

Scenarios - Global Scenarios Ecosystem Health



Global Scenarios Ecosystem Health

ABSTRACT

The Global Scenarios Ecosystem Health workstream aims to establish global scenarios of water quality, zooming in on multiple drivers of change, their pressures and impacts in a nexus context with a focus on ecosystems for the two indicators for Ecosystem Health: A) nutrient pollution and B) toxic stress, a global baseline and scenarios will be modelled. It will also leverage in-kind contributions from partners to generate the required models.

CONTACT

Principal Investigator:
Joost van den Roovaart
joost.vandenRoovaart@deltares.nl
Stichting Deltares

In collaboration with:
Lex Bouwman
lex.bouwman@pbl.nl
PBL Netherlands Environmental Assessment Agency
Faculty of Geosciences, Utrecht University

Website: www.unep.org/wwqa

A) NUTRIENT POLLUTION

UPDATE ON PROGRESS

- Global spatially explicit (0.5 by 0.5 degree) calculations are made for nitrogen (N) and phosphorus (P) according to the five shared socioeconomic pathways (SSP) for the periods 1980–2015 and 2015–2050 using the Integrated Model to Assess the Global Environment (IMAGE), including the Global Nutrient Model (GNM).
- Contribution to the workshop on Scenarios in June 2021 and alignment with the other WWQA partners.

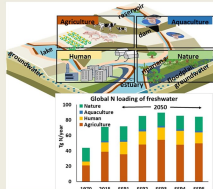


Figure 1. Graphical abstract (Beusen et al., 2022)

ACHIEVEMENTS

- Article *Exploring river nitrogen and phosphorus loading and export to global coastal waters in the Shared Socio-economic Pathways* (Beusen et al., 2022) is published in *Global Environmental Change*, Volume 72, January 2022, link: <https://www.sciencedirect.com/science/article/pii/S0959378021002053>.
- Highlights:
 - In 2050 anthropogenic sources will contribute up to 80% to river nutrient loading.
 - Curbing the global nutrient cycles requires paradigm shifts in food and waste systems.
 - N:P ratios in global rivers will further increase due to selective system retention of P.
 - Waste systems need to change from a disposal orientation towards conservation.
- All grid data is free available from: <https://dataportal.pbl.nl/downloads/IMAGE/GNM>.

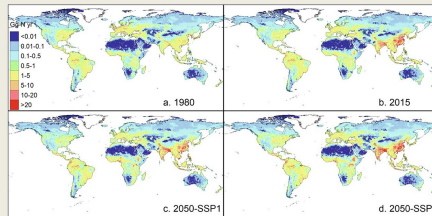


Figure 2. Maps of N delivery to surface water for 1980 (top left), 2015 (top right) and 2050 for the SSP1 sustainability (bottom left) and SSP2 middle of the road scenario (bottom right) (Beusen et al., 2022)

FUTURE OUTLOOK

- The work on the scenario calculations is finished.
- Contribution to the workshop on Scenario Analysis in February 2022 is foreseen.

B) TOXIC STRESS

BACKGROUND

- Anthropogenic contaminants are a growing issue of concern. So far, over 350,000 registered chemicals negatively affect the ecological status of surface waters and ground waters.
- In the EU-project SOLUTIONS (Van Gils et al, 2020), tools and methods have been developed to relate the effect of man-made chemicals to toxic stress through a correlation to socio-economic indicators (GDP, population).
- The used selected indicator, msPAF, is a measure of the chronic and acute mixture toxic effect pressure of exposure, mapped in relation species loss.

UPDATE ON PROGRESS

- A global assessment of the water quality status due to toxic stress is being carried out with a high-resolution (1x1 km) hydrological model (Wflow SBM).
- The models are setup using the open-source package hydromt, which is developed under the umbrella of the Deltares BlueEarth Digital Environment.
- Hydrology and toxic stress calculations are made for the present situation and for 3 RCP/SSP scenarios for 2050.

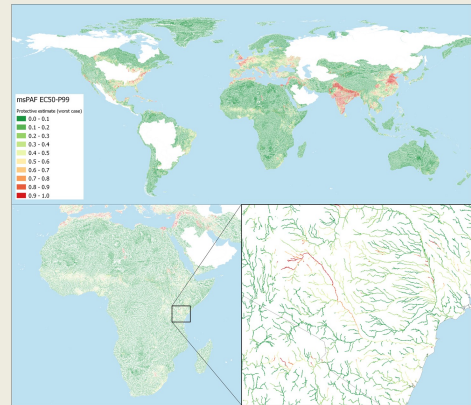


Figure 3. Global toxic stress results (msPAF), zooming in to Africa and Kenya.

ACHIEVEMENTS

- Calculations for hydrology and toxic stress for the present situation are finished for 90% of the river basins.
- Some last errors for very large rivers basins (white spots on the map in top of Figure 3) are being solved.
- Scenario calculations are started and running.

FUTURE OUTLOOK

- Full global hydrology and toxic stress for present situation will be finished in February 2022.
- Calculations for 3 combined RCP/SSP scenarios for 2050 will be finished in March 2022.
- Calculations for additional mitigation scenarios, other years and more RCP/SSP scenarios may be part of a follow up of this project.