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Exploring the possibility to develop on methodology for the evaluation of research infrastructure: the case of Estonia

by

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Overview of the Estonian research institutions



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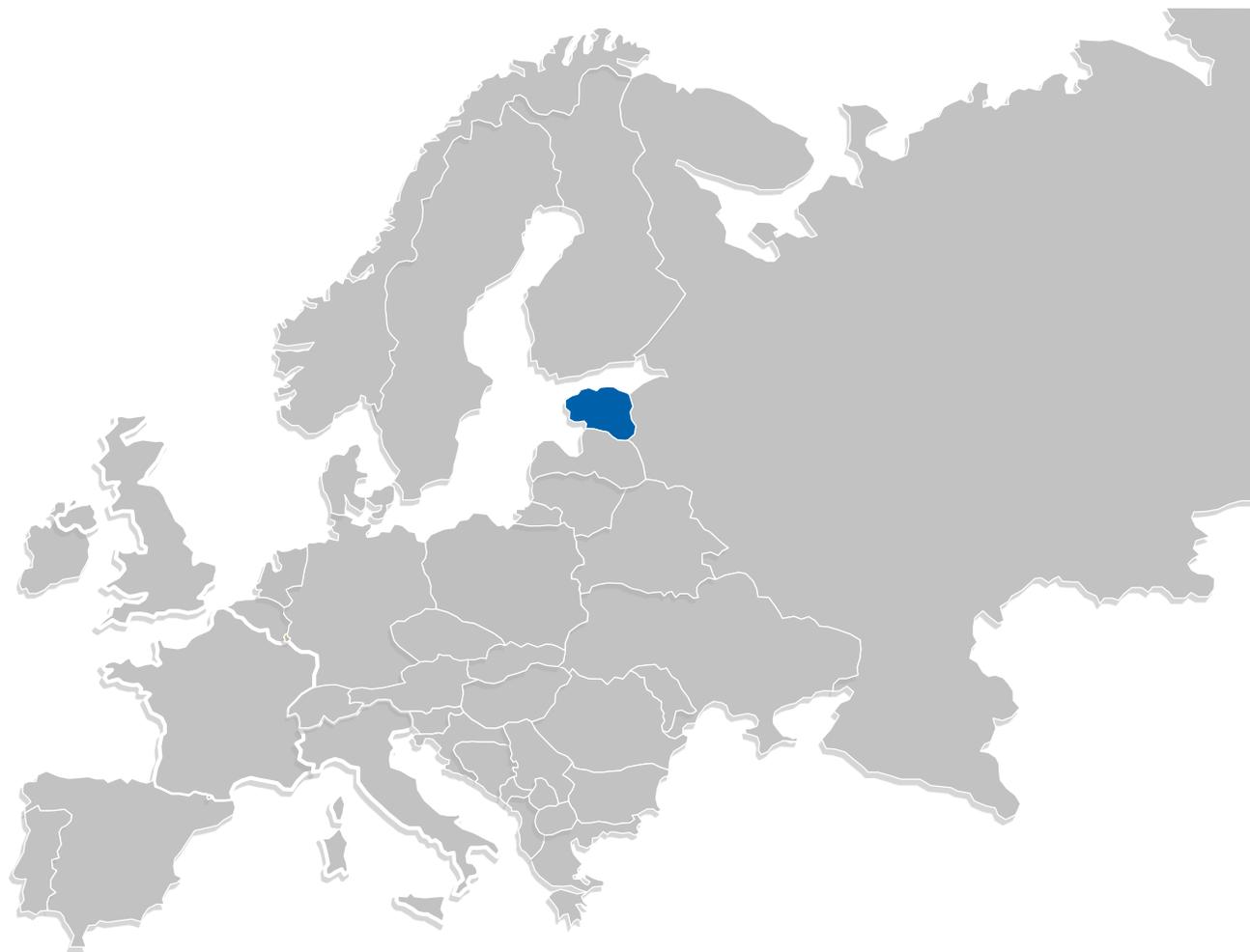
ESTONIA

1,3 mln inhabitants

20 HEIs (incl. 6 public universities and 1 private university)

47.700 students total (2017)

4.395 international students (2017)



Aim and research question



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- Current **research aims** to explore the possibility to develop on a methodological conceptual framework for the evaluation of the efficiency and performance of the research infrastructure, based on the example of the set of research infrastructure belonging to the Estonian universities and other research and development (R&D) institutions.
- The **main research question** to be asked is:
How to evaluate the use of the research infrastructure and what kind of methodology and methods to use for it?

