The Socio-Economic Relevance of Research Infrastructures

Report from Parallel Session II: Social/Educational/Environmental Apsects

http://erf.desy.de/workshop

HELMHOLTZ ASSOCIATION

ERF European Association of National Research Facilities Open to International Access

Frank Lehner, DESY

DESY

Report from Parallel II: Social/Educational/Environmental

- Overview of experience and assessment of social, educational and environmental impacts of RIs.
- Goal is to contribute to the development – based on empirical data, surveys, case studies and best practice examples provided by the speakers –of a methodological framework and guidelines for future impact monitoring and evaluation

Report from Parallel II: Social/Educational/Environmental

- Introduction by A. Dusa, U Bucharest (Chair)
- Subsession I:
  - Jacques Demotes, INSERM: European Clinical RI Network/impact on health and environment
  - Kimmo Koski, CSC Finland: e-infrastructures
- Subsession II – contributions from various labs:
  - ELETTRA – Bibi Palatini
  - PSI – Thierry Straessle
  - DESY – Stephan Haid
  - SOLEIL – Jean-Pierre Caminade
  - Canadian Light Source – Emil Hallin
  - Laserlab Europe – Wolfgang Sandner

Clinical Research Infrastructures – J. Demotes

- ECRIN – European Clinical Resaech Infrastcructures Network
- Pan-European, distributed infrastructure providing coordinated services to ***multinational*** clinical research in Europe:
- Figures of economic return, social impacts, quality of life:

- Estimated 40% per annum
  - ad perpetuum
- For medical research as a whole,
  - not restricted to clinical research
- Public funding to
  - projects
  - infrastructures
- Combined impact on
  - Innovation
  - Healthcare cost containment
  - Improved healthcare strategies

  -> reduces burden of disease
    - Improved productivity of healthy population
    - Improved quality of life

Clinical Research Infrastructures – J. Demotes

ECRIN
EUROPEAN CLINICAL RESEARCH INFRASTRUCTURES NETWORK

Effect of a US National Institutes of Health programme of clinical trials on public health and costs

S Claiborne Johnston, John D Rootenberg, Shereen Katrak, Wade S Smith, Jacob S Elkins, ***Lancet*** **2006; 367: 1319-27**

- **Findings**

28 trials with a total cost of $335 million were included. Six trials (21%) resulted in measurable improvements in health, and four (14%) resulted in cost savings to society. At 10 years, the programme of trials resulted in an estimated additional 470 000 quality-adjusted life years at a total cost of $3·6 billion (including costs of all trials and additional health-care and other expenditures). Valuing a quality-adjusted life year at per-head gross domestic product, the projected net benefit to society at 10-years was $15·2 billion. 95% CIs did not include a net loss at 10 years.

- **Implications**

For this institute, the public return on investment in clinical trials has been substantial. Although results led to increases in health-care expenditures, health gains were large and valuable

RoI = 5 times initial investment (trials plus healthcare expenditures) over 10 years.

