Aveiro (UA); UCgenomics - Universidade de Coimbra; Biocant; Instituto de Patologia e Imunologia Molecular, Universidade do Porto (IPA-TIMUP/UP); Instituto de Biologia Molecular e Celular, Universidade do Porto (IBMC/UP); InBIO, Rede de Investigação em Biodiversidade e Biologia Evolutiva; Universidade do Minho; Instituto Gulbenkian de Ciência (IGC/FCG); Instituto de Medicina Molecular, Universidade de Lisboa (IMM/UL); Instituto Nacional de Saúde Dr. Ricardo Jorge (INSARJ); Universidade do Algarve (UAlg).

ACTIVITIES

GenomePortugal provides access to a wide variety of services in genome sequencing and analysis, including whole genome sequencing (DNA-seq), exome sequencing, targeted DNA sequencing, genome bisulphite sequencing (methyl-seq), chromatin immunoprecipitation sequencing (ChIP-seq), whole transcriptome sequencing (RNA-seq), metagenome sequencing, DNA microarrays, microRNA microarrays and cytogenetics arrays (array-CGH). This RI also offers bioinformatic analysis of raw and processed data, as well as training in genome bioinformatics.

IMPACT

GenomePortugal will organize the Portuguese genome sequencing network, increasing its competitiveness, allowing for a stronger position under Horizon 2020, and increasing the national participation in European projects. Scientific production is expectable to increase in quality and number and a full parity participation in international research projects and infrastructures will be possible, opening new opportunities to compete for international funding. The law and Ethical core of the platform will promote an active participation in promoting public debates and in the creation of law directives related with genomic data technology applications. GenomePortugal will boost the national bioeconomy and will have a spill-over effect on the Agriculture, Forestry, Marine, Health and Biotechnology industries, which represent 6.8% of the Portuguese GDP. By acting as a technological infrastructure providing advanced services and technical support to companies with a R&D component, it will foster academic and entrepreneurial partnerships and the transfer of knowledge and technology. Indeed, GenomePortugal expects to produce at least 3

patents and 5 spin-offs, with different business models along the genome sequencing value of chain, from the bioinformatics to the point-of-use. Consequently, we will support the sustainable economic development based on high-value products.

Altogether, GenomePortugal will contribute to the sustainable economic growth by training highly qualified human resources in specialised state-of-the-art fields of genome sequencing and bioinformatics required to fuel basic and applied research in laboratories and technological centres, and also in companies; establishing a network of excellence in genomics to respond to R&DT-based company needs for high-value product development for the agro-food, marine, biotechnology or health industries; sequencing genomes of organisms with national economical relevance, in an effort to characterise the natural resources and generate advanced knowledge, to promote green and blue growth, based on the sustainable use of Portugal's natural resources.

PORTUGUESE PLATFORM OF BIOIMAGING (PPBI)

TYPE Distributed

COORDINATOR Paula Maria Sampaio Fonseca (IBMC/UP)

DESCRIPTION

PPBI will boost collaboration between researchers, institutions and industry to strengthen both basic and applied research, matching high-impact R&D projects with state-of-art bioimaging resources and expertise. Through shared coordination, strategic investments, and efficient allocation of resources, PPBI wants to give national researchers access to cutting-edge technological resources, create conditions to attract international researchers and integrate Portugal in the international BioImaging roadmap.

INSTITUTIONAL PARTNER(S) / NODE(S)

Instituto de Biologia Molecular e Celular (IBMC/UP); Instituto Nacional de Engenharia Biomédica (INEB/UP); Instituto de Patologia e Imunologia Molecular (IPATIMUP/UP); Faculdade de Medicina da Universidade do Porto (FM/UP); Laboratório Associado (ICVS/3B's/UM); Centro de Neurociências e Biologia Celular (CNBC/UC); Universidade de Coimbra (UC); Universidade de Aveiro (UA); Universidade da Beira Interior (UBI); Instituto Gulbenkian de Ciência (IGC/FCG); Faculdade de Ciências Médicas (FCM/UNL); Instituto de Tecnologia Química e Biológica (ITQB/UNL); Instituto de Medicina Molecular (IMM/FM/UL); Faculdade de Ciências da Universidade de Lisboa (FC/UL); Instituto Superior Técnico (IST/UL); Fundação D. Anna de Sommer Champalimaud e Dr. Carlos Montez Champalimaud (FC); Universidade do Algarve (UAlg).

ACTIVITIES

PPBI provides access to a wide variety of services in bioimaging, including access to imaging equipment, access to wet lab and sample preparation equipment, cluster access for computation and data storage, image analysis and training (courses and workshops, online tools). This infrastructure also offers support of animal facilities (model and non-model organisms) and on equipment operation, consulting and project planning, technology development and outreach activities.

IMPACT

The PPBI RI actively contributes to advanced training in major Educational and Research Institutions and regularly organize national and international workshops that will now be coordinated to maximize students and researchers exposure to advanced imaging techniques and state of the art equipment.

The RI will provide the basis for skilled young researchers, creating opportunities in all regions of the country, from the North (UM) to the South (UAlg) and interior (UBI). This includes an estimated hiring of 50 PhDs and MScs for 6 years and infrastructure managers

with expertise in key techniques of Bioimaging. The focus of these highly skilled professionals in advanced imaging, image analysis and data-mining will allow Nodes to offer a more efficient and complete set of services, appealing not just to research groups in academia and private institutes, but also to industry and SMEs operating in R&D in health sciences, biotech, food & agriculture. Examples of collaborations underway include startup companies working on diagnostics, biomarkers, and novel pharmaceuticals, or support tools. PPBI Nodes have also participated in development of novel technical solutions in imaging such as the OpenSPIN microscopy project, recently featured in Nature Methods, and other similarly collaborative projects are already underway. The network will have major impact in innovation, and promoting participation in Horizon 2020.

PORTUGUESE MASS SPECTROMETRY NETWORK (RNEM)

TYPE Distributed

COORDINATOR Maria Helena Ferreira da Silva Florêncio (FC/UL)

DESCRIPTION

The Portuguese Mass Spectrometry Network is the reference infrastructure representing Portugal in the fields of Mass Spectrometry and Proteomics. It is a major service provider for academia and industry and plays a pivotal role in training activities. This network is key for the development of Proteomics strategies within H2020

INSTITUTIONAL PARTNER(S) / NODE(S)

Instituto Nacional de Saúde Dr. Ricardo Jorge (INSARJ); Universidade de Aveiro (UA); Universidade da Madeira (UMa); Universidade de Coimbra (UC); Faculdade de Ciências da Universidade de Lisboa (FC/UL); Centro de Neurociências e Biologia Celular (CNBC/UC); Faculdade de Farmácia da Universidade de Lisboa (FF/UL); Instituto de Patologia e Imunologia Molecular (IPATIMUP/UP); Instituto Superior Técnico (IST/UL); Instituto de Tecnologia Química e Biológica (ITQB/UNL).

