Institut
"Jožef Stefan"
Ljubljana, Slovenija

Department of environmental sciences – O2

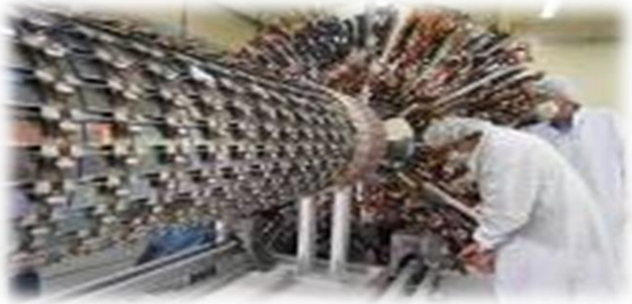
Prof. dr. Milena Horvat

www.environment.si

JSI research departments

Human resources:

- 850 researchers
- 250 support staff and administration
- 200 PhD students



PHYSICS AND NUCLEAR TECHNOLOGY

F1 Theoretical Physics
F2 Low and Medium Energy Physics
F3 Thin Films and Surfaces
F4 Surface Engineering and Optoelectronics
F5 Solid State Physics
F7 Complex Matter
F8 Reactor Physics
F9 Experimental Particle Physics
R4 Nuclear Engineering

CHEMISTRY, BIOCHEMISTRY, NEW MATERIALS

K1 Inorganic Chemistry and Technology
K3 Physical and Organic Chemistry
K5 Electronic Ceramics
K6 Engineering Ceramics
K7 Nanostructured Materials
K8 Synthesis of Materials
K9 Advanced Materials
B1 –B3 Biochemistry

ENVIRONMENTAL SCIENCE

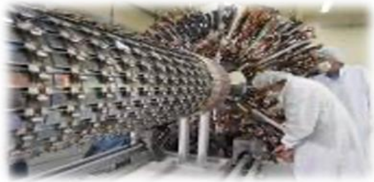
O2 Environmental Sciences

ELECTRONICS AND INFORMATION TECHNOLOGIES

E1 Automation, Biocybernetics and Robotics
E2 Systems and Control
E3 Artificial Intelligence
E5 Open Computer Systems and Networks
E6 Communication Systems
E7 Computer Systems
E8 Knowledge Technologies
E9 Intelligent Systems

Education

Human resources:
- 750 researchers
- 250 support staff and administration
- 200 PhD students



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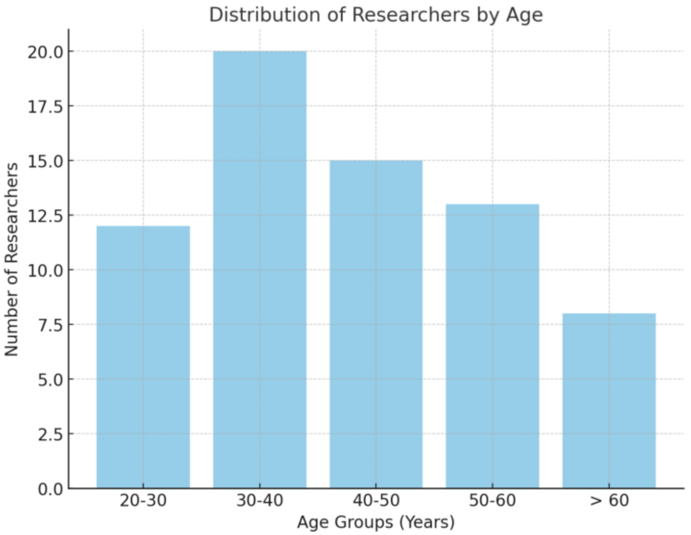
JOŽEF STEFAN
INTERNATIONAL
POSTGRADUATE SCHOOL

Staff members
Total no. 72

32 researchers (18F+ 14M)
14 post doc researchers (10F+4M)
18 PhD students (10F + 8M)

3 administrative support
4 technical support
16 habilitations



Two locations:

Jamova: 16

Reaktor : 56

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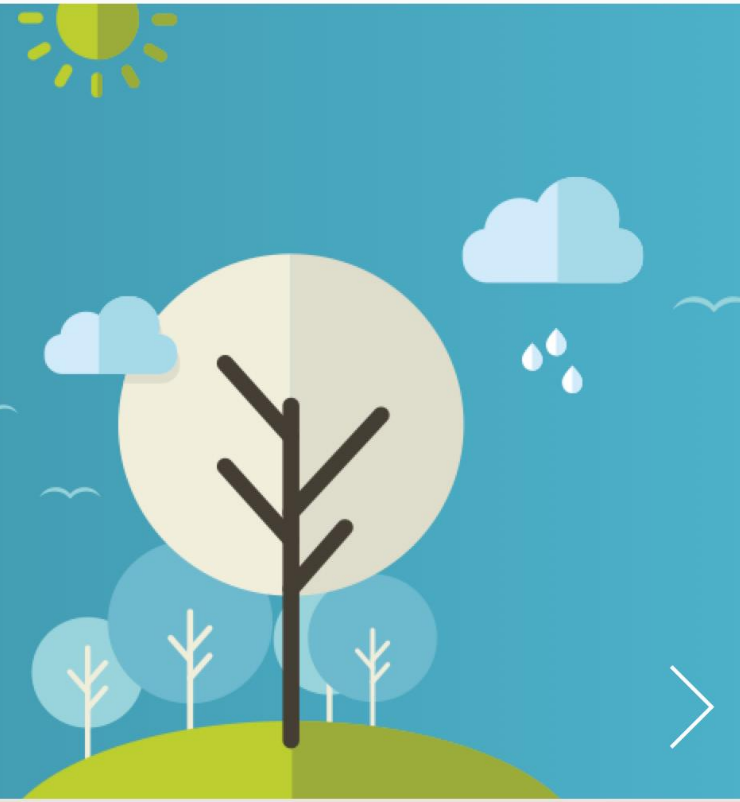
DEPARTMENT OF ENVIRONMENTAL SCIENCES
@ JOŽEF STEFAN INSTITUTE

Contacts | Events | News | Accreditations | Intranet

ACTIVITIES | PROJECTS | SERVICES | ORGANISATION AND PEOPLE | INFRASTRUCTURE | PUBLICATIONS

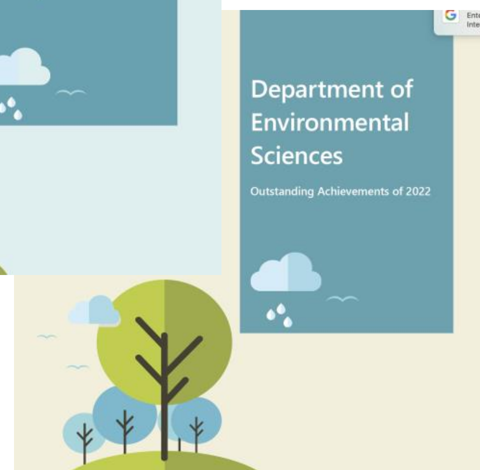
Department of Environmental Sciences

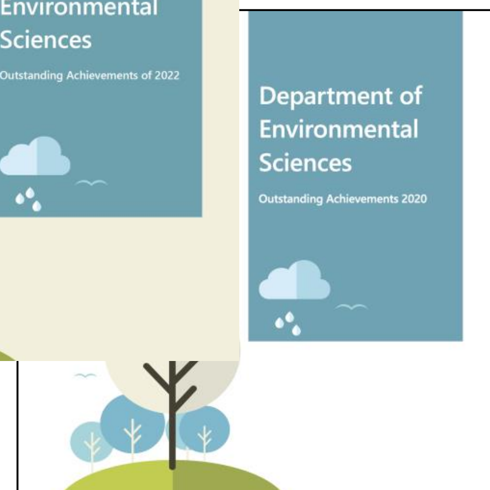
The Department of Environmental Sciences encompasses a broad range of research activities, diverse and varied as the environment itself.

