

GOS⁴M – Global Observation System for Mercury

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GOS⁴M – Knowledge Hub

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www.gos4m.org

The context: **GEO**

GOS⁴M is a GEO Flagship

The Group on Earth Observations (GEO) is a partnership of more than 100 national governments and in excess of 100 Participating Organizations that envisions a future where **decisions** and **actions** for the **benefit** of **humankind** are **informed** by **coordinated, comprehensive** and **sustained** Earth observations



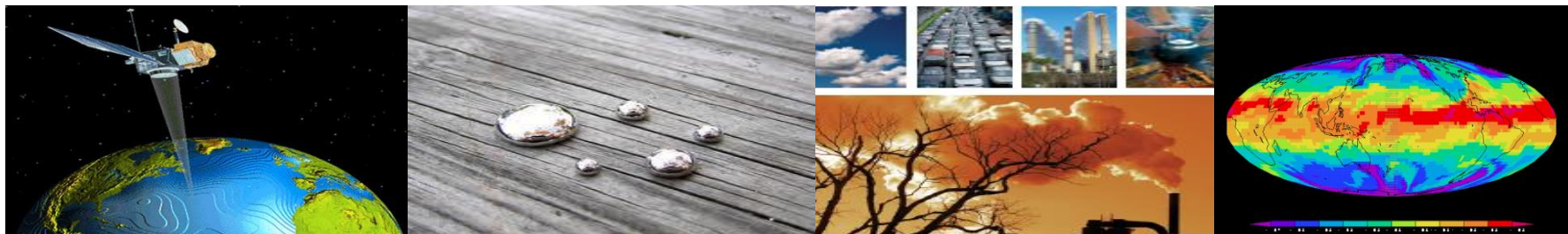
GLOBAL OBSERVATION SYSTEM FOR MERCURY

www.gos4m.org

GOS⁴M Knowledge Hub

Objective: to provide user-oriented integrated tools to support the Effectiveness Evaluation undertaken in the Minamata Convention on Mercury

Platforms: GEOSS; Copernicus; GOS⁴M Data Infrastructure



Policy Questions

“Based on the information collated, and through proposed indicators on process, outcome and monitoring, an assessment will be made on mercury levels attributable to the Convention in relations to the four policy questions.”

1. Have the Parties taken actions to implement the Minamata Convention?
2. Have these actions resulted in changes in supply, use, emissions and releases of mercury to the environment?
3. Have these changes resulted in changes in levels of mercury in the environment, biotic media and vulnerable populations attributable to the Convention?
4. To what extent are existing measures under the Minamata Convention meeting its objective of protecting human health and the environment from mercury?

UNITED
NATIONS



United Nations
Environment
Programme

Conference of the Parties to the
Minamata Convention on Mercury
Third meeting
Geneva, 25–29 November 2019
Item 2 (h) of the provisional agenda*
Matters for consideration or action by the
Conference of the Parties: Effectiveness
Evaluation

MC

UNEP/MC/COP.3/14 ADV¹

Distr.: General
4 October 2019
Original: English

**Report of the ad hoc technical expert group for effectiveness
evaluation: Proposed framework for the effectiveness
evaluation of the Minamata Convention on Mercury**

Note by the secretariat

1. This note relates to the outcome of the work of the ad hoc technical expert group on effectiveness evaluation that was mandated by MC-1.9 and MC-2.10 to consider the arrangements to be put in place to provide the Conference of the Parties with the required information to conduct an effectiveness evaluation of the Minamata Convention on Mercury.
2. The note contains two annexes. The first annex presents a draft decision for consideration by the Conference of the Parties at its third meeting. The second annex contains the report of the ad hoc technical expert group that puts forward the proposed framework for the effectiveness evaluation. The report in turn contains 4 appendices. It is to be noted, that the text for appendix 1 is contained in UNEP/MC/COP.3/14/Add.1. Furthermore, the report is complemented by additional information contained in UNEP/MC/COP.3/INF/15.

¹ As submitted to UNON Conference Services for editing translation and made available for advance reading.
* UNEP/MC/COP.3/1.