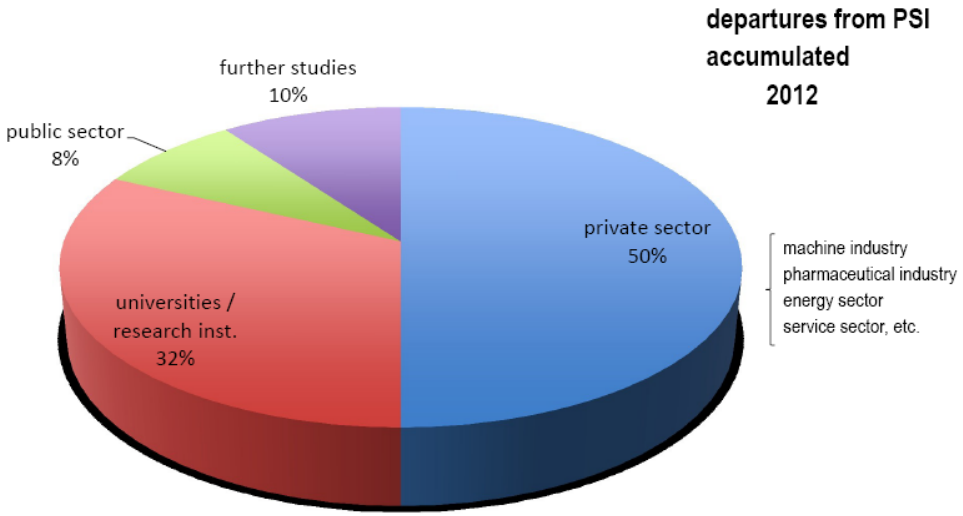
DESY

Report from Parallel II: Social/Educational/Environmental

- The build-up of human capital is a major benefit of RIs
  - it‘s a lot about people and their skills
- mobility and transfer of people is a major mechanism through which knowledge flows
- Every year thousands of skilled graduates leave RIs
  - knowledge of most recent scientific results
  - skills in using advanced instrumentation, techniques and methods
  - ability to solve complex problems, interdisciplinary, cooperation
- Some data collected at RIs exist where people go
- Figures from presentations seem to indicate 30-50% leave for industry

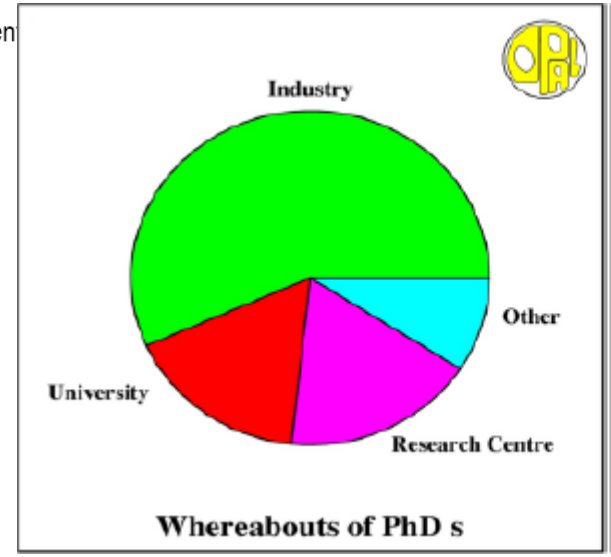
Human Capital: Where do people go after training/education?

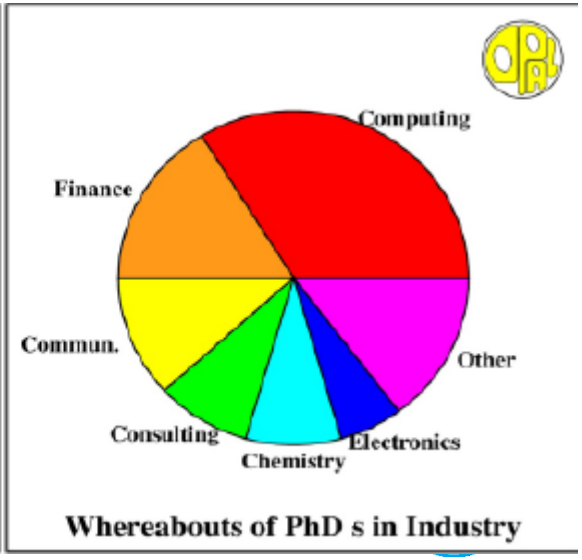
employment after PSI – indirect social / economical impact



about 160 departures per year with subsequent employmen
(without PhD students)

