Exploring Socio-economic Benefits of Large Research Infrastructures

4th National Day Large Research Infrastructures
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19th November 2019, Prague
Missions

Not-for profit, typically publicly-owned, organisations that have been established for a specific purpose other than economic profit are said to be ‘mission-based organisations’.

They have a ‘mission’ to do a specific thing
‘Mission-based’ organisations in daily life:
• Police
• Fire brigades
• Hospitals
• Schools

What are the ‘impacts’ and ‘socioeconomic’ returns of these organisations?
Science in Our Lives

The benefits of research are all around us

The ‘mission’ of research infrastructures: “Do (Excellent) Science!”

- Energy
- Hydrogen-fuelled society
- Sub-zero survival
- Tracking cholesterol
- Flexible plastic solar cells
- Disease resistant crops
- Super superconductors
- Enhanced oil recovery
- Infection sensors
- Tackling chemical waste in the pharmaceutical industry
- Stress relief in the air
The main scope of activities a research infrastructure is supposed to perform, usually ... ‘facilitating’ research for others.

The complexity and cost of the instruments requires a specific investment and the tool is shared by a community of researchers.

A single stakeholder (country or region) or a consortium of stakeholders hires a dedicated team of experts to maintain and manage the facility – and access to it.
What’s the Mission of a Research Infrastructure?

Scientific Access

Excellence-driven Access for Users
Peer-reviewed, depends on scientific excellence, originality, quality and technical and ethical feasibility of a proposal. No cost to user. Open data...

• Studies - must be published and open;
• Member contributions are linked to usage by their scientific community through a ‘look-back’ mechanism;
• Data and IPR policies are essential early on
  • ELI will keep and maintain the data, to be embargoed for the original researcher for a period of time (usually 3 years)

Proprietary Access
This is paid access, and results are proprietary. Prices are determined on a case-by-case basis.
EMBL: to promote molecular biology across Europe, and to create a centre of excellence for Europe's leading young molecular biologists.
LIGO: to open the field of gravitational-wave astrophysics through the direct detection of gravitational waves.
**ESO:** to provide state-of-the-art research facilities to astronomers and astrophysicists, allowing them to conduct front-line science in the best conditions.
ITER is not a user facility!

It was intended to have a technological and socioeconomic impact...
Now that science is an investment*, its funders will expect it to behave as such. That means that there will be extra strain on the principle by which politicians don't interfere in the setting of academic research priorities — known in Britain as the Haldane principle, after First World War minister and troubleshooter Richard Burdon Haldane. The era of scientists being left to run their own show may be drawing to a close if science is expected to make economic returns. You have been warned.”

- Ehsan Masood

Nature volume 551, pages 297–298
16 November 2017

* 2014 U.K. decision by G. Osborne to reclassify R&D as ‘investment’ in public books
Key Stakeholder Groups

The Environment is complex and stakeholders have many interests...

Effective governance and management work in the areas where interests overlap...
Key Stakeholder Groups

**FACILITY**
- Staff
- Governance and Funding Agencies
- Host Countries
- Committee Members
- Licensing Authorities
- EU Institutions and Funds
- Collaboration and Grant Partners
- Commercial Suppliers
- Neighbours

**SCIENCE**
- **Scientific and Academic Users**
  - 5,200 unique users and 3,500 principal investigators in globally

  **Potential Users** from the following science fields: laser-science, high-energy density, high-field, fusion, life science, soft condensed matter, chemistry of materials, energy, superconductivity, heritage conservation, engineering materials, and fundamental and particle physics

  **Multipliers**: European and national societies and associations

**SOCIETY**
- **Direct Beneficiaries**: Region, local and regional governments, municipalities, funding agencies, businesses, business associations

- **Indirect Beneficiaries**: society as a whole benefiting from research driven innovation, industrial users, and actors in the innovation ecosystem

**MEDIA**
National and international news agencies, newspapers, TV and radio stations, and online news portals
Stakeholder emphasis may shift as different socioeconomic indicators are relevant at different times ... or not!
Social and Economic Impact Starts Immediately in the Life Cycle of a Research Infrastructure. They are both local and global. But they offer opportunities – not guarantees.

