An overview of experiences and assessments of educational, social and environmental impacts of DESY

Education & Human capital at DESY in 2010

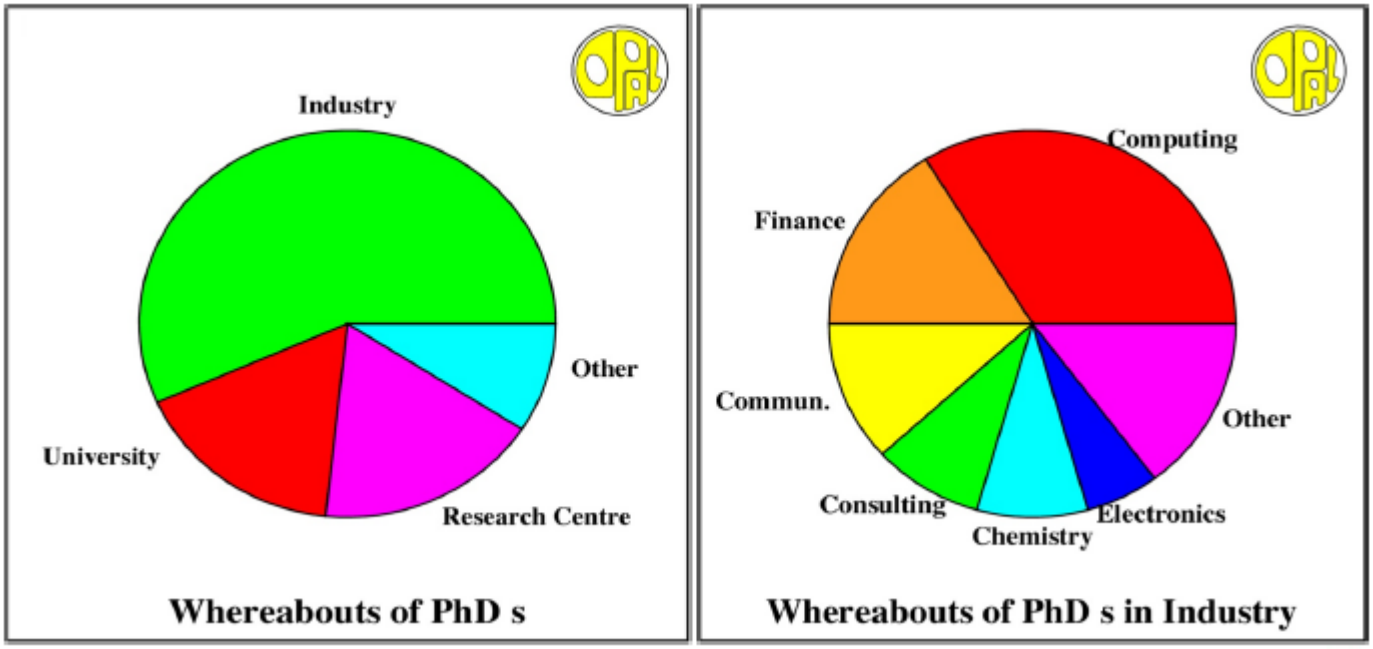
Supply of skilled graduates and researchers

- Training: **120 apprenticeships**
- **93 diploma students** (57 from german universities and research facilities and 36 from foreign institutions)
- **300 PhDs** (196 /104)
- **358 Postdocs** (213 /145)

- **Totally** DESY is involved in the education of **751 young scientists** per year
- 99 students from all over the world taking part in the **summer student programm** for 8 weeks
- **7900 pupils** visiting DESY in Hamburg and Zeuthen in the context of „Physik begreifen“

Education OPAL (Partical Physics Experiment at CERN)

- New **graduates entering industry** bring with them
  - **Knowledge of recent scientific research**
  - The skills needed to **perform research** and **develop new ideas**
  - Skills in using **advanced instrumentation and techniques**
  - The ability to solve **complex problems**
- **No DESY statistics** where Graduates are leaving to, but the OPAL experiment could give a hint for graduates in High Energy Physics (1983-2004)