OPAL study (LEP/CERN)
Characteristic for particle physics





Human Capital

- There is a massive stream by skilled people from RIs to industry which corresponds to a flow and transfer of knowledge, skills and methods into the private sector
- There are some case studies and illustrative examples. However, we have not much empirical data how the people that enter industry are absorbed at industry and/or effectively unfold their potential. We assume that it is a most effective mechanism, though.
- If transfer through people is a major mechanism between industry and RIs then we should also promote the return flow for effective innovation
- almost no data on inward-mobility, i.e., from industry/private sector to RIs
- Promote more „dual“ education/training programmes between industry and RIs

exchange between RIs

More than 30'000 unique users at photon / neutron facilities in Europe
Increasing trend to perform experiments at several facilities (supported by FP7)

- **30-45 % γ (n)-users use also another γ (n)-facility**
- **20-30 % n-users use also γ-facility**
- **~10 % γ-users use also n-facility**

Main reasons

- **Enhance quality of experimental result by applying several techniques**
  (e.g. high-Tc superconductivity)
- **Increase access time to beamlines**
  (e.g. structural biology: overbooking)

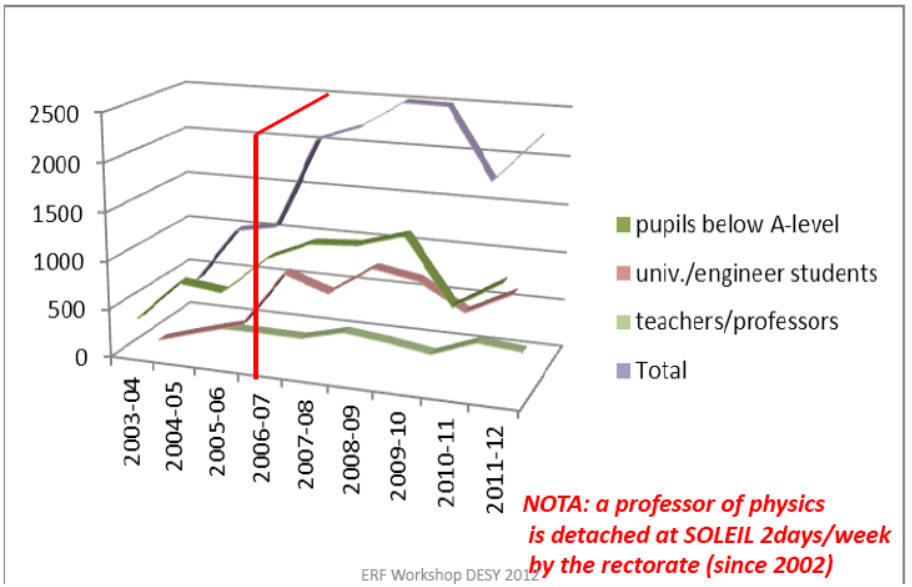
Source:
PaN-data Europe (Policy Framework for User Data)
based on anonymous user data of ESRF, DESY, ELETTRA, SLS, SOLEIL, ANKA, ISIS, SINQ

slide courtesy of Heinz Josef Weyer (PSI)

Education/Training/…

- All RIs presented many examples of educational/training activities
- These activities are manifold and on various levels and sometimes part of the mission of the laboratory
  - Kids & pupils through school labs/science days – important educational service to communities
  - Teachers at schools
  - students through summerschool, special training/workshop of students at beamlines etc.
  - Public: tours, public days
- Dissemination of scientific culture – value per se
- Important value for community, region, society etc.

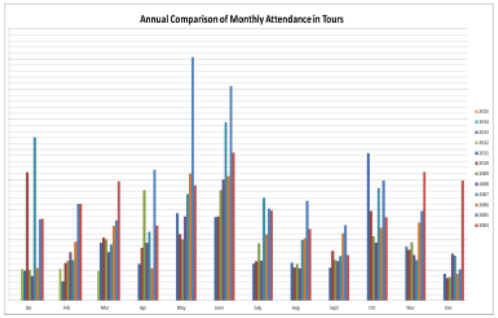
Students, pupils and… teachers!