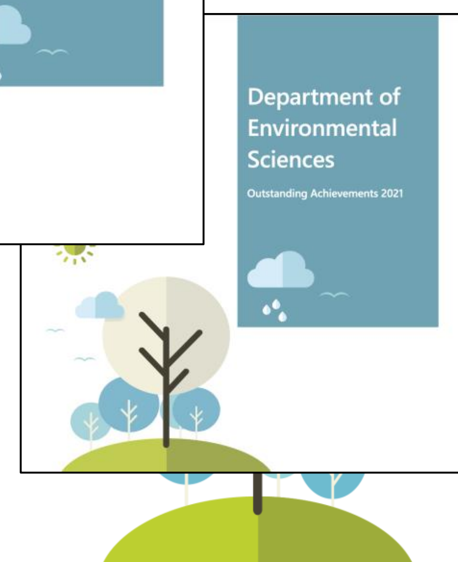


Summaries of yearly achievements

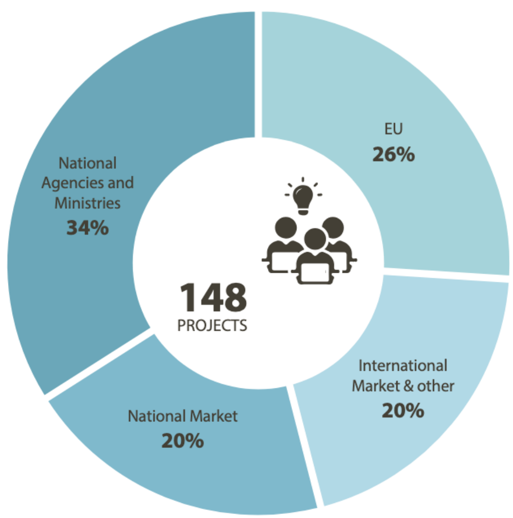
www.environment.si



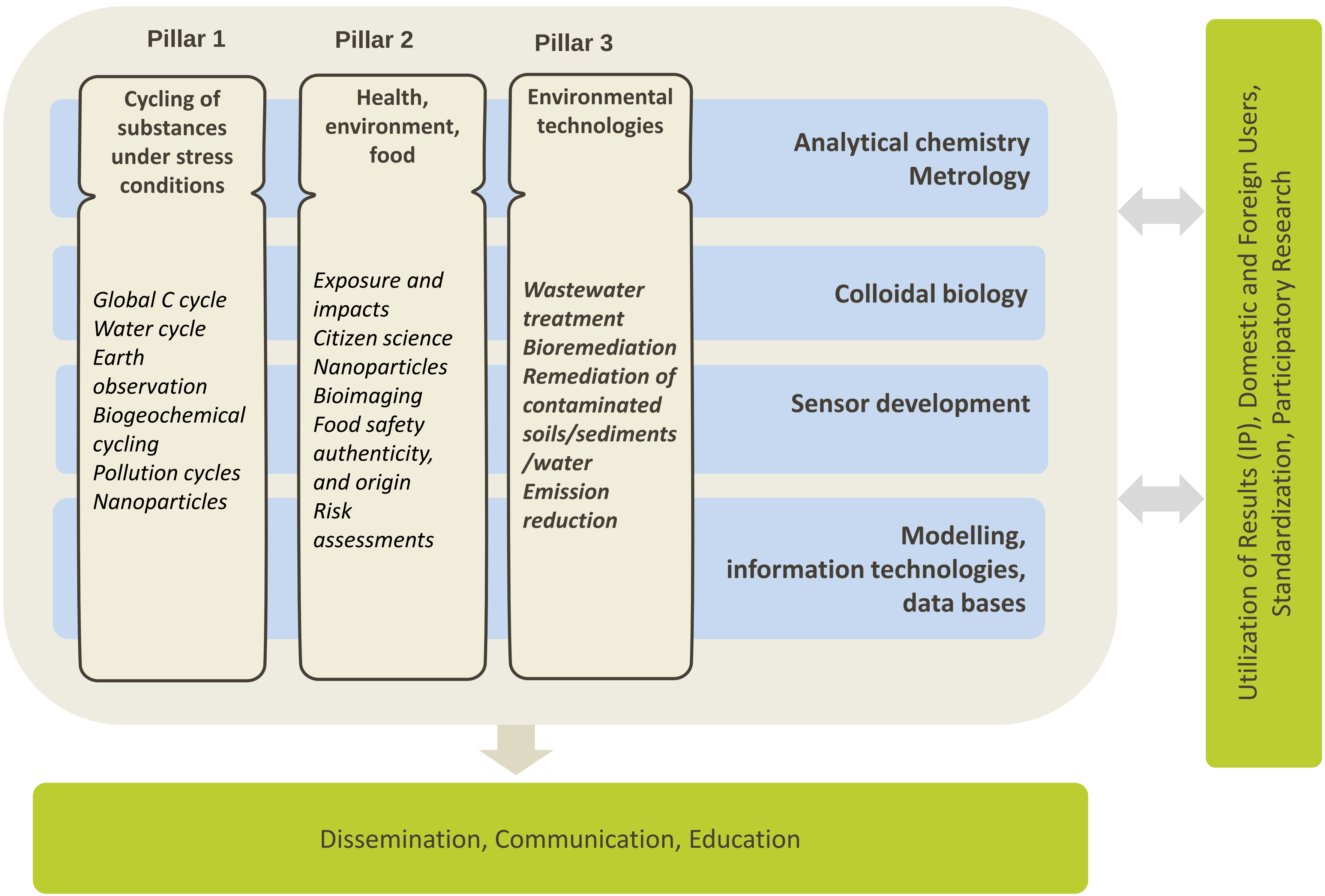




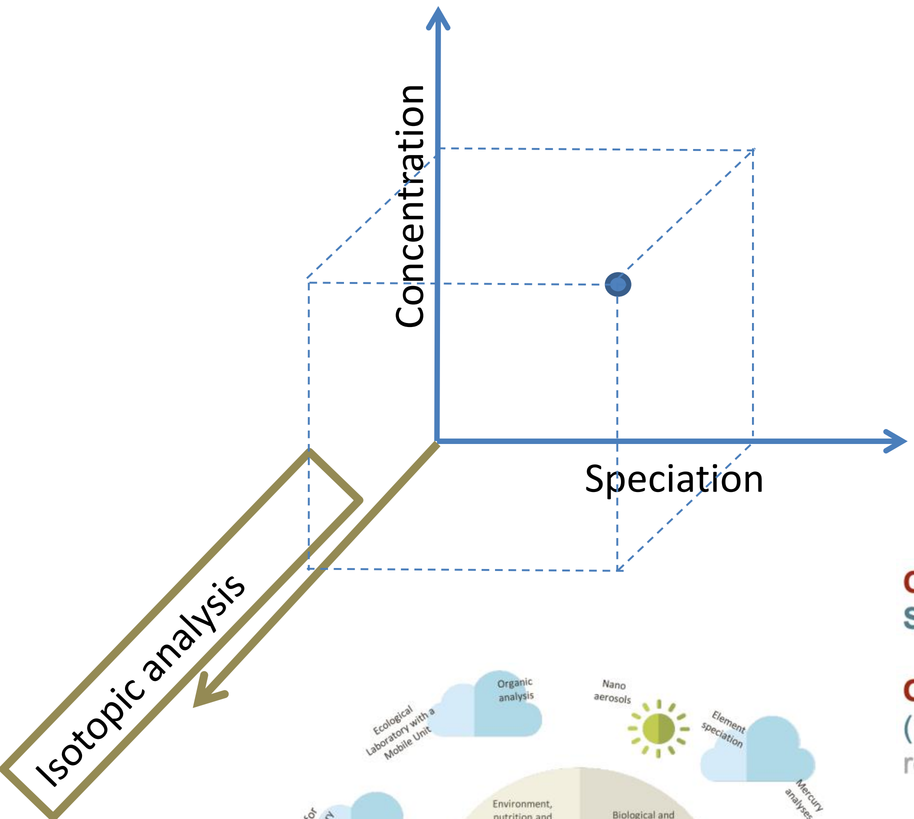
Financing (6.6 Mio EUR/2025)