ACTIVITIES

RNEM offers access to a wide variety of services in mass spectrometry and proteomics, including protein identification and quantification, analysis of protein post-translational modifications, top-down proteomics, structural mass spectrometry, metabolomics, analysis and characterization of natural products and organic molecules, gas-phase ion chemistry, inductively coupled plasma mass spectrometry and sample preparation. This infrastructure also provides consultancy in MS-based technology.

IMPACT

RNEM was intentionally designed as a research and support infrastructure to provide scientific services and as a technology platform to serve the national scientific community, the industrial and technological grid. This is the most direct route to render mass spectrometry technology and know-how available to Portugal in a distributed way. RNEM established, since its inception, a network of research and training activities and analytical services that could easily be accessed through a publicly available network portal. The web portal served as cohesion element and advertisement of the network's activities and analytical services. A single access point to RNEM is presently implemented. Knowledge and instrument sharing enabled to provide high level analytical services to the scientific community and the Portuguese industry. The network activities, beyond the regular cooperation among nodes, were also established within its working groups, dedicated to know-how dissemination, organization of national and international conferences, advanced training.

For the next six years RNEM will reinforce its great potential for

highly qualified direct employment. Structure determination and compound identification in complex matrices is out of reach for many industries and can be provided by RNEM, increasing its competitiveness and effectiveness. This may lead to a desirable employment increase and give birth to spin-off companies, contributing to national and local development. Depending on its resources, RNEM can expand even further and be part of the country's global economy, attaining "world-class" status.

RNEM has also a strong International projection as part of the national node of the ESFRI RI INSTRUCT - Structural Biology.

TISSUE ENGINEERING AND REGENERATIVE MEDICINE (TERM RES-HUB)

TYPE Distributed

COORDINATOR Rui Luis Gonçalves dos Reis (ICVS/3B's/UM)

DESCRIPTION

The TERM RES-Hub infrastructure is composed of the Associate Laboratory ICVS/3B's (AvePark campus) state-of-the-art facility. The labs are located at the headquarters of the European Institute of Excellence on Tissue Engineering and Regenerative Medicine, specifically designed to execute state of the art Tissue Engineering and Regenerative Medicine (TERM) related research, going from materials synthesis, to materials processing routes, stem cells isolation and differentiation, and *in vitro* and *in vivo* biological testing. The TERM RES-Hub' scientific objectives lie at the frontiers of knowledge in the fields of health science and technology, medical sciences, regenerative medicine and tissue engineering, biomaterials science and technology and nanomedicine.

INSTITUTIONAL PARTNER(S) / NODE(S)

Laboratório Associado (ICVS/3B's/UM); European Institute of Excellence on Tissue Engineering and Regenerative Medicine, EXPERTISSUES; Association for the Advancement of Tissue Engineering and Cell based Technologies & Therapies (A4TEC).

ACTIVITIES

TERM RES-Hub provides access to a wide variety of services related to tissue engineering and regenerative medicine, including high quality technical and consulting services in the fields of regenerative medicine and medical devices. This infrastructure also offers materials synthesis and processing, physicochemical characterization and biological testing of medical devices and tissue engineered products.

IMPACT

The TERM RES-Hub will integrate health sciences research and cutting edge technologies for the development of new clinically useful therapies and tissue regeneration strategies. For that purpose, the TERM RES-Hub will adopt highly multidisciplinary methodologies in order to advance the present knowledge on selected areas of Tissue Engineering and Regenerative Medicine, Nanomedicine, Biomedical Engineering and Biomaterials Science and Technology, aiming to develop new and sophisticated interventions to prevailing health problems, including advanced diagnosis methods and therapies. The TERM RES-Hub will provide research and training activities

to a vast audience, including undergraduate and postgraduate students and health professionals. ICVS/3B's (AvePark campus) know-how and core facilities have been made available to help strengthen the dialogue between academia and industry, thus helping to generate new ideas and products, in different sectors of the Portuguese economy. Efforts will be made to promote the increase in patenting, licensing, outsourcing and implementation of R&D projects in cooperation with established companies, start-ups, spin-offs and health institutions. Consulting, contract research and other services (e.g. advanced analytical techniques, *in vitro* and *in vivo* biological tests, materials development, specialised diagnostic services) will be made available to external companies, research institutes, health institutions or other public and private organisations.

TRANSLATIONAL AND CLINICAL RESEARCH INFRASTRUCTURES SPECIALISATION PLATFORM - HEALTH CLUSTER PORTUGAL (TRIS-HCP)

TYPE Virtual

COORDINATOR Luís Miguel Guimarães Soares (HCP)

DESCRIPTION

TRIS-HCP is a virtual organisational system within the Health Cluster Portugal (HCP) that brings together many of the most prominent Portuguese R&D institutions, hospitals and academic medical centres, and their respective facilities, resources, services and expertise in the areas of translational and clinical research, making them more accessible to other researchers and companies.

INSTITUTIONAL PARTNER(S) / NODE(S)

Health Cluster Portugal - Associação do Pólo de Competitividade da Saúde (HCP).

ACTIVITIES

TRIS-HCP offers access to a wide variety of services related to translational and clinical research, including search and access to R&D service centres, R&D partnership opportunities and technology offers, professional and technical training, and networking and matchmaking initiatives.

IMPACT

The TRIS-HCP RI will ensure full coordination between the actors of translational and clinical research in Portugal, according to a logic of an integrated network, oriented towards strategic areas and articulated with existing complementary networks, thus mitigating the dispersion/fragmentation of resources and capacities. By articulating resources, otherwise fragmented, synergies are fostered and duplications are avoided – hence rationalizing the investment in common interest resources –, and the access by the scientific and business communities is improved – thus optimizing the use of the resources.

TRIS-HCP will contribute to the valorisation and internationalization of Portugal's translational and clinical research, thus boosting the

performance and competitiveness of the entire health value chain. Expected impacts include:

- a) increased turnover and exports in high added value areas;
- b) attraction of foreign investment and creation of companies, including high-tech start-ups;
- c) creation of qualified jobs, including researchers/PhDs in companies;
- d) better access to healthcare and innovative therapies through clinical trials, etc.

In terms of training, TRIS-HCP will pay a special attention to complementary skills – e.g., project management, legal/regulatory affairs, quality and GxP, intellectual property and technology transfer – in order to make highly-qualified human resources, including PhDs, even more “attractive” to companies, which can have an impact on the number of PhDs in companies and on retaining talents in Portugal.

IN VIVO ARTHROPOD SECURITY FACILITY (VIASEF)

TYPE Single Sited

COORDINATOR Carla Alexandra Gama Carrilho da Costa Sousa (IHMT/UNL)

DESCRIPTION

The *In Vivo* Arthropod Security Facility aims to offer to European, Mediterranean and CPLP (Community of Portuguese Language Speaking Countries) countries an Arthropod-Containment-Level 3 (ACL-3) infrastructure that, in conjunction with other existing facilities (animal house, cryopreserved biological collections), will allow institutions and researchers to develop *in vivo* studies with arthropod vectors, including the establishment of transmission cycles of human vector-borne pathogens.