Report of the ad hoc technical expert group

From data to knowledge

Effectiveness Evaluation requires:

- Reliable data and wide recognized chemo-physical models
- Scenarios based on most advanced scientific results
- **F**indable, **A**ccessible, **I**nteroperable, and **R**eusable data (FAIR results)
- User-friendly and co-designed applications

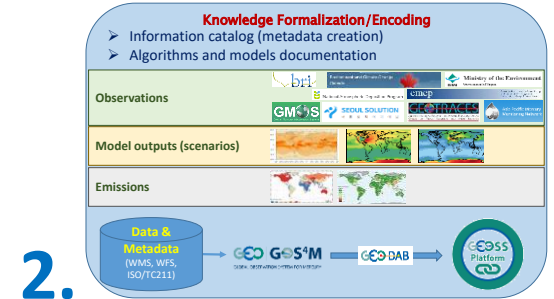
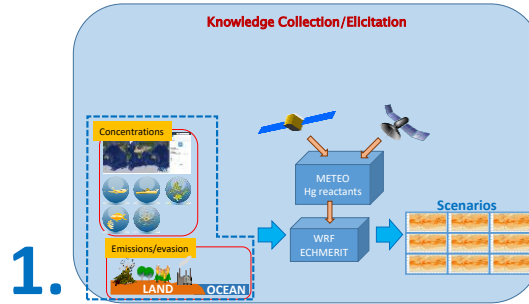
GOS⁴M can provide knowledge to support answer to relevant policy questions.



Policy Questions

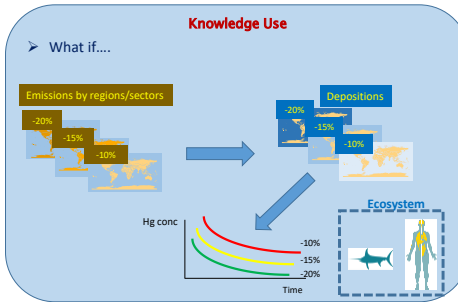


The GOS⁴M Knowledge Hub

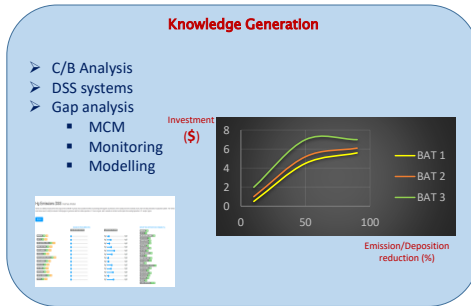


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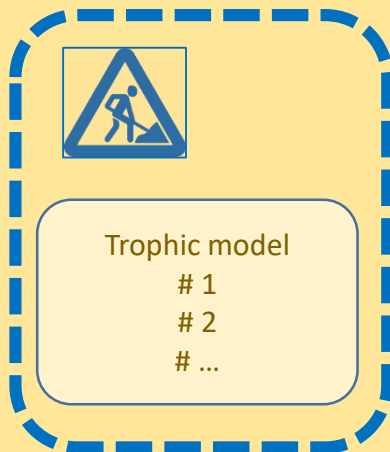
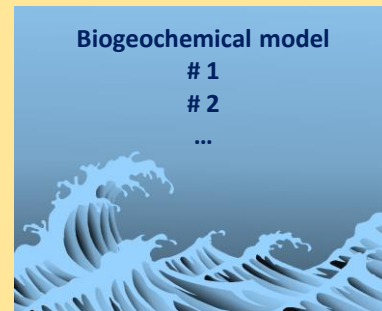
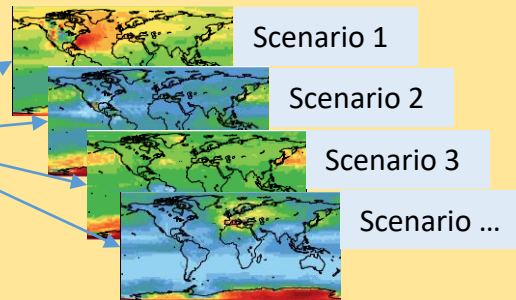
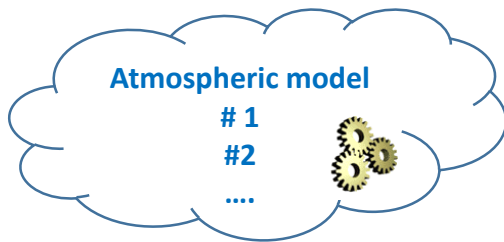
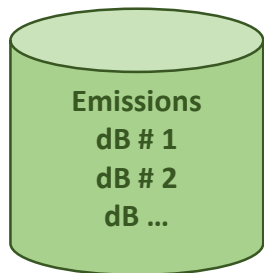
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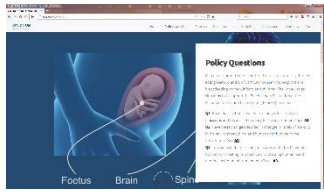
HDSS