Definition of research infrastructure (RI)



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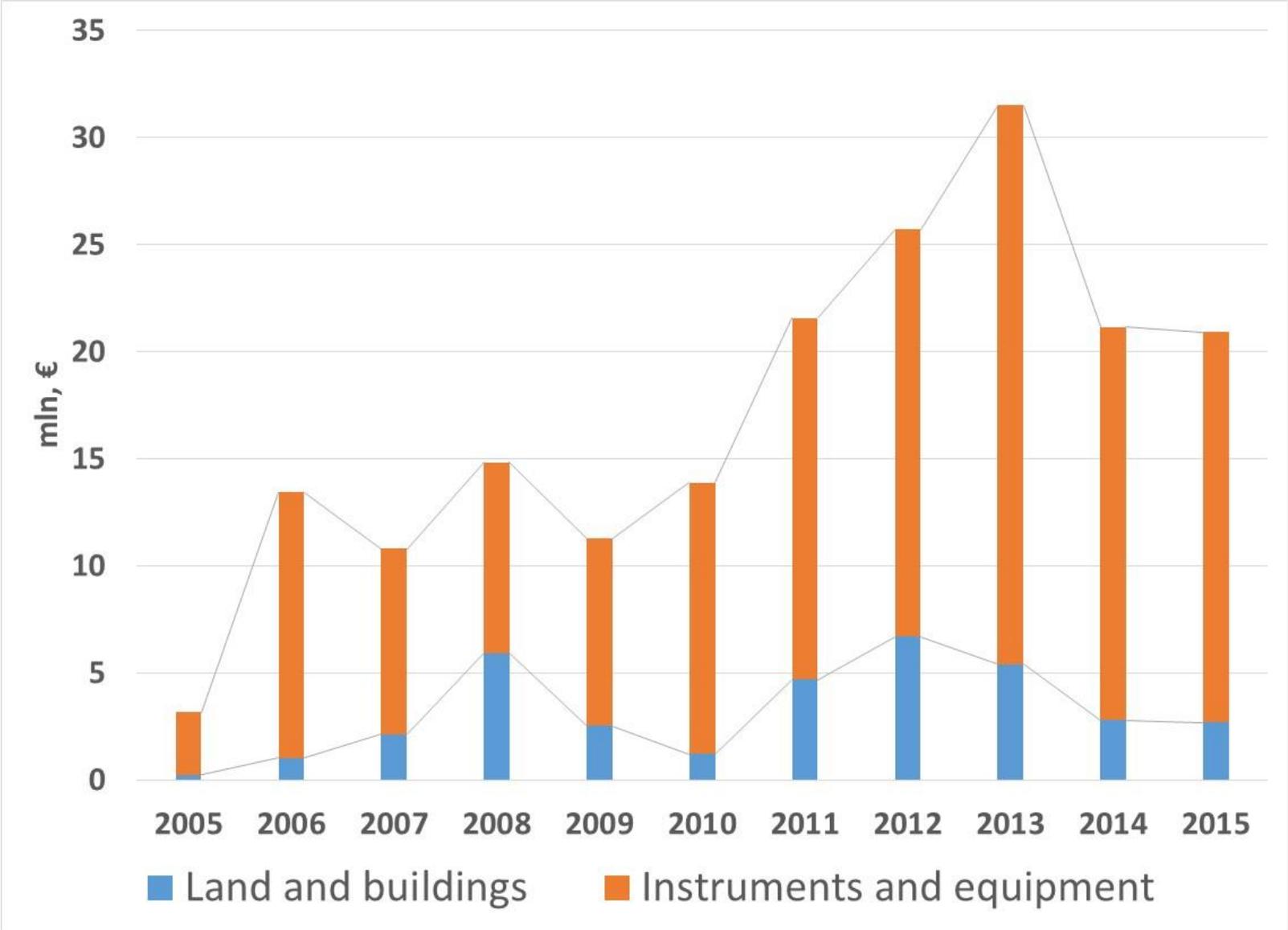
RI are facilities, resources and services that are used by the research communities to conduct research and foster innovation in their fields.

