

MARINA-Nutrients models

Focus and versions	Pollutants	Spatial resolution	Temporal resolution	Water systems	Pollution sources	References
Global applications						
Water scarcity analysis Global-1.0	Nitrogen	Sub-basin	Annual	Rivers, seas	Point (sewage, direct discharge of manure) and diffuse (agriculture, nature)	Mengru Wang et al (in prep) INMS project
Global change impacts Global-2.0	Nitrogen and phosphorus	Sub-basin	Annual	Rivers, sea	Point (sewage, direct discharge of manure) and diffuse (agriculture, nature)	INMS project
China applications						
Sub-basin scale analysis China-1.0 <i>Published as MARINA-Nutrients (v1.0)</i>	Nitrogen, phosphorus	Sub-basin	Annual	Rivers, seas	Point (sewage, direct discharge of manure) and diffuse (agriculture, nature)	Strokal et al (2016)
Seasonality China-1.1 <i>Published as MARINA 1.1</i>	Nitrogen	Sub-basin	Seasonal	Rivers, seas	Point (sewage, direct discharge of manure) and diffuse (agriculture, nature)	Xuanjing Chen et al (2019)
Global change and SDGs China-2.0 <i>Published as MARINA 2.0</i>	Nitrogen, phosphorus	Sub-basin	Annual	Rivers, seas	Point (sewage, direct discharge of manure) and diffuse (agriculture, nature)	Mengru Wang et al (2020); Mengru Wang et al (2022)
Multi-scale analysis China-3.0 <i>Published as MARINA 3.0</i>	Nitrogen, phosphorus	Multiple	Annual	Streams	Point (sewage, direct discharge of manure) and diffuse (agriculture, nature)	Xi Chen et al (2021)
European applications						
Water and air sources Europe-1.0	Nitrogen, phosphorus	Sub-basin	Annual	Rivers, seas Air	Point (sewage) and diffuse (agriculture, nature)	Aslihan Ural et al (in prep)
Loadings to lakes <i>Published as MARINA-Lakes versions</i>						
Pollution sources	Nitrogen, phosphorus	Basin lakes: Dianchi, Taihu, Tana, Guanting and Baiyandian	Annual and seasonal	Rivers, loadings to lakes	Point (sewage) and diffuse (agriculture, nature)	Yang et al., 2019; Wang et al., 2019; Li et al., 2019; Goshu et al., 2020

MARINA-Plastics

Versions	Pollutants	Spatial resolution	Temporal resolution	Water systems	Pollution sources	References
Global applications						
Pollution sources (macro-& microplastics) Global-1.0	Microplastics, Macroplastics	Sub-basin	Annual	Rivers, seas	Point (Sewage) and diffuse (mismanaged waste)	Strokal, Vriend et al (2021);
China applications						
Crop production impacts (macro-& microplastics) China-1.0	Microplastics, Macroplastics	Sub-basin	Annual	Rivers, seas	Point (Sewage) and diffuse (mismanaged waste, agriculture)	Yanan Li et al (in prep)
Europe applications						
Solutions for the Black Sea (microplastics) Europe-1.0 <i>Published as MARINA-Global for the Black Sea</i>	Microplastics	Sub-basin	Annual	Rivers, sea	Point (sewage)	Strokal et al (2022)

MARINA-Antibiotics

Versions	Pollutants	Spatial resolution	Temporal resolution	Water systems	Pollution sources	References
China applications						
Pollution due to livestock production China-1.0	>20 antibiotic types	Sub-basin	Annual	Rivers	Diffuse (livestock) and point (direct discharges of manure)	Qi Zhang et al (in prep)

MARINA-Multi

Versions	Pollutants	Spatial resolution	Temporal resolution	Water systems	Pollution sources	References
Global applications						
Pollution due to urbanization Global-1.0 <i>Published as MARINA-Global</i>	Nitrogen, Phosphorus, Triclosan, Cryptosporidium, Microplastics	Sub-basin	Annual	Rivers	Point (sewage, open defecation)	Strokal et al (2021)
Pollution due to livestock production Global-2.0 <i>Published as MARINA-Global-L</i>	Nitrogen, phosphorus, Cryptosporidium	Sub-basin	Annual	Rivers	Diffuse (livestock)	Yanan Li et al (2022)
Pollution due to COVID-19 measures Global-3.0	Triclosan, Microplastics, Macroplastics, Diclofenac	Sub-basin	Annual	Rivers	Point (sewage) and diffuse (mismanaged waste)	Qi Zhang et al (under review)
Pollution due to urbanization and agriculture Global-4.0	Nitrogen, Phosphorus, Triclosan, Microplastics, Macroplastics, Diclofenac	Sub-basin	Annual	Rivers, seas	Point (sewage, open defecation) and diffuse (livestock, crop production, mismanaged waste)	Ilaria Micella et al (in prep)
Seasonality in pollution Global-5.0	Nitrogen, Phosphorus, Triclosan, Microplastics, Macroplastics, Diclofenac	Sub-basin	Seasonal	Rivers, seas	Point (sewage, open defecation) and diffuse (livestock, crop production, mismanaged waste)	Mirjam Bak et al (in prep)
Europe applications						
Pollution due to urbanization Europe 1.0 <i>Published as MARINA-Global for the Black Sea</i>	Nitrogen, Phosphorus, Triclosan, Cryptosporidium, Microplastics	Sub-basins of the Black Sea	Annual	Rivers	Point sources	Strokal et al (under review)