



Position Paper of Helmholtz Association of German Research Centres on
Enabling and Industrial Technologies in Horizon 2020

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HELMHOLTZ
| ASSOCIATION

The Helmholtz Association of German Research Centres with its almost 33,000 employees and an annual budget of 3.3 billion euros is Germany's largest research organisation and one of the largest in Europe. The Helmholtz Association participates in many European projects – often in a coordinating role – and benefits considerably from the established instruments of the Framework Programme of the European Union for Research and Technological Development. The instruments and actions of the Framework Programme contribute significantly towards supporting networking and collaboration between the scientists of the Helmholtz Association and researchers throughout Europe. They facilitate as well activities which cannot be realised at the national level or which provide added value in the form of collaborations at the European level.

Helmholtz Research and Development emphases and rationales in the area of Enabling and Industrial Technologies

Helmholtz Association as one of the largest European research organizations strongly engaged in the development of new technologies is having an eminent interest in [long term European support](#) in this field. The findings of the High Level Group on Key Enabling Technologies (KETs) propose some changes in the direction and scope. By our comments we would like to support the HLG and to give some additional input to this task oriented towards the shaping of the European Research and Innovation Area. It is our impression that the Research Performing Organizations will have an important role and contribution to realization of the KET goals.

Research under the Enabling and Industrial Technologies should lead to development of [generic technologies and new methods securing our society skills and capacities that it will need in the future](#). These are R&D areas and technologies that are bridging Life Sciences to Natural Sciences and Engineering, and Nanosciences through Micro Systems to the Macro World. Holistic approach by the Helmholtz Centres includes the entire value added chain from basic research to demonstration activities and in selected areas direct cooperation with the industry. Also the interdisciplinary cooperation which is in many cases a fruitful source for innovations is one of the features which should be more actively sought after.

Crucial and paying off is according to the Helmholtz Association [R&D at the borderline between life and non-life systems](#). This theme extends

- from development of bio-inspired solutions (information processing in living matter, cell surfaces and responses to ions/chemical agents),
- incorporation of bioelements into our "cold" technologies (cells as catalysts, energy producers or part of information processing systems),
- through biomedical engineering (imaging and diagnostics, drug development and delivery, functional implants/prostheses and tissue engineering)
- to work on Human/Brain-Machine Interface.

Continuing support should be given to [nanosciences and nanotechnologies](#) (nanoelectronics/ nanophotonics, soft nanotechnologies, nano-particles and eco-toxicology, nano-level design of energy storage systems).

A topic of crucial and immediate importance is highly specific material R&D. Here, we talk about

- development of advanced materials for electronics, photonics and photovoltaics; production, storage and transmission of energy (fuel cells, batteries, innovative storage means);
- generic functional materials; materials for extreme

- conditions (fusion, space, security/defense);
- environmental applications (membranes, catalysts, innovative chemical processes);
- light weight and progressive materials/solutions for transport and for ecologic/economic construction.

The present and future demand for materials for high-tech enabling solutions and products is closely related to extracting, processing, recycling and substituting [non-energetic raw materials](#). It would be advisable to understand these technologies also as a KET and include the support for corresponding R&D in the pillar on Industrial Leadership.

In connection to generic technologies and capabilities we see a continuing need of support to [electronic data processing](#). Urgent is to work swiftly on management and storage of [extra large data volumes](#) and their analysis with appropriate powerful tools and systems. This entails

- building and operating adequate e-Infrastructures (Supercomputer Centres),
- related services (Data Repositories incl. Data Annotation)
- and grand applications (Human Body/Human Brain models/simulations, structural/system biology or particle physics).

Related and pressing issues include [security and reliability](#) of the new ICT systems (including electronic control systems in general), and effective tools for [scaling up and porting existing computer codes](#).

Most of the above mentioned development is impossible without the [availability of world class research infrastructure](#) (RIs). As the technological development becomes more and more sophisticated and is done frequently on smaller and smaller scales, the possession of proper infrastructure becomes a larger and larger comparative advantage of the countries where it is located. Thus, (public) investment into construction - and coverage of its operating costs - is becoming a strategic necessity for any country or group of countries that are to flourish economically in the near future and should be such also for the EU. This is true even more for RIs without any obvious direct practical applications (synchrotrons, high-power lasers) which generate knowledge that needs to be at hand for successful, seemingly unrelated, more practical innovative R&D.

Final emphasis the Helmholtz Association wishes to make at this occasion is the need to include proper [education and training of new generation of KET researchers](#) in the picture. One of the key ways how to make MSc., PhD and post-doc programs in this "boring" and demanding field more attractive is a deepened cooperation and inter-linkage of academia and industry.

For further information please contact the Helmholtz Office Brussels.

BRIEF PORTRAIT OF THE HELMHOLTZ ASSOCIATION

In the Helmholtz Association, 18 German research centres have joined forces to share their resources in strategically oriented programmes to investigate complex questions of societal, scientific and technological relevance.

They concentrate on six major research areas: energy; earth and environment; health; aeronautics, space and transport; key technologies and structure of matter. The scientists work closely together across the centres on these issues.

The Helmholtz Association provides the necessary resources, a framework for long-term planning, a high concentration of scientific competence and an outstanding scientific infrastructure with major projects, some of which are unique worldwide.

The research objectives of the Helmholtz Association are set by the funding bodies after discussions with the Helmholtz centres and the Helmholtz Senate and Assembly of Members. Within this framework, the scientists of the Helmholtz centres determine the themes of their research through strategic programmes in the six research areas across centres.

(Source: "Strategy of the Helmholtz Association," Berlin 2009, updated 2012)

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Helmholtz Centres

- Alfred Wegener Institute for Polar und Marine Research
- Deutsches Elektronen-Synchrotron DESY
- German Cancer Research Center
- Deutsches Zentrum für Luft- und Raumfahrt
- Deutsches Zentrum für Neurodegenerative Erkrankungen
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- Helmholtz Zentrum München, German Research Center for Environmental Health
- Karlsruhe Institute of Technology
- Max Delbrueck Center for Molecular Medicine (MDC) Berlin-Buch
- Max Planck Institute for Plasma Physics (associated member)

This paper presents a consensus of the views
of the Helmholtz Association and its centres.

Please direct further questions and comments to:

Dr. Susan Kentner
susan.kentner@helmholtz.de

Dr. David Kolman
david.kolman@helmholtz.de

Helmholtz Association Brussels Office
Rue du Trône 98
B -1050 Brussels, Belgium
www.helmholtz.de/en