Applying this allocations to HERA (1992-2007) with ~1000 PhD graduates
=> More than 500 graduates entered industry

Social Capital

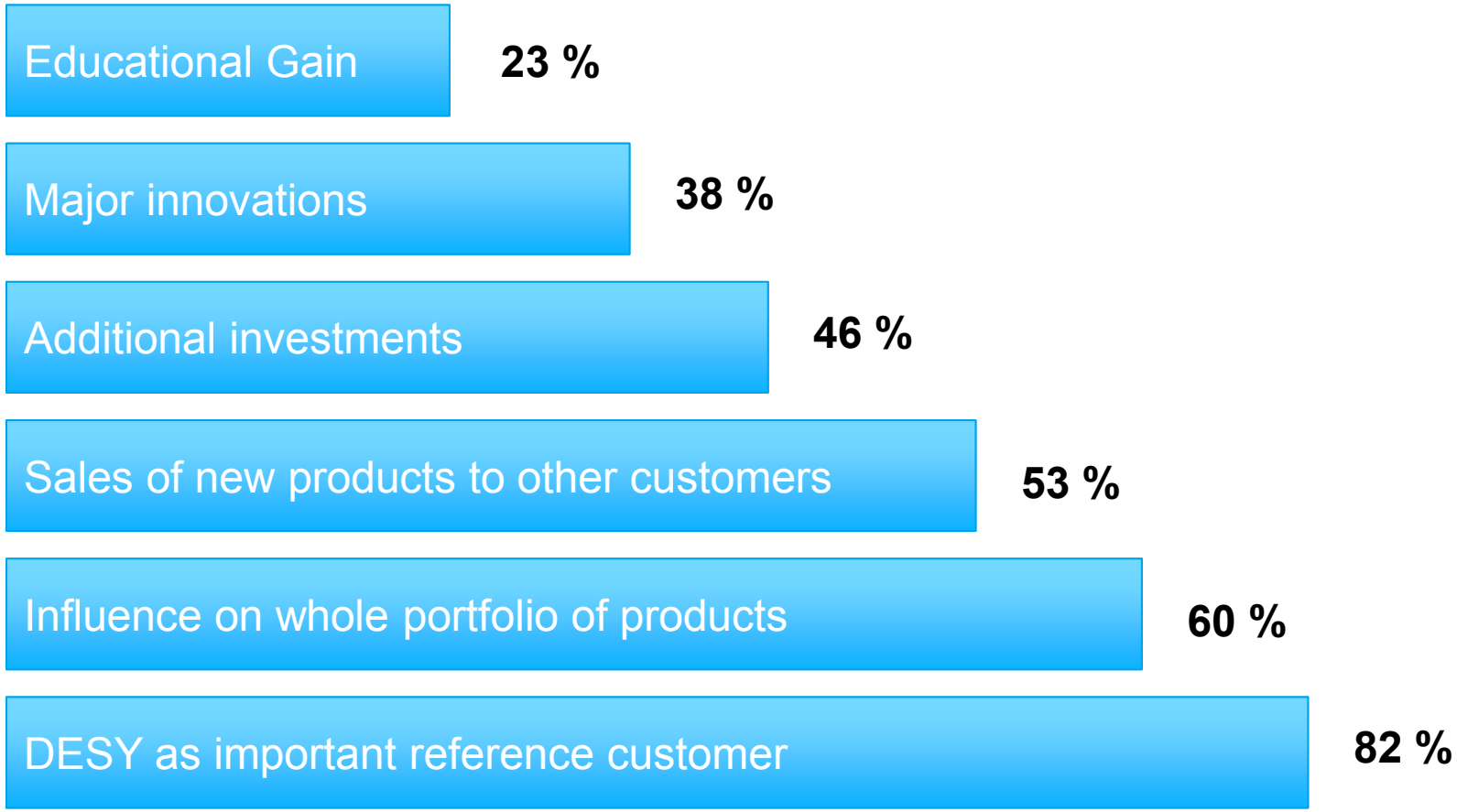
- *Social capital is broadly defined as the institutions, relationships, attitudes, and values that govern interactions among people and contribute to economic and social development* (Grootaert and van Bastelaert, 2002)
  - Readiness to give one another **access to their networks**
  - **Trust** is created and principle of **reciprocity** is reinvorced
  - Greater **overlap in knowledge** increasing the **efficiency of knowledge transfer**
- There is no linear **process of innovation** - Interactive nature of learning process characterises innovation
- Economic benefits are **difficult to measure**
- **Research infrastructures** provide an entry point into networks of expertise and practice
- **Small body of literature** dealing with social impacts of RIs