INSTITUTIONAL PARTNER(S) / NODE(S)

Instituto de Higiene e Medicina Tropical (IHMT/UNL).

ACTIVITIES

VIASEF provides access to a wide variety of services, including access to specific biological material (and also to alive/dead individuals) of mosquitos and sandflies, bioassays with autochthonous, non-autochthonous and/or invasive arthropod species, and establishment of extrinsic development cycles of human vector-borne pathogens. This infrastructure also offers insectaries and laboratories for rent with or without technical support.

IMPACT

The VIASEF will greatly improve the IHMT research conditions, allowing to carry out various projects demanding *in vivo* tests of vector-borne pathogens, which so far were not possible to perform due to the lack of proper infrastructures. These include all the *in vivo* assays for the study of vector competence determinants, as well as the study of new pharmacological products interference with the development of the

pathogen in the vector and its immunological factors. This will greatly strengthen the capacity for attracting research funding both at the national and international levels. The facility will also support advanced training actions and working conditions for researchers and post-doctoral fellows, from IHMT or other institutions, either national or international. VIASEF will serve as a basis to improve mobility and science exchange programs that IHMT is currently involved in, particularly with countries from Southern Europe, Mediterranean and sub-Saharan Africa, South America and Southeast Asia.

VIASEF already has well-established partnerships with industry and with national and international, public and private institutions. On-going partnerships involve mosquito bioassays for testing the efficacy of products under development such as new bioinsecticides, novel impregnation methods of textiles with repellents (e.g. nano-encapsulation, dyes), and light-activated surfaces for delayed release of insecticides/repellents.

The implementation of VIASEF will allow handling of invasive

mosquito species such as *Aedes aegypti* and *Aedes albopictus*.

These are the most important vectors of dengue, the first arboviral infection in the world. Arthropod containment conditions for bioassays with these vectors are a requirement in the research and public health context for southern European and Mediterranean countries. VIASEF will allow the evaluation of interactions between *Leishmania* spp. - *Phlebotomus* spp. and will promote the Portuguese and IHMT research competitiveness in the field of phlebotomine-borne diseases.

VIRAL VECTORS FOR GENE TRANSFER CORE FACILITY (VIRAVECTOR)

TYPE Single Sited

COORDINATOR Luís Fernando Morgado Pereira Almeida (CNC/UC)

DESCRIPTION

The ViraVector infrastructure will provide researchers in Portugal and abroad with a facility for production of viral vectors to perform gene transfer in cell and animal models, which is expected to contribute to the reinforcement of scientific production of Portuguese groups within the life sciences domain.

INSTITUTIONAL PARTNER(S) / NODE(S)

CNC - Center for Neuroscience and Cell
Biology of Coimbra

ACTIVITIES

ViraVector provides services of production and support to experimentation with viral vectors. This infrastructure will also engineer and produce different viral vectors and will provide training to safely use these vectors.

IMPACT

The ViraVector infrastructure will be instrumental in the post-graduate training within several PhD and Master programmes in which the team that integrates this line of research at CNC is engaged. Among these is the Doctoral Programme in Experimental Biology and Biomedicine (BEB), a multidisciplinary research-oriented training in emerging areas of Biology and Biomedicine, which has resulted in a multi-faceted education in molecular life sciences related to disease. The group involved in this infrastructure has organised courses on "Gene and Cell therapy of CNS, Gene therapy and nuclear Biology and is involved in the training of several PhD and Master students within the lab of Vectors and Gene Therapy. Moreover, the group is involved in the Masters in Pharmaceutical Biotechnology, and therefore will also provide training to these students.

This core facility aims at engineering and producing viral vectors for gene transfer in research experiments or non-clinical studies. Both fundamental studies and translational studies are expected to benefit from the ViraVector infrastructure, including companies located in close proximity, at BIOCANT, and the research groups both in the centre of Portugal and throughout the country working on the development of clinical translation for treatment of human diseases. ViraVector will hire a limited number of human resources and establish service contracts with skilled young researchers, creating opportunities in the centre of Portugal for highly skilled personnel, with expertise in key techniques of viral vector engineering, packaging and gene transfer. It is expected that the infrastructure will contribute to the development of research groups, as well as of start-ups operating in health sciences R&D, biotech and to the overall competitiveness of the corresponding innovation ecosystem. The infrastructure is also expected to have an impact in applications within the H2020 programme.

4.5. MATERIALS AND ANALYTICAL FACILITIES

4.5. MATERIALS AND ANALYTICAL FACILITIES

The continuous growth of knowledge and innovation in new and advanced materials, from steel blades to biological materials, including fluids and plasmas, has been fuelled by the capability to observe, design and assemble or manipulate these materials at ever-increasing definition of scale and complexity. It is now possible to operate at the nanometre scale, observing, manipulating and designing, atom by atom, increasingly complex materials that have specific properties tailored for specific products. Consequently, the boundaries between chemistry and physics and between materials science and biology have become very diffuse and present challenging new fields of research.

Therefore, it is not surprising that the research infrastructures in the thematic area of Materials and Analytical Facilities have several aspects that overlap with other fields, namely Physical Sciences, Engineering and Biomedical Sciences. The excellence of the research developed is a key factor to the success of policies aimed at promoting leading industries in emergent areas of Life Sciences, Materials, Nanotechnologies and Nanosciences.

PTNMR, the Portuguese Nuclear Magnetic Resonance Network, a distributed RI.



PORTUGUESE NUCLEAR MAGNETIC RESONANCE NETWORK (PTNMR)

TYPE Distributed

COORDINATOR Eurico José da Silva Cabrita (FCT/UNL)

DESCRIPTION

PTNMR provides coordinated access to a national platform of equipment, resources, services and skills in Nuclear Magnetic Resonance (NMR) for participating institutions and the scientific community, from both national and international R&D industry and academia. The main goal is the maintenance of a single platform that supports the technical integration, sharing of resources and a combined management of the NMR infrastructure, enabling access to modern and fully operational NMR spectrometers and to support of R&D initiatives.

INSTITUTIONAL PARTNER(S) / NODE(S)

Faculdade de Ciências e Tecnologia da Universidade Nova de Lisboa (FCT/UNL); Universidade do Porto (UP); Universidade da Beira Interior (UBI); Universidade de Coimbra (UC); Universidade de Aveiro (UA); Universidade da Madeira (UMa); Instituto Superior Técnico (IST/UL); Faculdade de Ciências e Tecnologia da Universidade Nova de Lisboa (FCT/UNL); Instituto de Tecnologia Química e Biológica (ITQB/UNL); Universidade do Minho (UM).

ACTIVITIES

PTNMR offers a wide variety of services, such as several types of NMR spectra in solution or solid state, from routine analytical services for structure elucidation to advanced applications (e.g. Structure activity relationship by NMR, HRMAS, NMR relaxometry, micro-imaging by NMR, Rheo-NMR, NMR Diffusometry), besides NMR consulting services and training.

