



# Nature-Based Solutions for Water Quality



**Co-led by UN Environment and UNESCO**

**With contributions from UNIDO, FAO, IHE Delft, IAHS, IWMI, IUCN, WBCSD, WWAP, TNC and the ILO**

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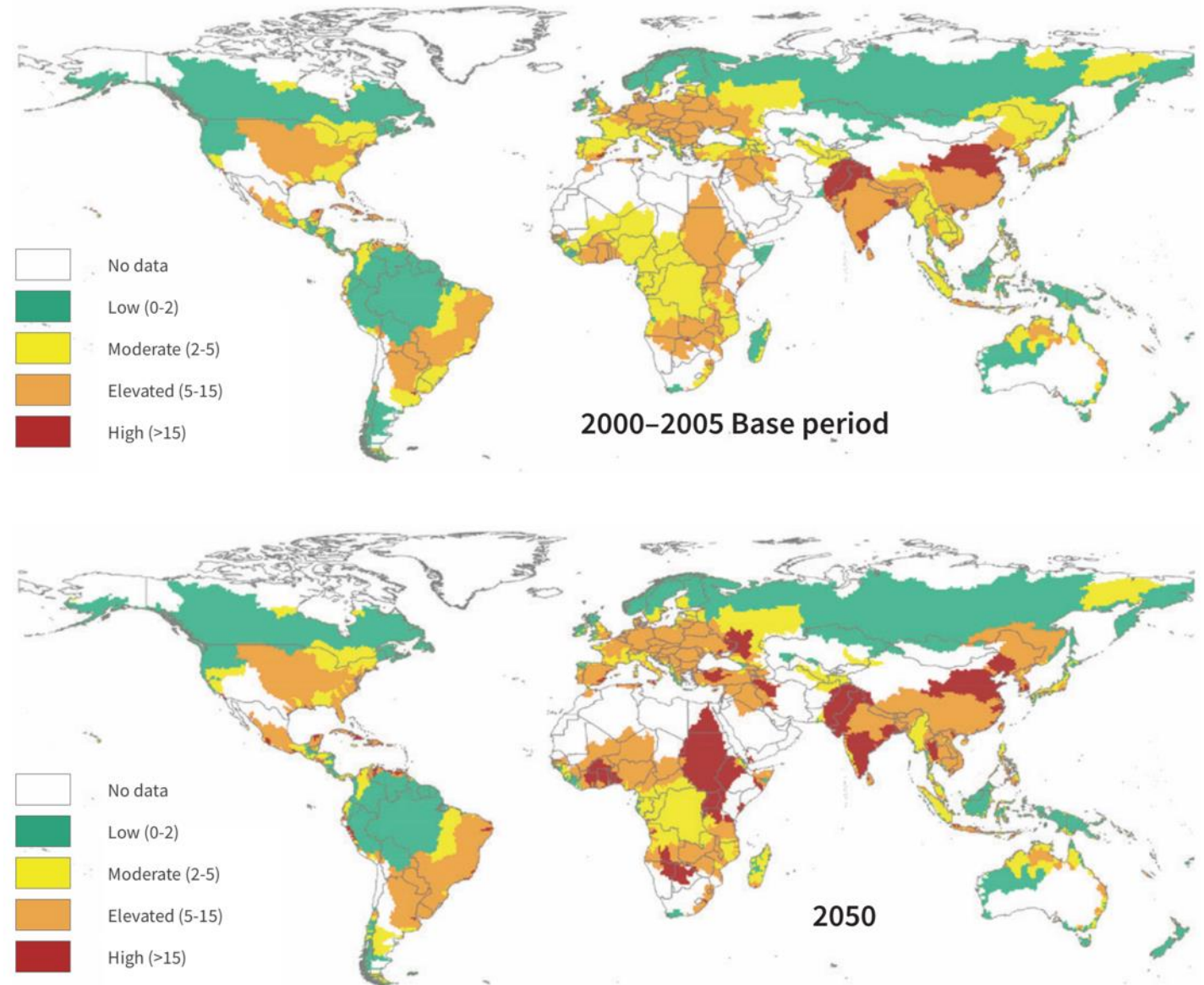
**Sarantuyaa Zandaryaa, UNESCO**

*Stockholm World Water Week - 28 August 2018*

# Water quality degradation

The greatest increases in exposure to pollutants are expected to occur in **low- and lower-middle income countries**, primarily because of higher population and economic growth, and the lack of wastewater management systems

Water quality risk indices for major river basins during the base period (2000–2005) compared to 2050 (nitrogen index under the CSIRO-medium-scenario)