They include:

- major scientific equipment (or sets of instruments),
- knowledge-based resources (collections, archives and scientific data),
- e-infrastructures (data and computing systems, communication networks),
- any other tools that are essential to achieve excellence in research and innovation.

Source: Article 2 (6) of the Regulation (EU) No 1291/2013 of 11 December 2013: `Establishing Horizon 2020 - the Framework Programme for Research and Innovation (2014-2020)`

The importance of research infrastructure: an example of Estonia

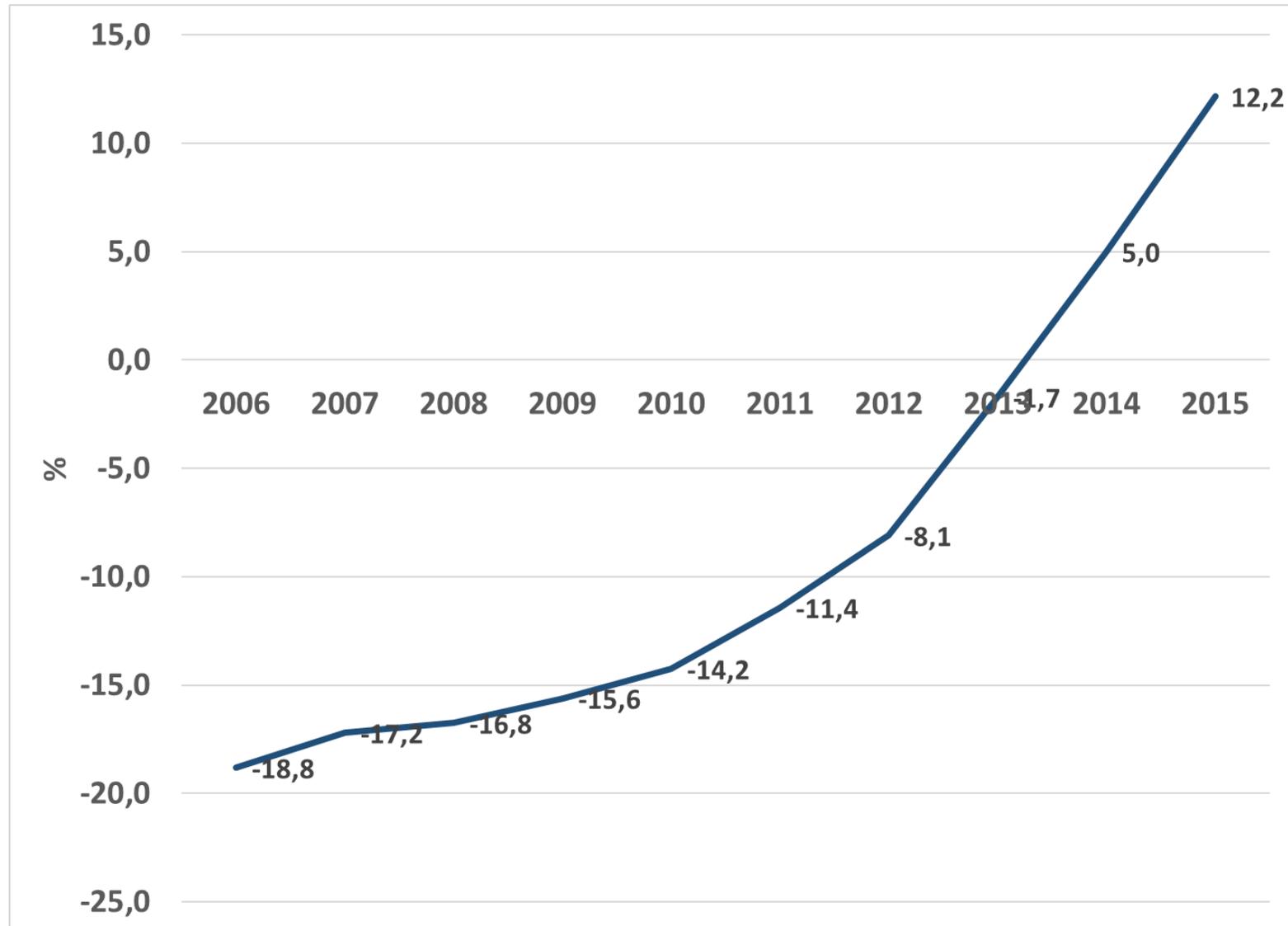


Source: compiled by the author, based on OECD 2018 database.

Citations per an Estonian scientist research paper relative to the World average



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Source: Web of Science, Essential Science Indicators, based on the calculations made by academic Jüri Allik.

Research funding and its main components in Estonia in 2016 (as an example)