IMPACT

PTNMR Network has been supporting S&T activities, fostering knowledge transfer and promoting the involvement of national and foreign researchers in R&D

projects in all areas of application of NMR including structural biology, materials science, drug design, metabolomics, natural products, and food science.

These activities comprise both fundamental and applied work in multiple areas of knowledge and most are conducted in Research Institutes and Faculties targeting real local problems. Thus, the excellence of the research therein developed is a key factor to the success of policies aimed at promoting leading industries in emergent areas of Life Sciences, Materials, Nanotechnologies and Nanosciences. The scientific aims of PTNMR are defined for these research areas, where new developments are unfolding and specific and strong competences in terms of human resources and recent scientific achievements are identified. PTNMR networking and training activities guarantee a continuous tutorship at the graduate and postgraduate levels and enhance opportunities for collaborative research, nationally and internationally. Through PTNMR, researchers, PhD, MSc and BSc students have contact with state-of-the-art equipment, contributing at a significant level to increase their level of expertise

and employability. PTNMR is also associated with the ESFRI project INSTRUCT.

PTNMR has been continuously working to collaborate with industrial partners, to promote the technology available and to offer its analytical services to companies. The support of PTNMR to R&D initiatives has already allowed the establishment of joint research projects with industrial partners that wouldn't be possible without the infrastructure and associated know-how. The Portuguese chemical industry is mainly formed by small companies specialised in the production of specific products that cannot afford large equipment such as an NMR spectrometer, but for whom the type of analytical and consulting service provided by PTNMR is essential. The PTNMR network provides support both in the quality control of raw materials and product identification, both of which are crucial to maintain competitiveness of these companies in the global market.

4.6.

ENERGY

4.6. ENERGY

The impact of the economic crisis has been far-reaching, creating pressures on global supply, such as increased energy demand and competition. Moreover, energy prices are set to increase with the highest prices expected to persist in the EU and in Japan, well above those in China and in the USA. The import-dependent ratio of the EU as a whole is increasing, originating an issue of security of supply. It is in this context that the EU has created SET-PLAN, the European Strategic Energy Technology Plan, which established an energy technology policy for Europe. The Energy RIs integrated in this Roadmap are fully in line with the main goal and *raison-d'être* of SET-PLAN, which focus on accelerating the development of cost-effective, low carbon technologies. In fact, the current trend in capital costs of energy technologies is one of decreasing prices.

Energy RIs play a central role as part of an integrated approach/vision for structural change towards a green economic recovery, based on efficient energy systems, all over Europe. At the forefront of multidisciplinary research and in close contact with industrial partners, these technologies are core instruments for the rise of smart cities.

One of the integrated research infrastructures in the Portuguese roadmap (INIESC - National Research Infrastructure for Solar Energy Concentration) is actively participating in the ESFRI preparatory phase project EU-SOLARIS - European Research Infrastructure for Concentrated Solar Power. This RI is focused on thermal conversion of solar energy at medium/high temperatures and aims for the development of solar energy concentration. Others, such as the Research Infrastructure on Integration of Solar Energy Systems in Buildings, aims to develop systematic knowledge about what fosters and promotes research and innovation in the field of high energy efficiency buildings or lower energy consumption buildings, the so-called Green Buildings. The Biomass and Bioenergy Research Infrastructure works on biomechanical and thermochemical conversion to advanced fuels, chemicals and other biomaterials. The Smart Grid and Electric Vehicle

Laboratory constitutes a physical space integrating systems and equipment designed to support the development and testing of solutions and pre-industrial prototypes, promoting active and intelligent management of electric grids scenarios with a progressive integration of micro generation and electric vehicles.

BBRI, the Biomass and Bioenergy Research Infrastructure, a single sited RI.

INIESC, the National Research Infrastructure for Solar Energy Concentration, a distributed RI and national node of its counterpart in the ESFRI Roadmap RI, EU-SOLARIS.

NZEB_LAB, the Research Infrastructure on Integration of Solar Energy Systems in Buildings, a distributed RI.

SGEVL, the Smart Grid and Electric Vehicle Laboratory, a single-sited RI.

BIOMASS AND BIOENERGY RESEARCH INFRASTRUCTURE (BBRI)

TYPE Single Sited

COORDINATOR Francisco Manuel Ferreira Gírio (LNEG)

DESCRIPTION

BBRI is a new RI built on the existing lab and pilot infrastructure of LNEG, with activities focused on chemical processes to advance bio-fuels, chemicals and other biomaterials. The BBRI shall contribute to the research excellence in Portugal in the field of Bioenergy. It is fully aligned with the main value chains of the SET PLAN and the implementation plan of the European Industrial Bioenergy Initiative (EIBI).

INSTITUTIONAL PARTNER(S) / NODE(S)

Laboratório Nacional de Energia e Geologia, I.P. (LNEG).

ACTIVITIES

BBRI offers a wide variety of services, such as the access to the Biomass Deconstruction Laboratory; Cell Factories and Enzymes Laboratory; Microbial Culture Collection for Biofuels production and Biomass Conversion; Pilot Downstream and Process Laboratory; Microalgal Biotechnology Laboratory and Culture Collection; Gasification Laboratory; Pyrolysis Laboratory; Laboratory of Biofuels and Environment (LBA). Technical consulting on Biogas Technology and on Sustainability Assessment; certification of Biofuels Sustainability in Portugal (ECS); auditing of Environment and Biofuels Analytical Laboratories and Thermogravimetric Analysis.

IMPACT

BBRI aims at the development of bioenergy technologies, promotion of research excellence and training of new professionals on sustainable bioenergy. BBRI activities will be focused on the

main bioenergy value-chains of the Strategic Energy Technological PLAN and aligned with the implementation plan of the European Industrial Bioenergy Initiative (EIBI). The current research infrastructure at LNEG meet unique conditions to support R&D activities, technical assistance, services and education activities in all the seven value-chains defined by EIBI, including: conversion of lignocellulosic feedstock into ethanol, higher alcohols and hydrocarbons (Sugar Platform); bioenergy carriers from CO₂ and light (Microalgae Platform); and gasification and pyrolysis for biofuels, heat and power (Thermochemical Platform). BBRI will have five different technical-scientific research sub-RIs: Sugar Platform; Microalgae Platform; Thermochemical Platform; Bioenergy Sustainability and Analytical Sciences for Biofuels.

The Bioenergy at LNEG has a strong partnership with national private operators in the field of bio and thermochemical conversion to biofuels and other biomaterials. In the last two years, more than 25 TA&T contracts have been provided. The BBRI activities for the upcoming 2014-2020 period will be directed towards professionals

working in the biomass and bio-energy markets and Masters and PhD students, contributing for the bioeconomy, aiming at increasing the number of bioenergy expert professionals in Portugal, although not responsible for either employability or social inclusion policies. A stepwise increase of 10% in number of TA & T contracts is expected over the next six years.