# Water quality threats

- Since 1990s, pollution worsened in rivers in Africa, Asia and Latin America – increase threats to human and environmental health
- Both point source and diffuse pollution, especially agricultural run-off
- Nutrients and chemicals (emerging pollutants)
- Sanitation: 80% wastewater goes untreated
- Global loss of natural wetlands – up to 70%



# Ecosystem degradation

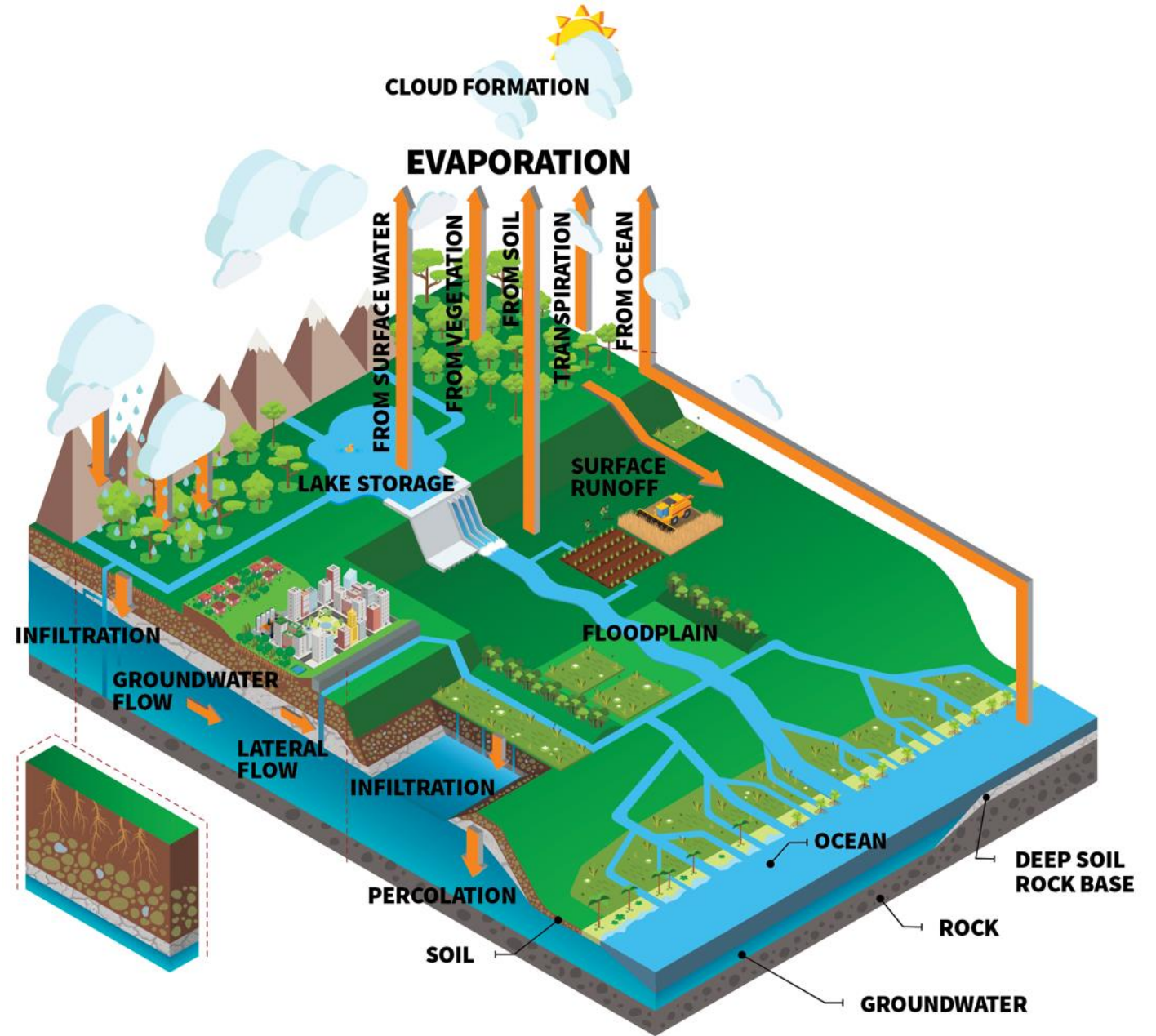
Since the year 1900, an estimated 64–71% of the natural wetland area worldwide has been **lost** due to human activity.

Although about 30% of the global land remains forested, at least two thirds of this area are in a **degraded** state.