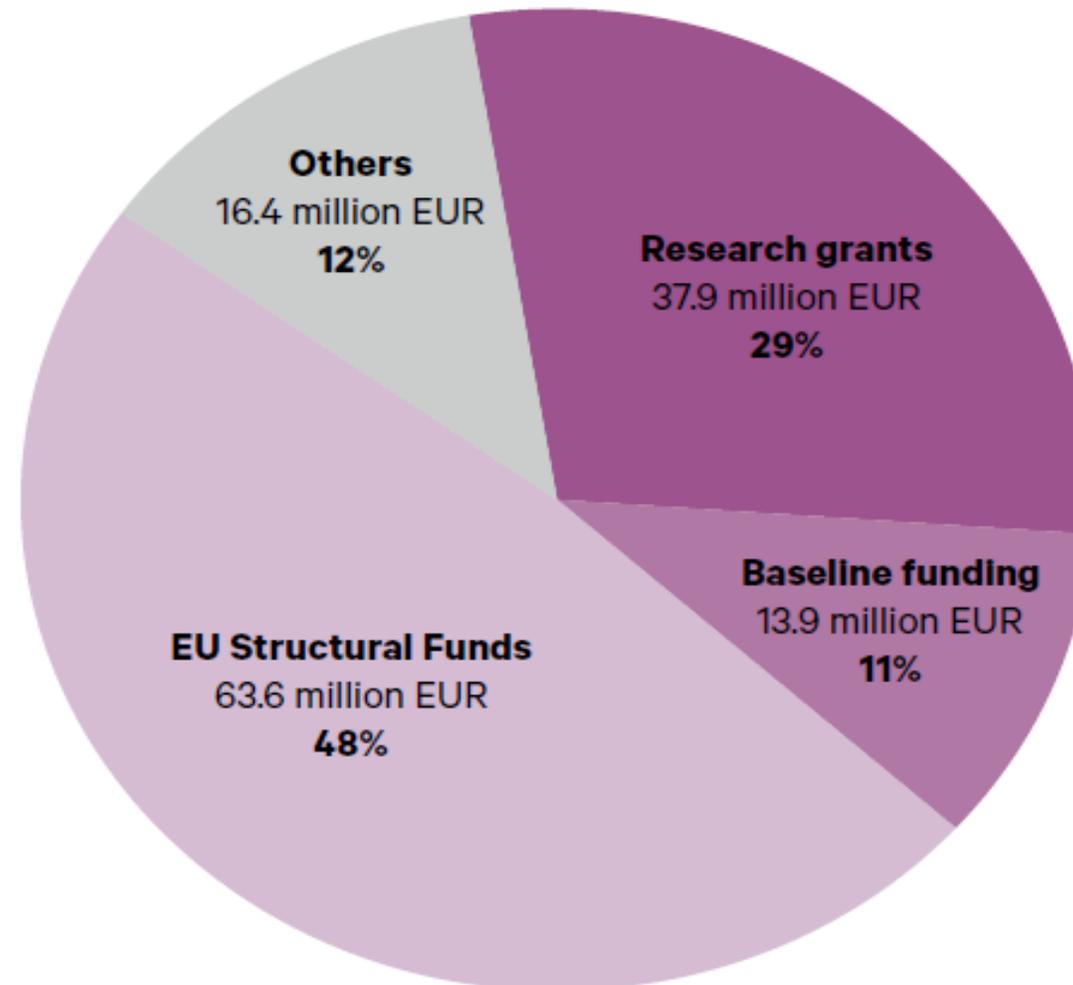


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- Research libraries
- Academy of Sciences
- Estonian Research Council
- National programmes
- Scientific collections
- Popularisation