NATIONAL RESEARCH INFRASTRUCTURE SOLAR ENERGY CONCENTRATION (INIESC)

TYPE Distributed

COORDINATOR Manuel Pedro Ivens Collares Pereira (UE)

DESCRIPTION

INIESC is focused on thermal conversion of solar energy and aims at the development of solar energy concentration technologies. INIESC addresses different applications, ranging from water desalination or industrial process heat to thermoelectric production or solar fuels, promoting technology transfer to industry and enabling a holistic approach to the product development process.

INSTITUTIONAL PARTNER(S) / NODE(S)

Universidade de Évora (UE); Laboratório Nacional de Energia e Geologia, I.P. (LNEG).

ACTIVITIES

INIESC offers a wide variety of services, such as the product development; engineering consultancy; prototype testing; materials characterization and studies; solar fuels production and molten salt testing facility.

areas matching with the development of Concentrated Solar Power (CSP) components like heliostats, primary and secondary reflectors, absorbers and reactors, the mechanic, electric and electronic components, software and engineering solutions.

IMPACT

Aware of the scientific challenges and opportunities it gathers, the main objective of INIESC lies on the development of concentrating solar collectors and their applications, to allow operation in the medium ($100^{\circ}\text{C} < T < 250^{\circ}\text{C}$) and high ($T > 250^{\circ}\text{C}$) temperature ranges. Basing its philosophy on a strong technology transfer component, INIESC explores and develops the conditions to offer to the industry (and other R&D partners) a wide range of support in the conceptual development and experimental testing of solar concentrators as well as on the assessment and demonstration of possible and innovative applications. Besides the competences and new products generated, INIESC will constitute an opportunity for the export of technology, engineering and products, in an essential aspect of the country's future economy. INIESC will contribute to enhance the national competence in those

RESEARCH INFRASTRUCTURE ON INTEGRATION OF SOLAR ENERGY SYSTEMS IN BUILDINGS (NZEB_LAB)

TYPE Distributed

COORDINATOR Helder Jose Perdigão Gonçalves (LNEG)

DESCRIPTION

The NZEB concept is discussed worldwide as the future trend in the building sector. This concept synthesises an overall perspective of a building project, where the integration of passive systems is fundamental, as is also the integration of renewable energy systems. Buildings are one of the most important fields of application of Solar Energy Systems (SES), both for thermal and photovoltaic technologies.

INSTITUTIONAL PARTNER(S) / NODE(S)

Laboratório Nacional de Energia e Geologia, I.P. (LNEG); Lógica - Sociedade Gestora do Parque Tecnológico de Moura.

ACTIVITIES

NZEB offers a wide variety of services, such as usage of SOLAR XXI (nearly Zero Energy Buildings); providing support to industry and large RES users; testing of solar thermal collectors and systems and of thermal deposits; testing of direct expansion solar assisted heat pumps for DHW.

IMPACT

The vision of NZEB_LAB Research Infrastructure is to set up and consolidate a Research Laboratory Infrastructure, which congregates in a grid, the existing facilities in Portugal in the domain of the Solar Energy to serve the National and European Industrial and Research Community to the goal of accelerate the integration of new systems, and components in buildings in order to achieve the NZEB concept. Through the research developed by NZEB_LAB, the RI strategy aims to develop and promote optimal pathways for achieving zero energy buildings standard, widespread adoption at national level by 2020, of optimized NZEB energy design and operation concepts suited to Portuguese climatic conditions and construction practices, in association with industrial partners.

A strong relationship with industrial companies, mostly Portuguese, will be envisaged. Companies in the area of buildings (designing, construction, component providers and equipment installers), and in the area of Solar Energy, both Thermal and Photovoltaics, some of which have already strong relations with the institutions forming this Research Infrastructure, will be contacted for an interchange of ideas and for possible technology transfer in the field of Solar Energy in Buildings, proposing and providing solutions to problems in this framework.

SMART GRID AND ELECTRIC VEHICLE LABORATORY (SGEVL)

TYPE Single Sited

COORDINATOR João Abel Peças Lopes (INESC Porto)

DESCRIPTION

The SGEVL constitutes a physical space integrating systems and equipment designed to support the development and testing of solutions and pre-industrial prototypes, promoting active and intelligent management of electric grids, in scenarios with progressive integration of distributed energy resources and electric vehicles.

INSTITUTIONAL PARTNER(S) / NODE(S)

Instituto de Engenharia de
Sistemas e Computadores do Porto
(INESC Porto/FEUP).

ACTIVITIES

SGEVL offers a wide variety of services, such as providing access to laboratory and data and training.

manufacturers and system operators to integrate and manage with distributed energy resources.

IMPACT

Jointly advancing the state of the art of ICT with energy system's core technologies will leverage the development of a solid and mature Smart Grid concept with innovative solutions that can be achieved throughout the main scientific objectives, such as Consolidation of Smart Grid reference architectures and conceptualization; Development of research and experimental activities for low voltage distribution grids; Development of pre-prototypes of power electronic converters for microgeneration applications, EV chargers and small scale distributed energy storage units to be used at the low voltage distribution grids.

The laboratory infrastructure will provide an important socio-economic contribution to the objectives of R&D reinforcement: increase know-how and provide advanced services in strategic areas of the green economy; interactions and networking activities; provide a test-bed to be used by

4.7. E-INFRA- STRUCTURES

4.7. E-INFRASTRUCTURES

E-infrastructures or digital infrastructures focus on ICT-based infrastructures and services that support and promote a broad range of scientific disciplines.

These services are usually provided more efficiently, economically and with higher quality in an aggregated, large scale and cross-cutting format, instead of through small silos for each application that may need such infrastructural services. Examples of such services are network advanced connectivity, storage services (bigdata), computing services, transverse databases, common telematics services, datacentre facilities and others.

The Laboratory for Advanced Computing aims at providing High Performance Computing (HPC) services to the Portuguese scientific community. BioData.pt is a distributed infrastructure for biological data, which comprises ELIXIR's Portuguese node. The Portuguese National Distributed Computing Infrastructure is an infrastructure for national GRID computing, integrated into European computing networks, that plans to expand its portfolio to include scientific cloud and other user driven computing and data services. The Science, Technology and Society Network (RCTS), is the Portuguese National Research and Education Network (NREN), that provides connectivity and several related services to Portuguese scientific communities, and interconnects to the pan-European network GÉANT.

E-infrastructures will have a significant contribution to the Portuguese smart specialisation policy within the Horizon 2020 context, particularly regarding the first strategic priority which is to develop an economy based on knowledge and innovation. In today's society, which is increasingly more dependent on information technology, it is difficult to generate knowledge and innovation without a solid foundation of integrated E-infrastructures.

ICT, by definition, is a support activity and today all areas of knowledge may benefit from a collection of ICT services, be it to exchange a few emails and files or to perform highly complex and resource-

demanding number crunching operations. As such, E-infrastructures are common to all other thematic areas and support each user community according to its needs.

UC-LCA, the Laboratory for Advanced Computing, a single sited RI, is connected to the ESFRI Roadmap RI PRACE (Partnership for Advanced Computing in Europe).