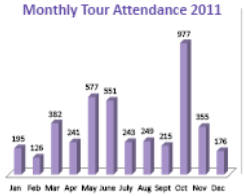


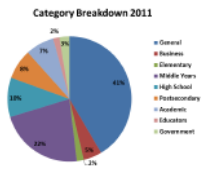
NOTA: a professor of physics is detached at SOLEIL 2days/week by the rectorate (since 2002)

Tours

The CLS enjoys significant attention from several audiences, including academic colleagues, business and government groups, the general public, and educational audiences. Our tours of the facility have been met with great enthusiasm and we accommodate requests as often as resources allow. We are a cornerstone of Saskatoon's science community.





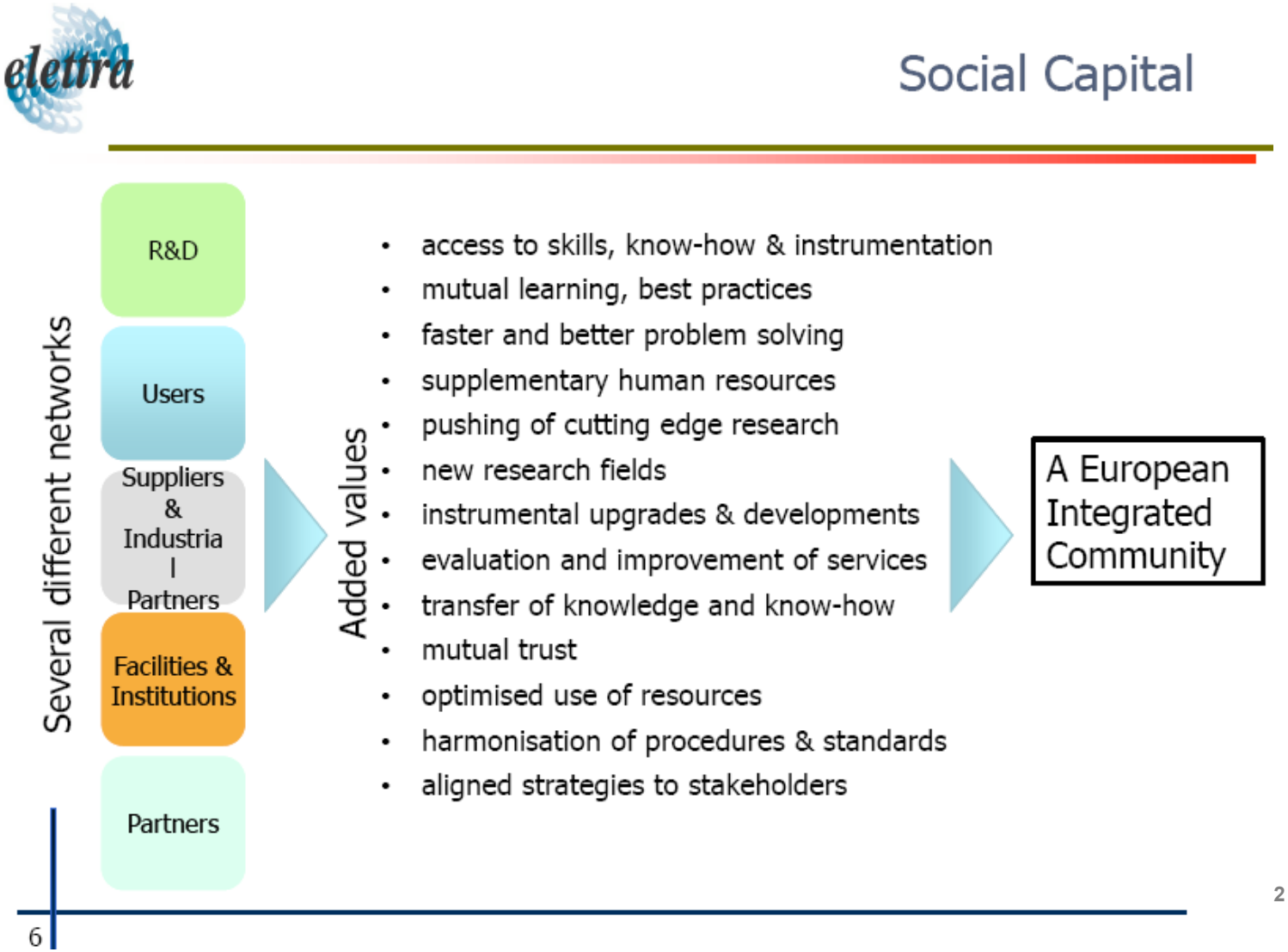


Social Capital

- Social capital refers to the benefits that arise from networks & relations and mutal trust