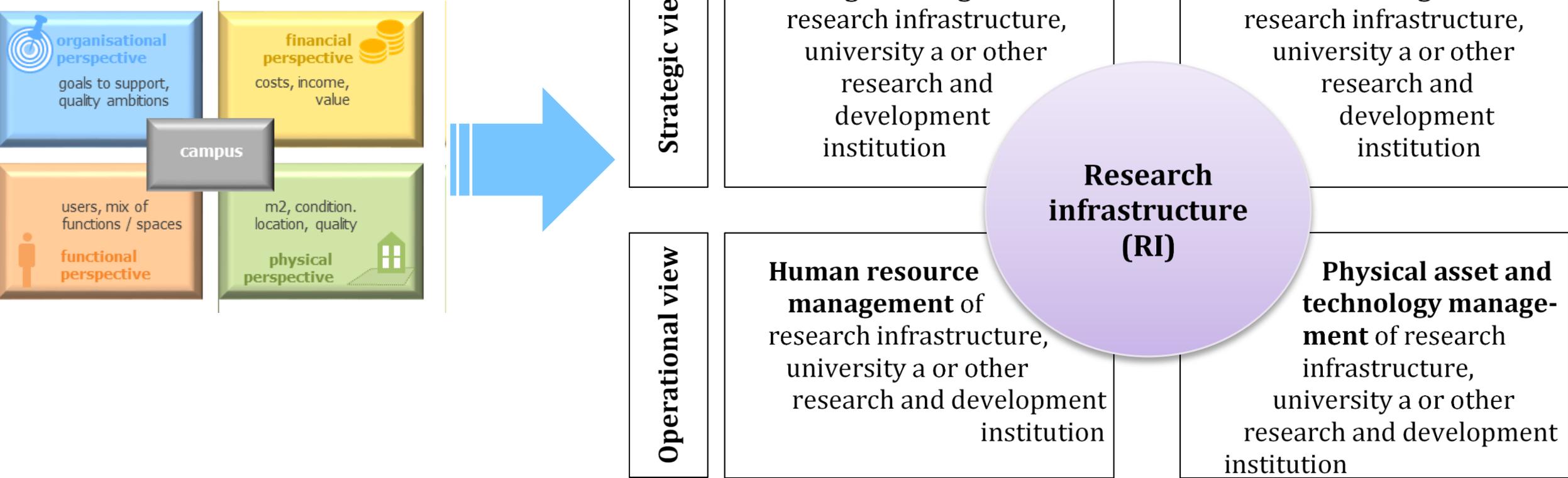
- ASTRA
- Centres of excellence
- Internationalisation (DoRa, Mobilitas)
- Applied research
- RITA
- National infrastructure
- Scholarships by research field
- Popularisation