BioData.pt, the Portuguese Biological Data Network, a virtual RI, is the national node of the ESFRI Roadmap RI ELIXIR (European life-sciences Infrastructure for biological Information).

INCD, the Portuguese National Distributed Computing Infrastructure, a virtual RI.

RCTS, the Science, Technology and Society Network, a single-sited RI.

BIODATA.PT PORTUGUESE BIOLOGICAL DATA NETWORK (BIODATA.PT)

TYPE Virtual

COORDINATOR José Bártholo Pereira Leal (IGC/FCG)

DESCRIPTION

BioData.pt is a distributed virtual infrastructure that aims to add value to biological data so that it can be maximally useful for academic researchers and industry, and serve as a basis for biodiversity and innovation, fostering research excellence, internationalisation, training, promotion of entrepreneurship and developing collaborative R&D work with industry.

INSTITUTIONAL PARTNER(S) / NODE(S)

Associação Portuguesa de Bioindústrias (APBio); Centro de Biotecnologia Agrícola e Agro- Alimentar do Alentejo (CEBAL), Instituto de Biologia Experimental e Tecnológica (IBET) e Instituto de Tecnologia Química e Biológica (ITQB/UNL); Centro de Ciências do Mar (CCMar/ CIMAR); Universidade do Minho (UM); Instituto de Biologia Molecular e Celular (IBMC/UP) e Instituto Gulbenkian de Ciência (IGC/FCG); Fundação D. Anna de Sommer Champalimaud e Dr. Carlos Montez Champalimaud; Instituto Gulbenkian de Ciência (IGC/FCG); Instituto de Engenharia de Sistemas e Computadores, Investigação e Desenvolvimento em Lisboa (INESC ID/INESC/IST/UTL) e Instituto superior Técnico – (IST/UL); Instituto Superior Técnico – (IST/UL).

ACTIVITIES

BioData offers a wide variety of services related to biological data, ranging from data curation and application integration, to support, consultancy and training services.

IMPACT

The field of biotechnology is being adopted at a rapid pace by industries: sustainable bio-based processes in the chemical industry,

the discovery of biopharmaceutical products by Pharma, the adoption of organisms and enzymes in different steps of the processes in diverse industries such as pulp and paper or textile industries. BioData will be a relevant instrument to allow and promote those scientific discoveries within the scientific community. BioData.pt will implement a sustainable infrastructure for biological information that will support the development of a stronger bioinformatics community in close proximity to life sciences and industry. It will also expose the Portuguese bioinformaticians to International researchers, thus promoting international collaborations. It is expected that BioData will contribute to train about 80-100 students every year, and also have an impact on the education of MSc and PhD students in bioinformatics.

BioData is expected to have a major impact on companies in Portugal that are taking steps towards the adoption of biological process in a variety of fields, through the availability of a platform where integrated and curated experimental datasets can easily be accessed and understood, together with the possibility of using

biological models or analysis tools in a user-friendly way. Especially well adapted for small companies, BioData will have a service access model based on cloud technology, with low capital expenses and start up investments. By promoting data re-use, BioData will contribute to the cost-effectiveness of research funding, reducing redundant data generation, insuring maximal usability of datasets. Due to its distributed nature, training and recruiting in different locations will contribute to dilute regional asymmetries in the development of bioinformatics in Portugal, while expanding the Portuguese bioinformatics community. The collaboration with the Industry Program at the EMBL EBI, in the organisation of industry-specific training and networking workshops, national and international, will represent a way of bridging academic centres and the needs of SMEs, introducing new technical capabilities to those SMEs.

PORTUGUESE NATIONAL DISTRIBUTED COMPUTING INFRASTRUCTURE (INCD)

TYPE Virtual
COORDINATOR Gaspar Pereira de Morais Barreira (LIP)

DESCRIPTION

INCD's mission is to satisfy leading edge research needs for huge data processing and computing capacities that cannot be provided by isolated research centres. The offered solution encompasses an integrated approach to the delivery of information technology services across multiple locations, interconnected by state-of-the-art networks.

INSTITUTIONAL PARTNER(S) / NODE(S)

National Research and Education Network (NREN); Laboratório de Instrumentação e Física Experimental de Partículas (LIP); Laboratório Nacional de Engenharia Civil (LNEC).

ACTIVITIES

INCD will provide a very rich set of services related with Computing Resource Housing for computing and data services from partners and supported scientific communities, high performance connectivity, high-throughput computing, interactive services, data storage, software storage, virtualisation clusters, grid computing, cloud computing and others related with service management needs.

IMPACT

The infrastructure aims to be the open scientific computing infrastructure of reference in Portugal, enabling compute and data intensive applications for researchers from all scientific domains.

The infrastructure will assist researchers in further developing their research work and strengthen their competitiveness.

The Specialised Centres will train skilled personnel in scientific and distributed computing, and provide specialised knowledge on computing for engineering studies. This is returned to society via the availability of knowledge and through a move to industry of trained students and staff.

The Specialised Centres will also provide employment as they grow. It is expected that some people will move to industry or other scientific projects taking knowledge and disseminating the infrastructure. The infrastructure may be used

to support participation in strategic research projects where access to computing capacity is required. LNEC provides very important services to society which currently depend on the infrastructure and its support services. Examples are: operational forecasts of hydrodynamic, water quality, and oil spills, traffic simulations and multiple-type dam behaviour and dam safety management.

Risk management on all fields of civil engineering are also supported by the infrastructure. The infrastructure will also be used to support the implementation of European Directives in Portugal (such as the Inundation Directive). A future cloud service will

bring new opportunities for small research groups and SME companies. Similarly such a service has a very strong potential to support e-government activities.

SCIENCE, TECHNOLOGY AND SOCIETY NETWORK (RCTS)

TYPE Distributed

COORDINATOR João Nuno Urbano Ferreira (FCT)

DESCRIPTION

RCTS is the Portuguese Research and Education Network (NREN), a dedicated high-performance network to serve researchers, teachers and students with greater demands, acting as a test platform for advanced communications services and applications.

RCTS is interconnected with the overall research and higher education communications platform through GÉANT - the pan European research and education backbone. In this context, RCTS provides a privileged collaboration channel for Portuguese researchers to access foreign research infrastructures, data sets and services.

INSTITUTIONAL PARTNER(S) / NODE(S)

National Science and Innovation Network.

ACTIVITIES

RCTS IP is the main connectivity service, allowing direct communication between all entities connected to the network in a practical and efficient way using the IP protocol. RCTS Plus provides a set of advanced features, at the logical communication layer, designed to serve applications requiring high performance switched connectivity. RCTS Lambda is the most advanced offer for dedicated optical communications within RCTS. Eduroam (education roaming) is the secure, world-wide roaming access service developed for the international research and education community. RCTSaai is the distributed authentication and authorisation infrastructure federation for the Portuguese research community. RCTSaai is part of eduGAIN, the pan-european research and education AAI confederation managed by Géant. This RI will also provide datacentre support services and telematics services, security and videoconferencing network services, among others.