DESY No. of **business cooperation** in 2010: **26**
DESY No. of **scientific cooperation** in 2010: **414**
+ suppliers, funding organisations, goverment bodies, civil societies,…

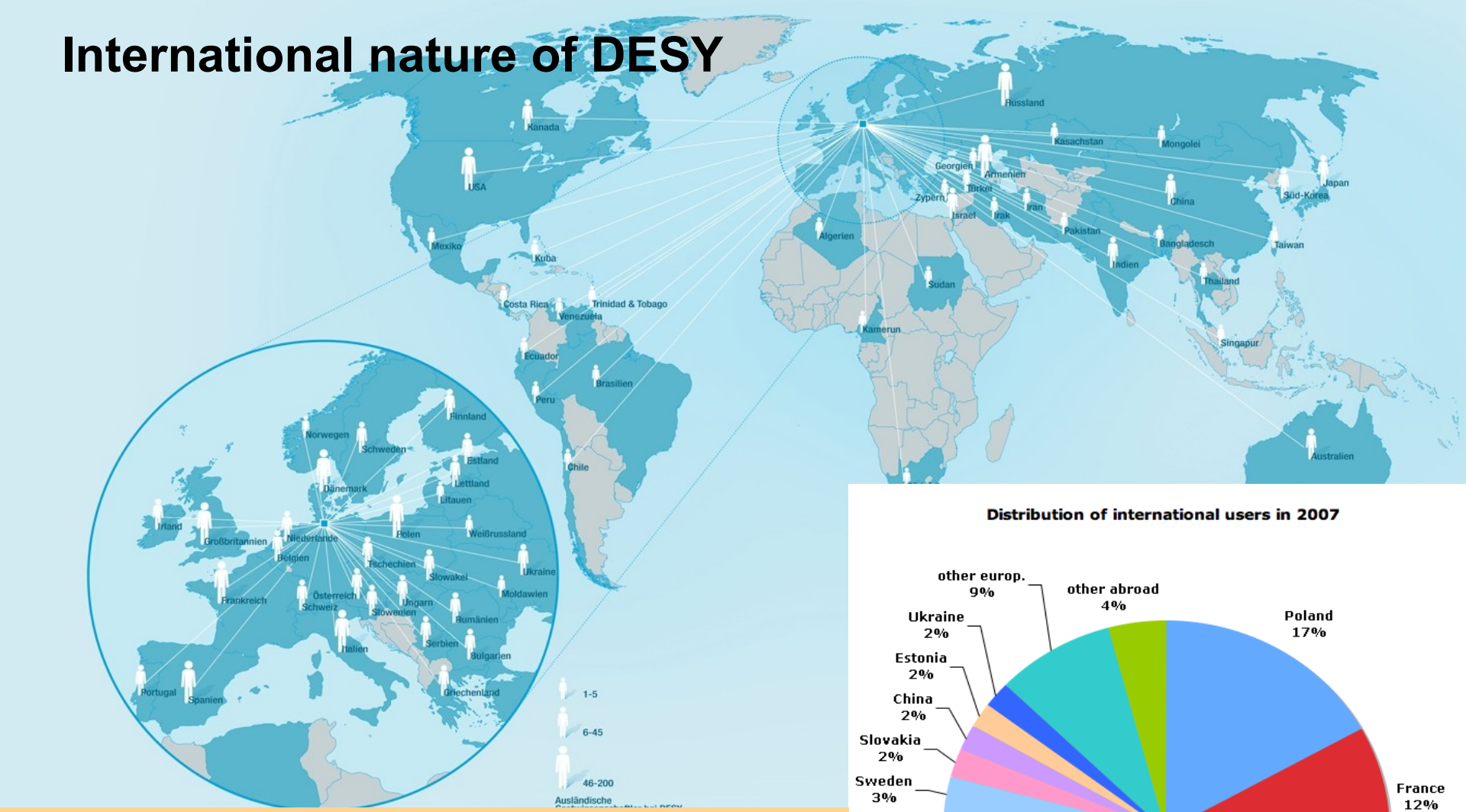
Example of Social Capital impact: Industry‘s benefits from TTF/FLASH