Research activities



Substances



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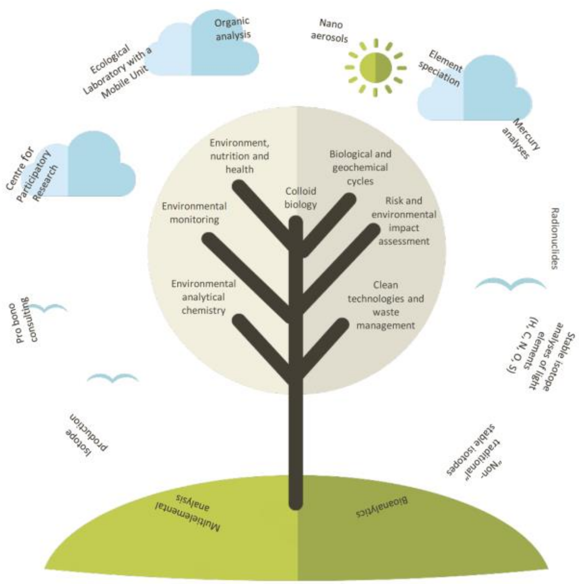


Chemical elements and their species:
Speciation: As, Se, Hg, Cr, Sn, Sb, Pb, Cd, Al, Zn, Fe, Pt, ...