- Institutional research funding
- Personal research funding



Total budget: 131.8 million EUR

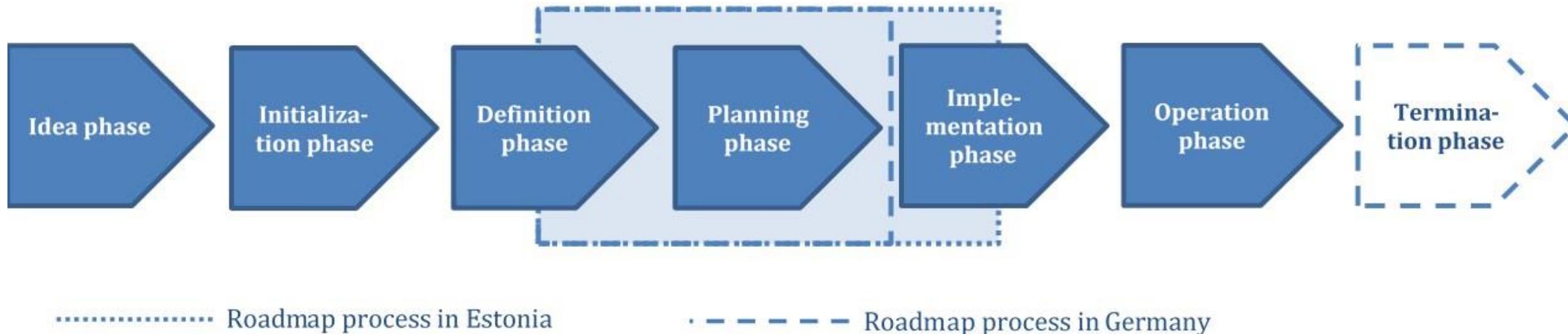
Strategic management of research infrastructure: positioning RI in CREM



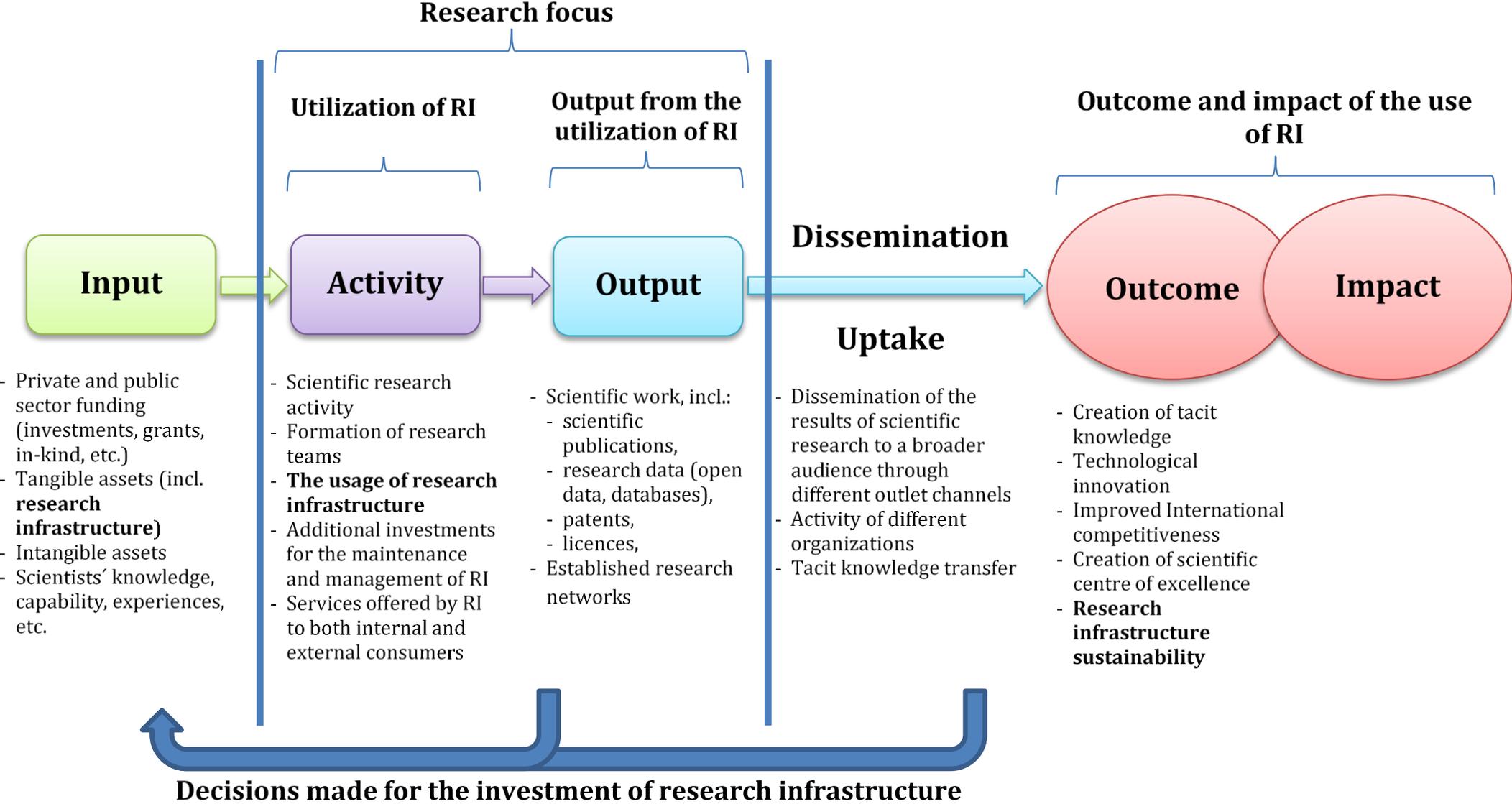
Source: modified by the authors, based on De Jonge et al. 2009.