Benefits for their own business

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



International nature of DESY



Guest Scientists & Users ~ 3,000/year from over 45 nations

In 2007 at Hasylab:
German Users: 1045
Internat. Users: 757
No. Of Nations: 35

Example of social capital impact: Mobility & Innovation

- Research institutions and host countries benefit from inflow of human capital through in-migration of foreign scientists
  - Different educational background and origin may complement each other
  - Knowledge exchange stimulatse diversity and creativity leading to innovative and creative ideas
- Assumption that mobile scientists possess broader skills and social capital that are conducive for entrepreneurship
- According to study using a sample of approximately 2500 researchers from Max Planck Society foreign-born scientists (non German citizens) and foreign educated scientists (German scientists with PhD degree from foreign universities) are more likely to become entrepreneurs.




Science@DESY is energy intensive

Facilities at DESY have power input **24 MW**
Annual consumption of **200 GWh**
mainly provided by **fossil sources**
Releasing roughly **110 kt CO2** per year
~ energy consumption of german city with
50 000 inhabitants

Laboratories
(bio/chem/phys)
~300 kWh/(m²a)

Universities
~150 kWh/(m²a)

Residential area
kWh/(m²a)

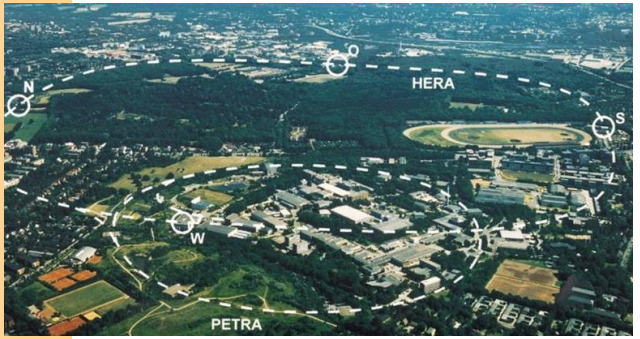
Future developments of energy prices?
How climate neutral/sustainable
should research centres be?
=> Strategic question of energy supply

RIs as a stimulating environment for technical and structural innovations

Better Energy management for facilities

Existing energy consumption data only on a high aggregated level

First step: set up an energy management controlling system



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.

Workshop Energy for Sustainable Science

Energy Management for Large-Scale Research Infrastructures

Conclusions

Education & Human Capital

- RIs play important role in capacity building. Added value is found mainly quality of the training provided.

Social Capital

- Need for better understanding about the impact of social capital of RIs
- Key Performance Indicators and measurements of Social Capital needed
- Positive relationship between career mobility and the propensity to engage in academic entrepreneurship

Environmental Impact

- Regarding the environment energy-intensive research infrastructures have a negative socio-economic impact, but…
- High potential to find innovative energy management solutions