Research infrastructures of pan-European interest: The EU and Global issues

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ABSTRACT

Research Infrastructures act as "knowledge industries" for the society and as a source of attraction for world scientists. At European level, the long-term objective is to support an efficient and world-class eco-system of Research Infrastructures, encompassing not only the large single-site facilities but also distributed research infrastructures, based on a network of "regional partner facilities", with strong links with world-class universities and centres of excellence. The EC support activities help to promote the development of this fabric of research infrastructures of the highest quality and performance in Europe. Since 2002 ESFRI is also aimed at supporting a coherent approach to policy-making on research infrastructures. The European Roadmap for Research Infrastructures is ESFRI's most significant achievement to date, and KM3Net is one of its identified projects. The current Community support to the Preparatory Phase of this project aims at solving mainly governance, financial, organisational and legal issues. How should KM3Net help contributing to an efficient Research Infrastructure eco-system? This is the question to which the KM3Net stakeholders need to be able to answer very soon!

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1. Introduction

Scientific and technological research is the major and essential source of the new knowledge needed to fuel innovation-driven growth and to underpin robust, evidence-based public policies. For this reason, research is at the heart of the EU's broad policy strategy. The main objective of EU research policy is to strengthen the scientific and technological capabilities of the Union by realising a European Research Area (ERA) featuring:

- research excellence driven by open competition;
- transnational research synergies and economies of scale via the pooling of resources;
- world-class centres of excellence and networks of research institutions;
- free movement of knowledge and technology;
- world-class research infrastructures;
- research in support of EU policies; firm roots in society and responsive to its needs and ambitions in pursuit of sustainable development.

The Ljubljana Process led to the adoption by the Council in December 2008 of a 2020 Vision for ERA with, at its core, the idea of the fifth freedom: the free movement of researchers, scientific knowledge and technology. Policy development work is underway for all six dimensions of ERA, one of which relates to Research infrastructures to support the development of world-class research infrastructures, implementing in particular the new Community legal framework for a European Research Infrastructure (ERIC) that has been developed to facilitate the joint establishment and operation of new European infrastructures between Member States. Such activities are in line with the work of ESFRI, the European Strategic Forum for Research Infrastructures, which continues developing initiatives of pan-European interest. The long-term objective is to support an efficient eco-system of Research Infrastructures of pan-European relevance, encompassing not only the large single-site facilities but also distributed research infrastructures. This should also be linked with a network of "regional partner facilities", world-class universities and centres of excellence.

The FP7 "integrating actions" help to promote the development of this fabric of research infrastructures of the highest quality and performance in Europe. By the end of FP7 (2013), more than 550 key existing infrastructures would have received support for a better and coordinated use, while providing direct access to more than 7000 top level researchers per year. Much more access and research services would have been provided through the efficient deployment of a pan-European e-infrastructure. All these actions would have contributed helping Europe to identify solutions to many of the challenges that it has to face such as climate change, ageing population, sustainable energy supply, safer products, better and efficient health care, etc.