- **Investment** is driving *development and attractiveness* in Dolní Břežany.
- **Investment** is driving *recognition* in Prague and the Czech Rep. with spillover effects for institutions and industry.
- **Investment** is driving *European leadership* in laser and photonics, especially for state-of-the-art systems.
- Projected total peak power for high power laser systems operational and under construction is by far world-leading with ELI Facilities introducing **5 PW-class lasers**
The Extreme Light Structure has a mission to develop and provide access to the world’s leading lasers for research.

- **ELI** is transitioning from Construction to Operations
- **ELI facilities** being delivered for users beginning in 2020
- The **users’ access** is excellence-based and open
- **Built with European Regional Development Funding**
- Integration of **ELI ERIC** enables a single, Member-led consortium
ELI is a driver for development in industry:

• The global market for lasers is estimated at €13.5B in 2018
  • up 5% over 2017 (Laser Focus World, Mar. 2019)

Over the construction period ELI Facilities report procurement:

• More than €455 million in technical contracts
• Companies from 19 European countries
What are the Political, Economic, Social, and Technological Indicators (PEST)?

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<tr>
<th>Indirect</th>
<th>Direct</th>
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<tr>
<td>• Impact on Competitiveness</td>
<td>• Increased expert interest</td>
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<tr>
<td>• Advanced Materials</td>
<td>• Community acceptance</td>
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<tr>
<td>• Regional Attractiveness</td>
<td>• “Buy-in” from Scientists</td>
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<tr>
<td>• Kids interested in science</td>
<td>• Sense of Pride and positive identification</td>
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<tr>
<td>• Community acceptance</td>
<td>• Enhanced reputation ‘soft-indicators’</td>
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<td>• Return on Investment (?)</td>
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<th>Short-Term (1-yr)</th>
<th>Long-Term (5-yrs+)</th>
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<tr>
<td>• Jobs</td>
<td>• Publications</td>
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<td>• Responsible spending</td>
<td>• Jobs</td>
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<tr>
<td>• Earned Value</td>
<td>• Companies involved</td>
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<tr>
<td>• Buildings built</td>
<td>• Expanded Science Community</td>
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<tr>
<td>• Industrial Return in contracts</td>
<td>• Return on Investment (?)</td>
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<td>‘hard-indicators’</td>
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'hard-indicators'
ESFRI is Charged by Competitiveness Council to Develop Key Performance Indicators

“...Such KPIs must be easy to use, adjustable to different systems and types of RIs (new as well as existing) and yet robust to ensure high a level of confidence. They could serve as one element of the monitoring carried out by RIs and their governance bodies to monitor their performance.” – EU Compt. Council, May 2018
‘Missions’ are research with an aim.
Horizon Europe will incorporate research and innovation missions (€50B) to increase the effectiveness of funding by pursuing clearly defined targets.

The Interim Evaluation of Horizon 2020, chaired by Pascal Lamy found that Horizon Europe (Framework 9) should:
• make it easier for citizens to understand the value of investments in research and innovation
• maximise the impact of investments by setting clearer targets and expected impact when addressing global challenges
‘Mission-oriented’ Access

In this context RIs have to evaluate their place in the landscape and determine if their strategies will be proactive or reactive. Stakeholders must be clear about their expectations! Mission criteria include:

- Bold, inspirational, with wide societal relevance;
- Targeted, measurable, and time-bound;
- Ambitious, but realistic R&I actions;
- Cross-disciplinary, cross-sectoral and cross-actor innovation;
- Drive multiple, bottom-up solutions.

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- Climate-neutral cities
- Healthy soil and food
- Cancer
- Healthy oceans
- Climate change
Some Things to Think About

- Is it still the ‘mission’ of Research Infrastructures (just) to facilitate excellent science, or are we asking more from them?
- Are socio-economic impacts equivalent to scientific impacts?
- Can a Mission-oriented approach satisfy both aims?

Remember:

*Electricity was once basic science...*