Life-cycle based management of RI

- The European Strategy Forum on Research Infrastructures (ESFRI) applies a life-cycle approach coherent and consistent with RI funding under the EU Framework Programme for Research and Innovation (FP) and the Group of Senior Officials (GSO) concerning Global Research Infrastructures (GRI).
- The life-cycle of a RI is a reference to understand the needs and targets of RI at a given time and at various levels.



Logic model based evaluation of RI



Source: Elaborated by the authors, based on Ukrainski et al. 2017, Harland et al. 2015: 6, Griniece et al. 2015: 2.

Modes of categorization of RIs



- Research infrastructure can be categorized, based on:
 - geographical location (single-sited or locational or centralized, distributed RIs, virtual);
 - monetary measurement (small, medium, large);
 - hierarchy (unit-based, national, international, global);
 - physical characteristics (tangible, intangible);
 - the purpose of the use of RI;
 - the nature of the services provided by RIs;
 - the scientific disciplines;
 - the success indicators in the life-cycle phase;
 - combined categorization.

Evaluation of the use of RI: types of key performance indicators (KPIs)



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- **Direct use**
 - the number of users, time of the use, number of the uses etc.
- **Economic outcome**
 - an income the use and services provided by the RI, number of new jobs created, etc.
- **Human capital**
 - the number of engaged new (foreign) professors, etc.
- **Innovation**
 - the number of collaborative projects, created new technologies, new enterprises and/or ventures, etc.
- **Scientific research**
 - the new research data created by the RI, number of publications, number of research institutions in the research network, etc.
- **Social outcome**
 - the number of new solutions for the customers, development of local infrastructure, etc.

Alternative RI evaluation methods



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- Decision-tree
- Checklist
- Divide and choose procedure
- Indicators based index
- Multiple criteria decision analysis / Saaty Analytic hierarchy process

Conclusion and Discussions

- RIs are the second most important asset of universities and other R&D institutions next to people.
- RI is a strategic asset research institutions and therefore – a strategic view to the management of RI is in an utmost importance, aligned with the overall strategic goal of the research institution.
- For the successful implementation of the strategic management of RI, it is:
 - ✓ important to assess and evaluate both the short-term use and the long-term impact of the RI on the performance of the university, country, region (EU) and also global level research.
 - ✓ possible to assess and measure the use, the outcome of the use and also the output and impact of the use of RIs.
 - ✓ possible to apply already existing general asset management models and international standards (e.g., CREM models; BS ISO 5500 „Asset Management“ etc.).
- As RIs are rather heterogeneous assets, there is no single way for the categorization of RI, therefore the measurement system of the use of RI must be tailor-made rather than standardized – i.e., the set of KPI are rather unique per each RI.
- However, the data collection of the use of RIs should be implemented in an automated and standardized way (e.g., allowing to automatically match the RI with the particular scientific paper), in order to allow scientists do their main job and spend less time on ancillary activities; also for getting the comparable data on the national, regional and global RI ecosystem, if possible.

Thank You!



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