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2. State of play

- ESFRI, the European Strategy Forum on Research infrastructures, and the ESFRI Roadmap: The Member States and the European Commission set up the European Strategy Forum on Research infrastructures (ESFRI) in 2002 to support a coherent approach to policy-making on research infrastructures, both existing and new, in Europe. The European Roadmap for Research Infrastructures is ESFRI's most significant achievement to date. Forty-four new research infrastructures (or major upgrades of existing ones) to be developed in the next 10–20 years are listed in the 2008 ESFRI Roadmap. Their total construction cost amounts to some 17 B€. KM3Net is one of these.
- FP7 support to existing and new research infrastructures: The overall objective of the current Community action for Research Infrastructures is to optimise the use and development of the best existing research infrastructures in Europe, and to help create in all fields of science and technology new research infrastructures (i.e. the ESFRI projects). The FP7 budget for this action is about 1700 M€. It is managed, within the same Programme, by both DG RTD and DG INFSO:
- FP7 gives support to existing infrastructures though the "Integrating Activities" (∼630 M€), which aim to better structure, on a European scale, the way research infrastructures operate and to promote international open access as well as their coherent evolution. In addition, FP7 supports "ICT-based e-infrastructures" (∼420 M€) to foster development and use of high-capacity and high-performance communication and grid infrastructures.
- Through "Design Studies" (∼50 M€), FP7 supports feasibility studies for new research infrastructures. Based on the ESFRI roadmap, Community support to the construction of new facilities (or major upgrades) is given through a grant related to their Preparatory Phase (∼220 M€). Community support aims mainly at providing help in solving legal, governance, financial and technical issues linked to the realisation of the projects. Community support to the real Construction Phase is limited (90 M€). Additional financial resources (200 M€) come through the Risk-Sharing Finance Facility to help the setting-up of loans from the European Investment Bank (EIB).
- Support of Structural Funds to new Research Infrastructures and their Regional Partner Facilities: The aim of the Structural Funds is to strengthen economic, social and territorial cohesion. Each region or Member State has developed operational programmes that cover the programming period 2007–2013. According to the DG REGIO, an amount of 43.9 M€ has been earmarked for "Research and Development Infrastructures and Centres of Competence". However, unlike FP7, the management of the Structural Funds is decentralised to regional or national bodies, and their use is subject to very clear socio-economic impacts. In this context, guidelines to combine better the various funding opportunities (FP7, Member States, EIB and Structural Funds) have been developed by the EC. Some ESFRI projects, such as KM3Net, are now designed to use these funds for the construction/upgrade of the so-called "Regional Partner Facilities".
- ERIC, a Community legal framework for new European Research Infrastructures: the next generation of European Research Infrastructures, such as those identified in the ESFRI Roadmap, will require new legal and governance structures. In July 2008, the Commission presented a proposal for a Community legal framework, adopted by Council in June 2009. The new Community legal framework for a European Research Infrastructure Consortium (ERIC) will provide some of the advantages of international organisations, such as VAT exemption, and will offer the opportunity to cut down significantly the time necessary for setting up European research infrastructures.

3. The community specific support to KM3Net

KM3NeT is a deep-sea research infrastructure in the Mediterranean Sea hosting a cubic-kilometre sized deep-sea neutrino telescope for the astronomy based on the detection of high-energy cosmic neutrinos and giving access to long-term deep-sea measurements. The KM3NeT neutrino telescope would be the leading European facility for neutrino astronomy. It would be the only deep-sea installation of this size in the world and only be complemented by the US-led IceCube project. The design of KM3NeT poses substantial challenges concerning e.g. photo-detection, data acquisition and processing, deep-sea technology, installation and maintenance procedures, cost effectiveness and stability of operation. These issues are being addressed in a FP6 design study (2006–2009), building on technology at the forefront of science.

Design Study: EC contribution €5 million
45 months (end October 2009), total costs ∼17.6 M€
Design for a cubic-kilometre sized deep-sea neutrino telescope
(evaluation of procedures for assembly and construction; models for operation and maintenance)

KM3NeT intends to be a truly interdisciplinary research infrastructure: it would provide access to neutrino observations for the astronomy, astrophysics, astroparticle and particle physics communities and, in addition, allow for long-term measurements in the deep-sea environment that are of utmost interest for biologists, geophysicists and oceanographers. The current Community support to the Preparatory Phase of the project aims mainly at solving legal, governance, financial and technical issues linked to the realisation of the project.

Preparatory phase: EC contribution €9 million
48 months (end February 2012), total costs ∼13 M€
Towards a pan European facility; legal, governance, financial engineering; international networking; integration with regional
and global marine and environmental systems

4. Next steps

Since the political vision is a "renaissance of Europe", this implies the development of a fully integrated, consistent, efficient eco-system of Research Infrastructures, serving researchers in all S&T fields, based on European wide e-infrastructures. In addition, Research Infrastructures should act as a knowledge industry for the society and as a source of attraction for world scientists.

Research Infrastructures of pan-European interest require therefore professional management throughout their life-cycle (from preparation to decommissioning). This entails a wide range of activities as these facilities not only provide access to highly sophisticated equipment; they should also train people, participate in technology development, and may be responsible for establishing standard operation procedures (extract of the 2007 ERA expert group report).

Of course this needed development requires the European capacity to offer a favorable environment for EU research (not just national). This corresponds for example to the efficient implementation of the ERIC regulation. It also requires the European capacity to strengthen relations with education and with industry, the capacity to work together to face increasingly complex problems and costly solutions, in particular at international level.

As far as KM3Net is concerned, it is reminded that the political objective is, at European level, to develop an efficient and world-class eco-system of Research Infrastructures, encompassing not only a large single-site facilities but also distributed research infrastructures, based on a network of "regional partner facilities", with strong links with world-class universities and centres of excellence.

How should KM3Net help contributing to an efficient Research Infrastructure eco-system? This is the question to which the KM3Net stakeholders need to be able to answer very soon!

For more information see the web page at: http://ec.europa.eu/research/infrastructures.