IMPACT

RCTS is a core infrastructure intended to support and leverage the overall work of the research community in all scientific areas. RCTS services are crucial to connect in a secure and efficient way researchers around the world and connect these researchers with other concentrated, distributed or virtual eScience infrastructures. Access to these eScience infrastructures is a central plank of developing Europe's future capability to participate and compete in the global research arena. This stands also true for AAI and collaboration tools. This has been proven to be true for past large international distributed infrastructures such as CERN LHC, where RCTS provided hosting facilities for the tier 2 node as well as the link for the enormous data transmission from CERN to Portugal, but is also true for small research units and small research projects with distant participants.

RCTS successfully delivers essential, state of the art network and middleware services, to support research activities. However, these communities' demands are increasing and towards 2020 it is highly likely that the user community will require a number of

new services and that the NRENs will be in a primary position to develop and deploy. The deployment of these new services tends to be demanding to industry as well. For each new development, RCTS makes a study on feasibility and market availability to understand if it's worth developing itself or not. It's common to make trials of new networking equipment and technologies inside RCTS. Also it is common to develop inside the NREN new services for which there is not yet a business model and there is no market offer. Given this, it is expected that the proposed RCTS developments will both increase the efficiency of Portuguese researchers and create new opportunities for participation in international research activities, independent of the research domain, with better networking infrastructures and set of new collaboration tools.

LABORATORY FOR ADVANCED COMPUTING (UC-LCA)

TYPE Single-Sited

COORDINATOR Pedro Almeida Vieira Alberto, (LCA/UC)

DESCRIPTION

UC-LCA provides High Performance Computing (HPC) services with a very broad scientific scope of application, considering that there are many scientific fields which rely on heavy computational simulation for their research. It offers support to specialised training in HPC and on the effective use of the RI, and promotes technological development in associated areas such as energy efficiency. UC-LCA is the national node of PRACE – Partnership for Advanced Computing in Europe.

INSTITUTIONAL PARTNER(S) / NODE(S)

Laboratório de Computação Avançada
(LCA/UC).

ACTIVITIES

Training in HPC systems and software, through workshops on parallel computing, sessions for users to learn about the software environment of the existing cluster, and also through collaborations with other organisations or initiatives like PRACE. Provision of CPU time and storage through scientific projects, following the international practice for a Computer Centre on providing CPU time and storage, that is, through submission of scientific project proposals in response to regular national calls.

SCIENTIFIC IMPACT

The research based on the future supercomputer is expected to open new research areas, namely in the field of computational engineering. It's expected that the rate of publication of papers in international journal with referee would be of the order of 50 per year, when the new computer system will be in full production. There have also been patent applications resulting from simulations done on the cluster Milipeia, so it's expected that it would also be case in the future, with the

next version of the system. There are several fields in which UC-LCA services can be provided to local or national companies, as compute intensive simulations for drug discovery, engineering consultancy and numerical weather forecast. Other services would be related to the high-value emerging fields of genomics and in general personalised medicine.





ANNEX I. EVALUATION PANELS

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SCIENTIFIC EVALUATION PANEL	
NAME	INSTITUTION
Anthony Atkins	University of Reading
Alejandro Cifuentes	National Research Council of Spain (CSIC)
Alessandro Bagnato	Università Degli Studi di Milano
Amir M. Kaynia	Norwegian Geotechnical Institute
Ana Cavalli	GET (Groupe des Écoles des Télécommunications)/ Institut National des Télécommunications
Ana Proykova (Chair)	Faculty of Physics, University of Sofia
Andre Faaij	Copernicus Institute for Sustainable Development - Utrecht University
Andre Preumont	Université Libre de Bruxelles
Andreas Haeberle	PSE – Projects in Solar Energy, AG
Andrzej Gamian	Institute of Immunology and Experimental Therapy
Aníbal Gattone	Universidad Nacional de San Martín - UNSAM
Anne Vaahtokari	Cancer Research UK London Research Institute
Anne-Claude Gavin	EMBL Heidelberg - Germany
Antonella Fresa	Promoter SNC
Antonis Armoundas	Massachusetts General Hospital
Arkadiusz Marciniak	Adam Mickiewicz University
Arturs Puga	Forward Studies Unit
Athanassios Stubos	National Research Center Demokritos
Barbara Koch	Albert-Ludwigs University of Freiburg and Steinbeis
Beniamino Di Martino	Seconda Università di Napoli (Second University of Naples) - Dipartimento di Ingegneria Industriale e dell'Informazione

NAME	INSTITUTION
Blaga Angelova Mutafova	The Stephan Angeloff Institute of Microbiology, Bulgarian Academy of Sciences
Brigitte Winklhofer-Roob	Karl Franzens University of Graz
Carmen Rodriguez Augustin	National Institute for Aerospace Technology (INTA)
Cesar Dopazo (Chair)	Zaragoza University
Christian Hellmich	Vienna University of Technology
Cristina Albu	Department of Art and Art History - University of Missouri - Kansas City
Dana Petcu	West University of Timisoara
Daniel Ramon Vidal	Instituto de Agroquímica y Tecnología de Alimentos - BIÓPOLIS, S.L.
Dimitar Tcharaktchiev	University Specialized Hospital for Active Treatment of Endocrinology - Medical Faculty - Sofia
Dimitrios Thanos	Institute of Molecular Biology and Genetics, BSRC Al. Fleming
Donal Morris	RedZinc
Edwin DE PAUW	Université de Liège
Ekkehard Mochmann	GESIS-ZA, University of Cologne
Esteve Cardellach Lopez	Departament de Geologia Facultat De Ciències- Universitat Autònoma de Barcelona - Spain
Felix Fernandez-Alonso	Rutherford Appleton Laboratory, Science And Technology Facilities Council - UK
Fernando Lopes da Silva	Center of Neuroscience, Swammerdam Institute for Life Sciences
Francesco Pegoraro	Dipartimento di Fisica – Università di Pisa
Francesco Zimbardi	ENEA - Dip. Tecnologie per l'Energia, Fonti Rinnovabili e Risparmi Energetico

NAME	INSTITUTION
Francis QUETIER	Université d'Evry
Francisco Tomás-Barberán	CEBAS (CSIC), Múrcia Spain
Frederick Friend	University College, London
George Elias Georghiou	University of Cyprus
Georgios Banos Aristotle	University of Thessaloniki
Gian Piero Zarri (Chair)	University Paris-Est, France
Guido Langouche	University of Leuven
Heinrich Hoerber	HH Wills Physics Laboratory, Bristol University
Helene Lundkvist	SLU - Swedish University of Agricultural Sciences
Iris Pantle	Volkswagen Motorsport Ltd.
Isabelle Charpentier	Université de Lorraine
Isto Huvila	Uppsala University
Jan Vejvalka	Charles University
Jane Ohlmeyer	Trinity College, Dublin
Jean-Claude Beloeil	CNRS - Orleans, France
Jean-Claude Charpentier	Université de Lorraine
Jean-Claude Guédon	Université de Montréal
Jean-Michel Hiver	Free University, Brussels
Jean-Paul Issi	Universite Catholique de Louvain
Jeremy Colls	University of Nottingham
Joaquin Garrido	Universidad Complutense de Madrid