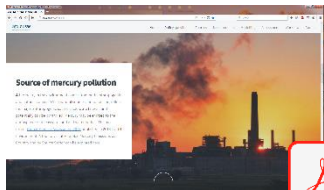
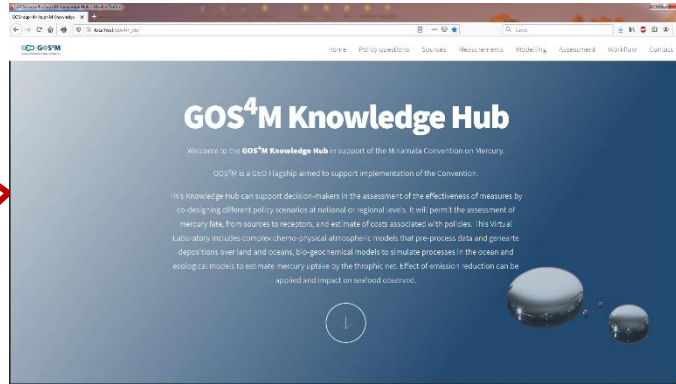
Home page

Can be visited at

www.gos4m.org/kh



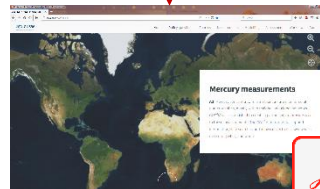
Policy questions



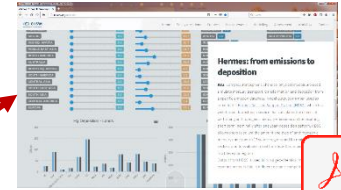
Emissions



Visual report



Monitoring



Scenario assessment



Hg uptake



The road ahead .1 computation

Now	Forthcoming
1 database on emission (AMAP 2010)	Many databases, many years (AMAP, EDGAR, STREET, etc.; 2010, 2015, etc.)
1 atmospheric model to run scenarios (ECHMERIT)	Many models: <ul style="list-style-type: none"> - global GLEMOS, GEOS-Chem, GEM-MACH-Hg, ECHMERIT), - hemispheric (CMAQ-Hem) - regional (WRF-Chem, CCLM-CMAQ)
1 Global Circulation Model (Selin)	Many models
Trophic model N/A	Available models and data-driven techniques
Regional assessment	Country assessment
4 industrial macro-sectors	24 Sectors (GMA 2018)
Assessment of emission N/A	Emission by-country & by-sector
Assessment of BATs N/A	Assessment of BATs

The road ahead .2 Graphical User Interface

Now	Forthcoming
Maps as picture	Browsing maps
Map charts and histograms N/A	Map charts and histograms with reports
Selection of emission database, model N/A	Selection of emission database, model
Reporting on emission, monitoring, scenarios N/A	Reporting on emission, monitoring, scenarios
Reporting on concentration in seafood N/A	Reporting on concentration in seafood

Thank you!

Credits:



Integrated Global Observing Systems for Persistent Pollutants (**IGOSP**), project funded by the European Commission in the framework of “The European network for observing our changing planet (**ERA-PLANET**)” program (Grant Agreement: 689443).



EuroGEO Showcases: Applications Powered by Europe (**E-SHAPE**) project (Grant Agreement: 820852).

Inside HDSS

Implementation

Emission reduction

Hermes Decision Support System (HDSS) Hg Emissions

The Hermes Decision Support System (HDSS) is a web-based downstream service to evaluate in real-time the effects of anthropogenic Hg emission reduction, from different regions and industrial sectors, on the atmosphere and oceans. The service was designed to assist policy makers in defining reduction strategies and to assess the impact of emission scenarios on Hg deposition over both the short (1 year) and long term, as well as the effect on Hg bio-accumulation in food-chains. Hermes is the core of the service, being a statistical emulator built on numerous runs of a state of art Hg Chemical Transport Model, ECHM4, in a source-receptor framework.