Organic substances:, POPs (PCB-ji, PAH, etc..) CECs (pharmaceuticals, pesticides, Phtalates, PFAS, bisphenols, flame retardants), chemical mixtures (sreeening, non-target ....)

Nutrients: nitrogen, sulphur, carbon, water cycles

Stable isotopes: δ2H, δ13C, δ15N, δ18O, δ34S, and heavy elements (Hg, Sr, Pb, U, etc...)

Nanoparticles: inorganics(metal particles), plastics, etc..

Radionuclides:
- **Natural:** ^{235}U, ^{234}U, ^{238}U, ^{228}Th, ^{230}Th, ^{232}Th, ^{226}Ra, ^{226}Rn, ^{210}Po, ^{210}Pb, ^{40}K
- **Manmade:** ^{241}Am, ^{238}Pu, $^{239+240}$Pu, ^{137}Cs, ^{134}Cs, $^{89/90}$Sr

Accreditation

SLOVENSKA AKREDITACIJA
SIST EN ISO/IEC 17025
LP-090

CIPM MRA

- Trace and major elements by k_0-NAA
- ^{14}C in alkaline solution, tritium activity in solution by LSC
- Strontium by beta counting
- $^{13}C/^{12}C$ stable isotopes in methanol using MS
- $^{18}O/^{16}O$ in water of foodstuff using MS

- Designated institute in the national metrology system
- BIPM DI – Metrology in chemistry
  - Trace and major elements in biological and environmental samples
  - Planned: stable isotopes ration measurements in environmental and biological samples

Scale ....

Global

Regional

Local

Organisms

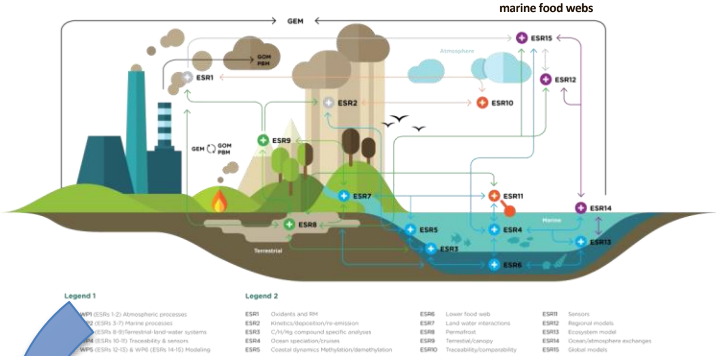
Molecular

Global scale:

Global biogeochemical Hg Cycle, GMOS-Train project

The overall objectives:

1) to provide urgently needed training in Hg science within the context of the UNEP Minamata Convention
2) to fill key knowledge gaps in biogeochemical Hg cycling linking anthropogenic emissions and Hg in marine food webs



Regional scale:

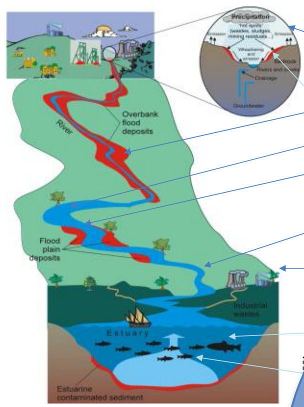
Mercury distribution in soil and air in Idrija:
(Kocman et al., 2004, 2010, 2011a,b,c; 2013; Tomiyasu et al, 2006, 2012, 2017; Esbri etal. 2010; Nolde et al., 2005, 2006; Lllanos et al.2011; Esbri et al., 2010; Kotnik et al; 2004, 2005, 2013; Gronlund et al., 2005, Gnamuš et al., 2000)

Mercury speciation in Idrijca and Soča rivers:
(Horvat et al., 2002, Žižek et al. 2007, 2008, 2011; Jereb etal., 2003; Bonzongo et al., 2002; Hines et al. 2000, 2006, 2017)

Distribution of Hg species in the coastal area of the Gulf of Trieste:
(Horvat et al., 1999, 2003, 2013, 2014; Faganeli et al., 2003, 2014, 2018; Hines et al., 2012; Bratkič et al. 2013, 2017, 2018; Covelli et al. 1999, 2001, 2006,2008; Ogrinc et al., 2019; Aquvita et al., 2012; Emili et al., 2012; Baldi et al. 2012 a,b.; Živković et al., 2018; Patranich et al., 2018)