- broadly defined as the institutions, relationships, attitudes and values that govern interactions among people and contribute to economic and social development (Grootaert & van Bastelaart, 2002)
  - Readiness to give one another **access** to their **networks**
  - **Trust** is created and principle of **reciprocity** is reinforced
  - Greater **overlap in knowledge** increasing the **efficiency of knowledge transfer**
- Social Capital has some complementary function to Human Capital- the two are closely related to: Social capital is an „enabler“ to make productive use of human capital

Social Capital

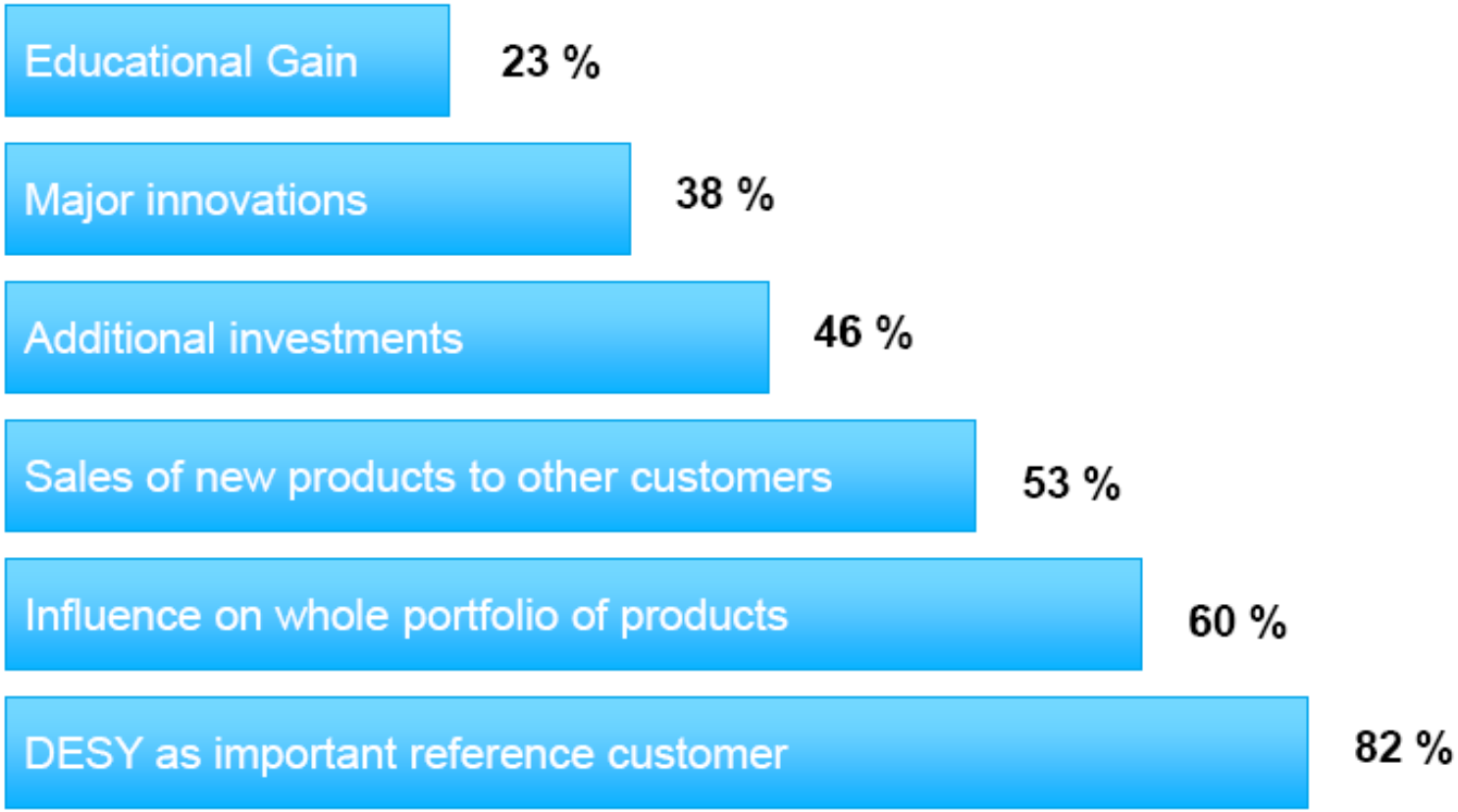
- RIs establish variety of different networks, e.g. ELETTRA