Reset button

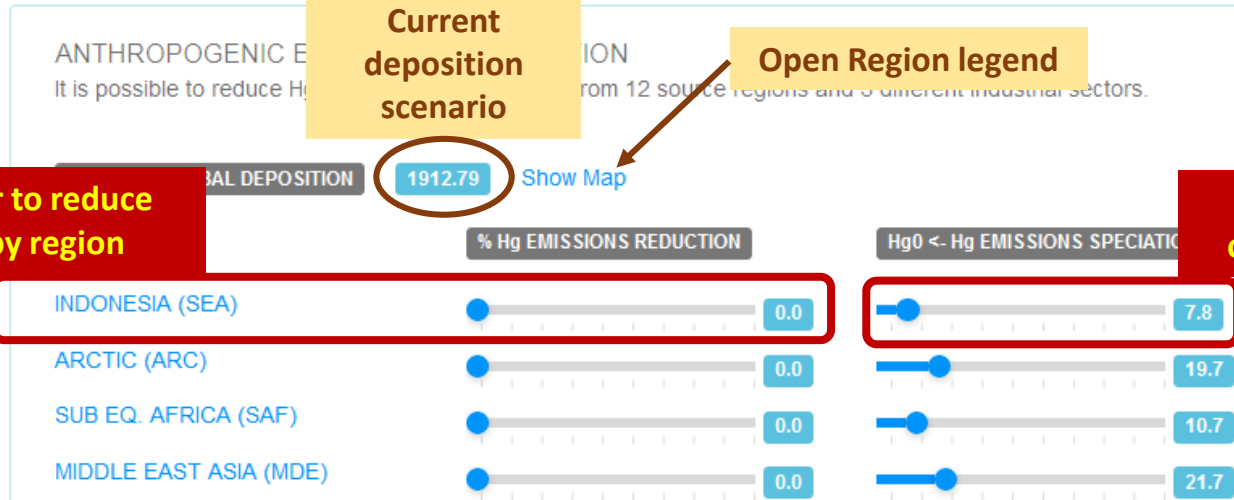
RESET

Current
deposition
scenario

Open Region legend

Move cursor to reduce
emission by region

Move cursor to
change speciation



Implementation

Emission reduction

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RESET

Click to open and reduce emission by sector

INDONESIA (SEA)

ARCTIC (ARC)

SUB EQUATORIAL AFRICA (SAF)

MIDDLE EAST ASIA (MDE)

ANTHROPOGENIC EMISSION PERTURBATION

It is possible to reduce Hg A

DIFFERENT GLOBAL DEPOSITION

SOURCE DEFINITION: INDONESIA

SECTOR	REDUCTION	EMISSION (KG)
STATIONARY COMBUSTION	<input type="range"/>	5.96
INDUSTRIAL	<input type="range"/>	18.1
INTENTIONAL USE AND ASGM	<input type="range"/>	50.64

CLOSE

Fix reduction scenario

FIX



0.0

21.7

Implementation

Deposition change

DEPOSITION C
The inputs are pa
reduction is not st
value is displayed

Customized deposition scenario

ne that calculates the change (%) on Hg deposition due to the selected emission reductions. If a
(al) the deposition change is shown in blue. If reduction is significant for a given receptor the

GLOBAL DEPOSITION SCENARIO: 1912.79

LANDS

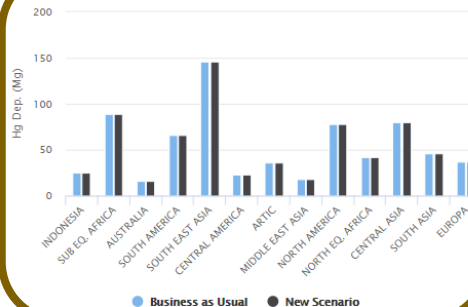
- INDONESIA (SEA)
- ARCTIC (ARC)
- SUB EQ. AFRICA (SAF)
- MIDDLE EAST ASIA (MDE)
- NORTH AMERICA (NAM)
- AUSTRALIA (PAN)
- NORTH EQ. AFRICA (NAF)
- SOUTH AMERICA (SAM)
- CENTRAL ASIA (CIS)
- EAST ASIA (EAS)
- SOUTH ASIA (SAS)
- CENTRAL AMERICA (MICA)
- EUROPA (EUR)

OCEAN (Mg)

- NORTH PACIFIC
- SOUTH PACIFIC
- MEDITERRANEAN
- INDIAN
- NORTH ATLANTIC
- SOUTH ATLANTIC
- SOUTH OCEAN
- ANTARCTIC (ANT)
- GLOBAL OCEANS
- Biogeochemical response
- Oceans at 10 years

