Environment-health and climate change nexus:
*Is there a need for a pan-European research infrastructure?*

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ESFRI - European Strategy Forum on Research Infrastructures

- **Strategic instrument** to develop the scientific integration of Europe and to strengthen its international outreach.
- **Competitive and open access to high quality Research Infrastructures** supporting and benchmarking the quality of the activities of European scientists, and attracting the best researchers from around the world.
- Operates at the forefront of European and global science policy and contributes to its development translating political objectives into concrete advice for RI in Europe.
ESFRI Working Groups

Since 2006, ESFRI has presented a series of Roadmap updates supporting a coherent and strategy-led approach to the development of pan-European Research Infrastructures, which would ensure that scientists in Europe have access to world-class facilities enabling them to do cutting-edge research. This has been possible by establishing the Strategy Working Groups in five research domains and the Implementation Group, transversal to all research areas. A series of ad-hoc Working Groups periodically performed an in-depth analysis of the scientific aspects and the maturity features of the Research Infrastructures of ESFRI portfolio.

IMPLEMENTATION GROUP

Implementation
The Implementation Group is the ESFRI instrument to analyze the maturity features of Research more..

STRATEGY WORKING GROUPS

Energy
The Energy SWG monitors and assesses the implementation of existing Energy Research Infrastructures more..

Health and Food
The Health and Food SWG monitors and assesses the implementation of existing Health and Food RIs. more..

Environment
The Environment SWG follows up the scientific developments and initiatives in the field of the more..

Social and Cultural Innovation
The Social and Cultural Innovation SWG monitors and assesses the implementation of existing Social more..

Physical Sciences and Engineering
The Physical Sciences and Engineering SWG monitors and assesses the implementation of existing more..

Data, Computing and Digital Research Infrastructures
As novel proposals with a dominant, or substantial, digital research infrastructure character have more..

AD HOC WORKING GROUPS

Innovation
The Working Group on Innovation – INNO WG – was set up in 2013 in order to propose to the Forum more..

e-infrastructures Group
The main goal of the e-INFRA WG is to analyse the investment strategies of the Member States in e- more..

Long-term Sustainability Group
The objective of the LTS WG is to provide a consolidated input to the European Commission – EC – more..

Neutron Landscape Group
The Expert Group on Neutron Landscape – NLG – was mandated in 2014 by the Physical Sciences & more..

Monitoring
In May 2018, the Competitiveness Council adopted conclusions on Accelerating knowledge circulation in more..
A gap identified in the Health&Food domain of 2018 ESFRI Roadmap

„There is a need to enable a research infrastructure that will facilitate research on the human health and wellbeing at all stages in development, including ageing, nutrition and behavioural studies, and their connections to the social sciences and humanities. There are geographic, economic and environmental drivers affecting human health and wellbeing. Climate change, extreme weather, dramatic changes in ecosystem services, environmental pollution and exposure to harmful chemicals represent a new combination of issues that require an integrated approach at pan-European level.

At the heart of this approach is the EXPOSOME, taking a holistic view throughout the human lifetime on the effect of exposures to diet, lifestyle, and the environment on human health and disease. The EXPOSOME coupled with advanced genetic and medical approaches represents an opportunity to tackle this complex issue by connecting to the landscape of Health & Food RIs and other domains. Ongoing EU projects and networks on human biomonitoring (HBM4EU and EMEP) are important steps to bring together relevant parties.”
EXPOSOME:
Internal and external factors
Life course dimensions

EXTERNAL
- Occupational environment
- Urban environment
- Indoor environment
- Life style factors
- Social environment

INTERNAL
- Compound levels
- Host metabolism
- Biological processes
- Molecular function
- Microbiome interactions

HEALTH
Respiratory
Cardiovascular
Mental
Metabolic
etc.