Example of Social Capital impact: Industry's benefits from TTF/FLASH

Benefits for their own business

Stated by 83 suppliers (1992-2004) of DESY's FLASH facility



Social Capital

- Knowledge and intelligence organized in social ways, capacity for networking crucial in tapping into intelligence of others, „tacit dimension of knowledge“
- RIs create and provide „entry points“ into networks of expertise, knowledge and practice
- RIs generate new forms of interactions among actors in innovation system, stimulating learning environments, creation of new research and development options
- Need a better conceptualization of social capital and proxys/indicators

Environmental Impacts

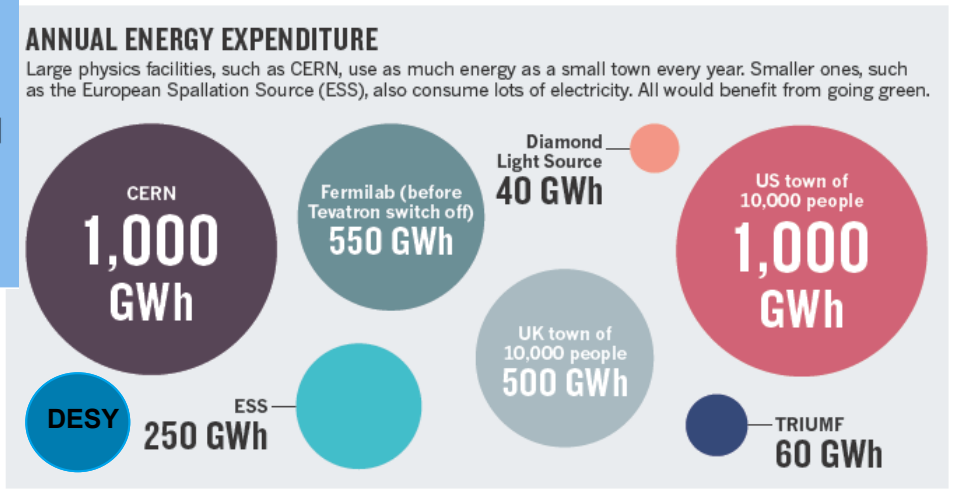
- RIs also have sometimes non-negligible impacts, in particular on the environment, which can be both negative and positive
- RIs can be energy-intensive (light sources, particle accelerators etc.)
  - dedicated ERF-workshop Lund 2011

Workshop Energy for Sustainable Science

Energy Management for Large-Scale Research Infrastructures

According to the main findings of **workshop on „Energy management for large-scale research infrastructures“** in Lund 2011 RIs should make use of their human and social capital in regards to energy management

- Training on young researchers, operators and managers
- Exchange of best practices
- win/win partnerships with industries
- Supporting renewable energy through new and improved materials, environmentally biofuels, new and safe methods od carbon capture, tc.