Mass balance and modeling:
(Rajar et al. 2000, 2004, 2007; Širca et al. 1999; Žagar et al., 2001, 2006. 2014; Ramšak et al. 2013; Massoualieh et al., 2010)

Mercury in the marine systems:
(Horvat et al., 2004; Ogrinc et al., 2007; Kotnik et al., 2007, 2014, 2015, 2017; Buckman et al. 2018; Živković 2017a,b)



Methodological improvements

Atmospheric Hg dynamics: Improved understanding of atmospheric Hg observations

Reactivity and mobility of mercury in soil

Watershed mercury dynamics

Mercury methylation in the riverine systems and the reservoirs using novel isotopic techniques

The **reactivity of terrestrial Hg along land to sea transect**

Atmospheric Hg dynamics: Improved understanding of atmospheric Hg observations

MMHg formation and degradation processes in coastal marine environments

Sorption and uptake rates of dissolved Hg and MMHg species by key marine particles, **Biosensor**

Molecular level
Hg and Se interaction in humans

Fish consumption dilemma

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Healthy eating patern
Proteins
Unsaturated fatty acids
Iron, zinc, **selenium**
Iodine, vitamin B12, vitamin D,
Choline

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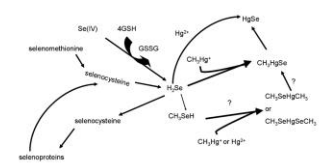
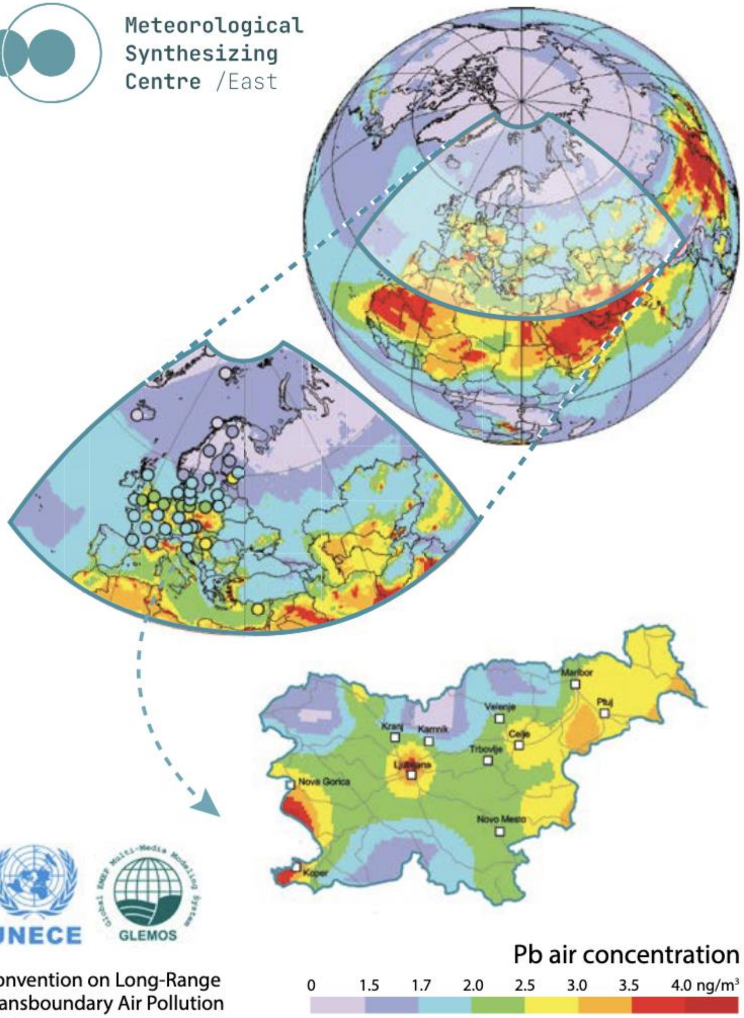
Contaminants in fish
Mercury
PCBs,
PBDEs,
dioxins,
chlorinated pesticides



https://msc-east.org/

Air Pollution Modeling for Better Environmental Policy

Meteorological
Synthesizing
Centre /East



UNECE GLEMOS

Convention on Long-Range Transboundary Air Pollution

Computer modeling is an essential tool in understanding and mitigating environmental pollution. By integrating air monitoring data with chemical transport models, we can gain a comprehensive insight into the levels and movement of toxic substances in the atmosphere and other environmental media. These models enable us to track the dispersion pathways of pollutants, assess contamination levels, and inform effective policy actions to reduce environmental harm.