LIFE COURSE DIMENSION
EIRENE RI (coordinated by RECETOX, CZ)
Research Infrastructure for Environmental Exposure assessment in Europe

User communities
Research and education, chemical management, innovation, risk assessment, food safety, environmental policy, public health

Top-down exposomics
- Environmental samples and data (air, water, food, consumer products, indoor)

Bottom-up exposomics
- Human cohorts, biomarkers and health outcomes, socio-economic and psychological factors, lifestyle, diet

Exposomics
- Markers of exposure

(epi)Genomics
- Markers of susceptibility

Metabolomics
- Markers of effect

Data integration
- Biocomputing, advanced biostatistics
- ELIXIR

Data interpretation
- Epidemiology, mechanistic toxicology, risk assessment and modelling
- Data to knowledge
- Artificial intelligence, machine learning

Top-down exposomics
- Monitoring networks
  - ACTRIS RI
  - ICOS ERIC
  - METROFOOD

Bottom-up exposomics
- Biobanks, clinical and epi studies
  - BBMRI ERIC
  - ECRIN ERIC

Inventories of cohorts, networks, data

Lab inventories, sample management and traceability, IDs

Integrative analysis

Methodological harmonization, QA/QC consolidation, and capacity building
EIRENE key facts

- Research Infrastructure for Environmetal Exposure assessment in Europe;
- Addressing major obstacles in advancing science of human exposome;
- Supporting chemical strategy for sustainability;
- Filling existing gaps and strengthening synergies with existing RIs and projects;
- Providing sustainability for the outcomes of the EU joint programmes;
- 17 national Nodes, 50 individual partners;
- 9 official political supports, 9 national projects, 5 financial supports, 2 national roadmaps.
How EIRENE RI will approach the risks due to the fact the work to be done builds on many other projects or programmes as the European environmental monitoring networks and their databases (EMEP, GMP, GMOS), the GEO initiatives, EU projects, EU monitoring initiatives, UNEP/WHO, EU exposome etc.?

There is a strong need for **interdisciplinarity** in science, clustering of existing RIs, and opening the EU science;

EIRENE consortium is **interdisciplinary** but homogenous: several of the partners work across several fields, and demonstrate experience in testing approaches in other EU programmes (ERA-Net, EJP);

GMP supported by UNEP/WHO has been **already closely linked** to GMOS or EMEP through the H2020 ERA-PLANET and their **data harmonized** and made available through GEO Flagship/Initiative supported by the H2020 e-Shape project. There is further initiative to build a new EU Partnership on Agriculture by merging successful Era-Nets (ERA-PLANET and AgriFOOD);

Most consortium members have been collaborating in HBM4EU to harmonize **human biomonitoring efforts** and EU funded **exposome projects**;

Horizon Europe **PARC partnership** (under preparation) links the environmental and human exposure risks (EIRENE partners are co-leading all infrastructural elements of as well as cross-cutting working groups of the **H2020 EHEN and EURION clusters** to enhance the synergies and harmonize approaches);

EIRENE RI will benefit from the developments and provide a platform for their **sustainability and accessibility** of existing capacities to wide research community.
EIRENE layers of exposome data, Knowledge platform and Virtual Labs

Domain specific or ad hoc data aggregation according to requests from Virtual Labs. Data from local/national storages can be copied to one place if needed for the data analysis and processing.

Virtual Laboratories at Knowledge Platform distributed infrastructure for data analysis.

Data transfer or distributed analysis.

Graphical User Interface of the Knowledge Platform and access to Virtual Labs.
HERA Research Goals:

5.2 Development of laboratory capacities for assessment of the chemical exposome and its functional impacts

Objective: Develop a distributed research infrastructure providing sufficient laboratory capacities for assessment of human exposome, i.e. a combination of methods for target and non-target analysis of exposure and effect biomarkers.

5.1 Well-designed and maintained population cohorts and related biobanks

Objective: Establish a coordinated and harmonized infrastructure of population cohorts and biobank capacities of existing and future epidemiological cohort studies in Europe, with the goal to spearhead research in the area of environment, climate change and health.

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Thank you