Improve environmental impacts

Environmental Aspects: Energy

Strategic plan 2011-2012:
- ✓ Define and implement reduction of impact on the environment
- ✓ Optimize the use of energy□

- ✓ **Tri-generation plant** to reduce environmental impact of Fermi and CO_2 emission

- - 3000 tonnes CO_2 per year
- Combined production of electric power, heating and cooling from methane
- Doubling the efficiency of energy vs a conventional plant
- New in Italy for a Research Laboratory, one of the first examples in Europe
- A second plant soon operating

Laser Infrastructures – a distributed RI – talk by W. Sandner

Integrated Activity: The incarnations of LASERLAB-EUROPE

LASERLAB-EUROPE (2003-2007 and 2008):
- *First vision of a unified "European Distributed Laser Infrastructure" with ambitious structuring elements:*

LASERLAB-EUROPE II (2009-2011)
- *"Extending the European dimension"*
  Growing from 17 to 27 individual laser infrastructures from 16 countries, participants from 19 European countries.

LASERLAB-EUROPE III (2012 – 2015)
- Assisting Europe in the creation of new laser infrastructures
- Increasing the basis of human resources
- New science and applications
- Sustainability: preparing for an ERIC

Global photonics market ~ €300 billion,

Leveraged impact in enabled industries is substantially greater!

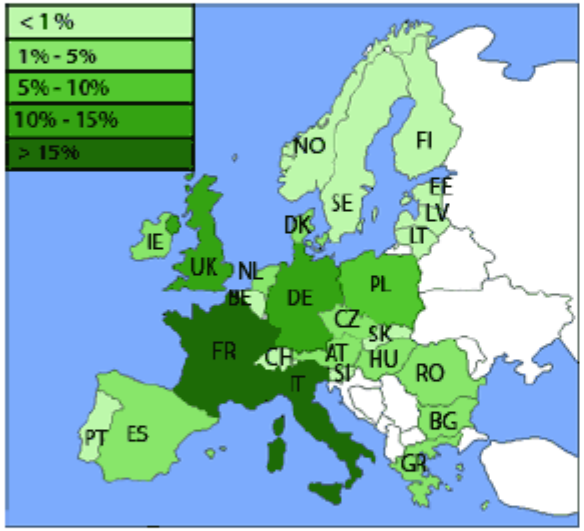
Europe:
- Overall share of 20%, rising to as much as 45% in specific key sectors.
- ~290,000 employees. The sector is largely based on SMEs,.
- Estimated annual growth > 10%, i.e. 2-3 times faster than European GDP and faster than the growth of the global market.
- 40,000 new jobs being created between 2005 and 2008,

Building up new RIs for new communities

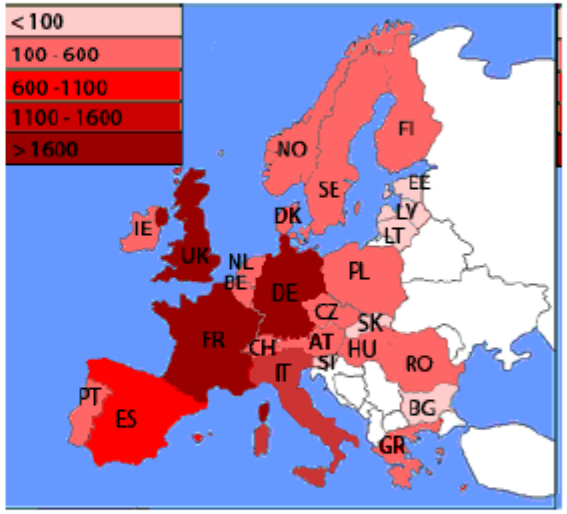
Structuring:
Mission accomplished?

Laserlab Europe

The user paradoxon



Geographic distribution of users



Geographic distribution of research activities and infrastructures

Users come from highly developed laser countries (counter-intuitive!)
⇒ Positive correlation between infrastructures and scientific communities
⇒ New infrastructures may be seminal for new communities!