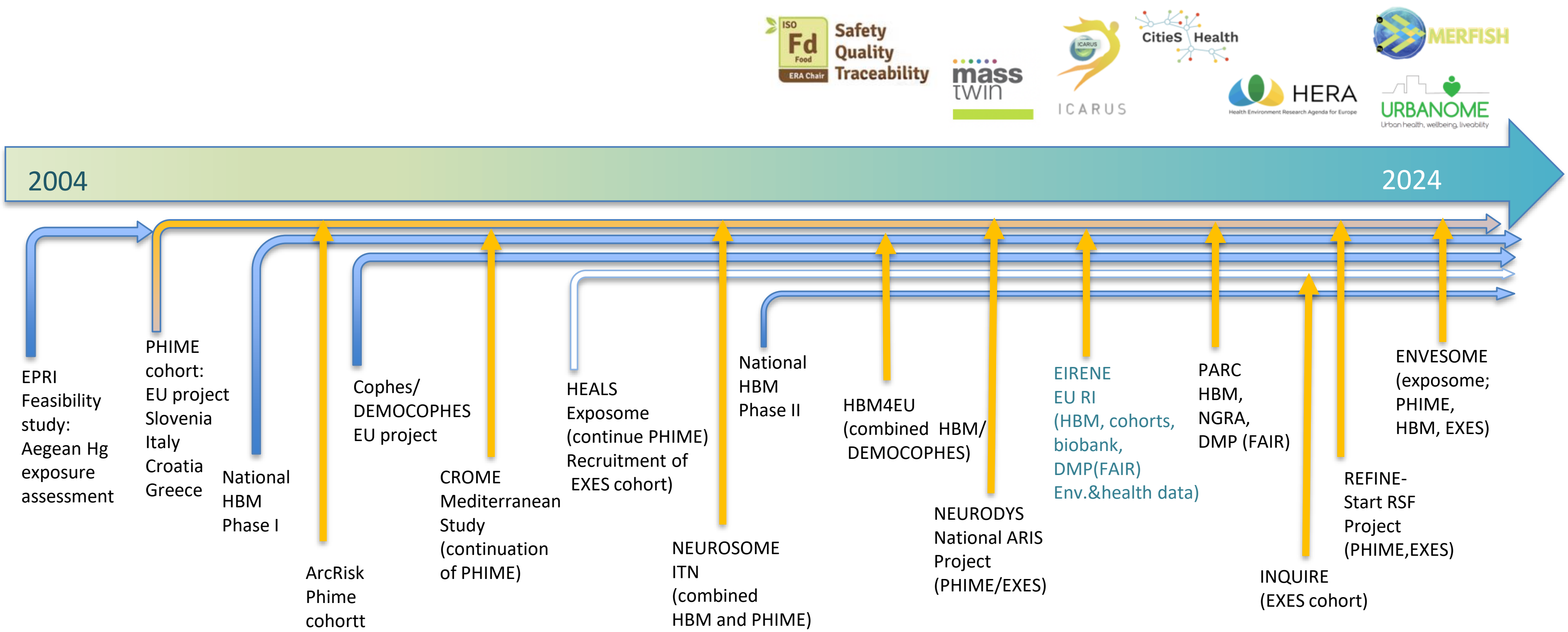
The Meteorological Synthesizing Centre – East (MSC-E, www.msc-east.org), one of the research centres of the European Monitoring and Evaluation Programme (EMEP, www.emep.int), was recently hosted by the Department of Environmental Sciences at the Jožef Stefan Institute (JSI). The Centre is committed to advancing scientific research in support of the UNECE Convention on Long-Range Transboundary Air Pollution (CLRTAP, unece.org/environmental-policy-1/air). Through advanced modeling techniques, MSC-E provides critical insights into the transboundary movement of pollutants across Europe, with a focus on toxic metals and persistent organic pollutants (POPs).

The Centre develops state-of-the-art modelling tools, such as the GLEMOS Chemical Transport Model, to assess pollution levels and trends within specific regions and countries, along with evaluations of transboundary pollution on global, regional and local scales. The comprehensive assessments provided by MSC-E serve as valuable tools for policymakers to gauge the effectiveness of pollution control measures

References:
https://doi.org/10.5281/zenodo.14831196

Temporal dimension

Example: environment and health



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Thank you

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