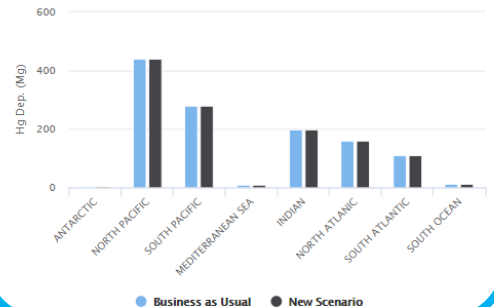
Deposition over land

Hg Deposition - Lands



Deposition over oceans

Hg Deposition - Oceans



Workflow

Example

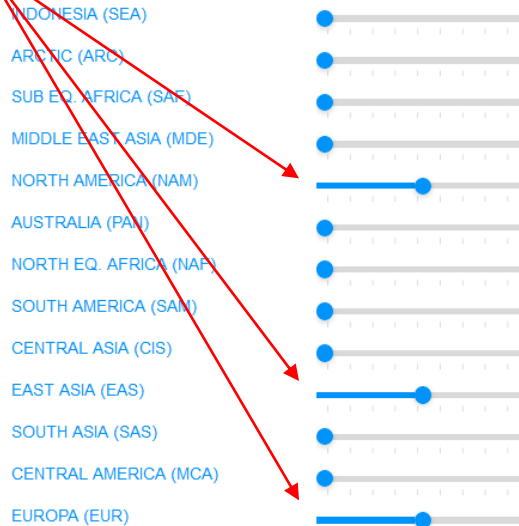
-50%
Europe
North America
East Asia

ANTHROPOGENIC EMISSION PERTURBATION

It is possible to reduce Hg Anthropogenic emission from 12 source regions

CURRENT GLOBAL DEPOSITION 1912.79 Show Map

% Hg EMISSIONS REDUCTION



DEPOSITION CHANGES

The inputs are passed in near-real time to the statistical engine that calculates the change (%) on Hg deposition due to the selected emission reductions. If a reduction is not statistically significant (95% confidence interval) the deposition change is shown in blue. If reduction is significant for a given receptor the value is displayed in green. (De Simone et al., 2017)

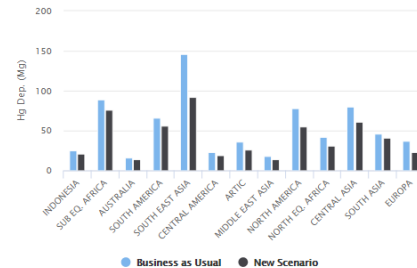
GLOBAL DEPOSITION SCENARIO 1492.08

LAND (%)	OCEAN (%)
INDONESIA (SEA)	NORTH PACIFIC
ARCTIC (ARC)	SOUTH PACIFIC
SUB EQ. AFRICA (SAF)	MEDITERRANEAN
MIDDLE EAST ASIA (MDE)	INDIAN
NORTH AMERICA (NAM)	NORTH ATLANTIC
AUSTRALIA (PAN)	SOUTH ATLANTIC
NORTH EQ. AFRICA (NAF)	SOUTH OCEAN
SOUTH AMERICA (SAM)	ANTARCTIC (ANT)
CENTRAL ASIA (CIS)	GLOBAL OCEANS
EAST ASIA (EAS)	Biogeochemical response
SOUTH ASIA (SAS)	Oceans at 10 years
CENTRAL AMERICA (MCA)	
EUROPA (EUR)	

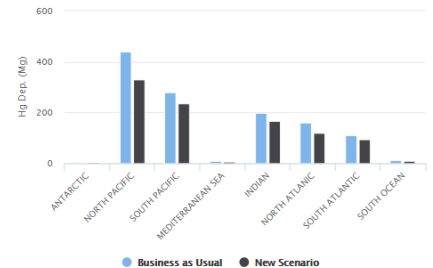
% of reduction is shown

blue = not significant
green = significant

Hg Deposition - Lands



Hg Deposition - Oceans



Details on HDSS

A long path to rise

Step 1: ECHMERIT-Hg Development & Validation vs. observations

Step 2: ECHMERIT-Hg Tagging Hg (regions & sources)

Step 3: Uncertainty evaluation in Source-Receptor Matrices

Step 4: Design & runs of Anthropogenic Emissions Perturbation

Step 5: CTM-Hg Emulator built and Web implementation

2009-2018