NAME	INSTITUTION
John Corish	University of Dublin Trinity College Ireland
John Ditch	University of York
John Sweeney (Chair)	Irish Climate Analysis and Research Units - Department of Geography, NUIM
John V Wood (Chair)	Imperial College London
John Villadsen	Technical University of Denmark
Julieta C. Schallenberg	University of Las Pamas de Gran Canaria
Karim Chine	Cloud Era Ltd
Kenneth Kellermann	National Radio Astronomy Observatory, USA
Konstantin Arutyunov	University of Jyvaskyla, Finland
Kristina Djinovic-Carugo	University of Vienna
Lambros Kaiktsis	National Technical University of Athens
László Pusztai	Wigner Research Centre for Physics, Hungarian Academy of Sciences
Luis Enjuanes	National Research Council of Spain (CSIC)
Maria Dinescu	National Institute for Laser, Plasma and Radiation Physics
Maria Elisabeth Lucas	Universidade Federal do Rio Grande do Sul
Marios Dikaiakos	University of Cyprus
Marta Castillejo	Consejo Superior de Investigaciones Científicas, Spain
Martin Antony Walker	Hewlett Packard ??? SÓ ASSIM?
Martin Tomlinson	Plymouth University
Michael Grewing	IRAM-France; University of Tuebingen-Germany

NAME	INSTITUTION
Michael Stoddart	Institute for Marine and Antarctic Studies, Australia
Miroslav Chomat	Institute of Thermomechanics, Academy of Sciences of the Czech Republic
Muriel Foulonneau	Centre de Recherche Public Henri Tudor
Niels Keller	Centre National de la Recherche Scientifique
Norbert Kroo	Hungarian Academy of Sciences
Nuria De Lama Sanchez	Atos SE Digital Services
Paul Gormley	National University of Galway, Ireland
Pawel Gorecki	Institute of Informatics, University of Warsaw
Peter Elias	Université Libre de Bruxelles
Peter M. Maitlis	University of Sheffield
Piero Malcovati	University of Pavia
Pierre Vincent	Université Pierre et Marie Curie
Raja Chatila	Institut des Systèmes Intelligents et de Robotique
Rajendra Prasad	Jawaharlal Nehru University
Ralf Ficner	University Goettingen
Ralf Schaefer	Fraunhofer Heinrich Hertz Institute
Relva Buchanan	University of Cincinnati
Ricardo Galvão	Universidade de São Paulo
Richard Bradshaw	University of Liverpool
Rita Puzmanova	IEEE Distributed Systems Online

NAME	INSTITUTION
Roger Plank	University of Sheffield
Romano Danesi	University of Pisa, Italy
Stefan Gradmann	University of Leuven
Stephen Hawkins	University of Southampton
Sven-Erik Gryning	Technical University of Denmark
Teresa Radziejewska	University of Szczecin
Tomas Pieler	Georg August Universität Göttingen
Tony Pembroke	University of Limerick
Touradj Ebrahimi	EPFL
Ute Linz (Chair)	Julich Research Centre
Vaidutis Kucinskas	Vilnius University, Lithuania
Vassilis Pontikis	CEA-DSM/IRAMIS/LSI
Victor Castelo (Chair)	National Research Council of Spain (CSIC)
Vincent Smith	The Natural History Museum of London

STRATEGIC EVALUATION PANEL

Comissão de Coordenação e Desenvolvimento Regional do Norte (CCDR-N)

Comissão de Coordenação e Desenvolvimento Regional do Centro (CCDR-C)

Comissão de Coordenação e Desenvolvimento Regional de Lisboa e Vale do Tejo (CCDR-LVT)

Coordenação e Desenvolvimento Regional do Alentejo (CCDR-A)

Comissão de Coordenação e Desenvolvimento Regional do Algarve (CCDR-ALG)

Direção Regional de Estudos e Planeamento dos Açores (DREPA)

Instituto do Desenvolvimento Regional da Madeira (IDRM)

Fundação para a Ciência e a Tecnologia (FCT)

ANNEX II. MONITORING COMMITTEE

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NAME	INSTITUTION
Paulo Pereira (Chair)	Member of the FCT Board; ESFRI Delegate
Ricardo Miguéis (Vice-Chair)	ESFRI Delegate; National Delegate to Research Infrastructures (Horizon 2020 and Science Europe)

NAME	INSTITUTION
Alexandre Fernandes	Executive Coordinator of the FCT Scientific Council for Natural and Environmental Sciences
Ana Almeida	Executive Coordinator of the FCT Scientific Council for Social Sciences and the Humanities
Cristiana Leandro	Executive Coordinator of the FCT Scientific Council for Exact Sciences and Engineering
Andreia Feijão	Executive Coordinator of the FCT Scientific Council for Life and Health Sciences
Tiago Saborida	FCT Research Infrastructures Unit

	NAME	NATIONAL EXPERTS
SOCIAL SCIENCES AND HUMANITIES	Paulo Cruz *	School of Architecture, University of Minho
	Heitor Alvelos *	Research Institute for Design, Media and Culture (ID+), University of Porto

	NAME	NATIONAL EXPERTS
PHYSICAL SCIENCES AND ENGINEERING	José Paulo Mota *	REQUIMTE, Network of Chemistry and Technology, New University of Lisbon
	Maria Rute André *	CICECO, Centre for Research in Ceramics and Composite Materials, University of Aveiro
MATERIALS AND ANALYTICAL FACILITIES	Mário Ferreira *	CICECO, Centre for Research in Ceramics and Composite Materials, University of Aveiro
	Albano Cavaleiro	Mechanical Engineering Department, University of Coimbra
ENERGY	<i>To be nominated</i>	
E.INFRASTRUCTURES	Lino Santos	Fundação para a Ciência e a Tecnologia
	João Pagaimé	Fundação para a Ciência e a Tecnologia
ENVIRONMENTAL SCIENCES	João Carlos Marques *	IMAR, Institute of the Sea, University of Coimbra
	Eduardo Rosa *	CITAB, Centre for Research and Technology of Agro-Environmental and Biological Sciences
BIOLOGICAL AND MEDICAL SCIENCES	Celso Reis *	IPATIMUP, Institute of Molecular Pathology and Immunology, University of Porto
	Manuel Santos *	CESAM, Centre for Environmental and Marine Studies, University of Aveiro

NAME	INTERNATIONAL ADVISORY GROUP
David Bohmert	SwissCore, Head of Office; ESFRI Delegate; ESFRI Implementation Group Coordinator
Eucharía Meehan	Director of the Irish Research Council; ESFRI Delegate; Member of ESFRI Executive Board
Jan Hrusak	Director-General of the Academy of Sciences of the Czech Republic, ESFRI Delegate; Member of ESFRI Executive Board

** Member of an FCT Scientific Council*

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