# The relationship between ecosystems and the water cycle

Ecological processes driven by vegetation and soils in forests, grasslands, wetlands, as well as in agricultural and urban landscapes, play a **major role** in the movement, storage and transformation of water

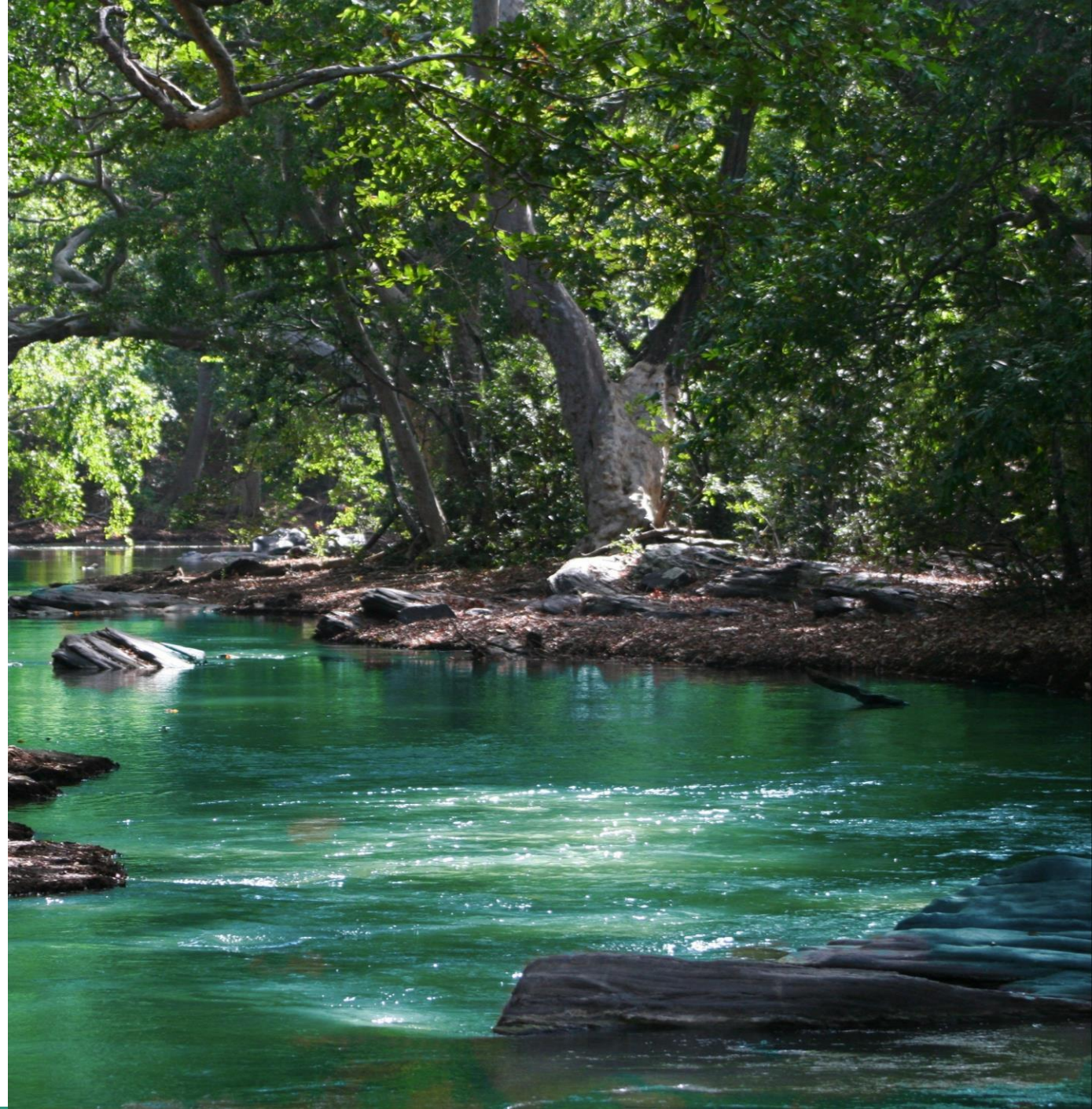




# NBS for managing water quality

A range of NBS can contribute to water quality management by:

- improving and restoring water quality (attenuating pollution from different sources)
- protecting water resources from being polluted
- indicating the overall quality of water in rivers and lakes and the health of aquatic ecosystems



# Ecosystems suitable for restoration as NBS

Table 1. Ecosystems suitable for restoration as an NBS (adapted from UNEP, 2014).

Ecosystem	Effect on water services			
	Water supply	Moderate extreme events	Erosion control	Water purification
Forest and vegetated land	++	++	++	++
Soils	++	++	++	++
Riparian buffers	+	++	++	++
Wetlands	++	++	+	++
Floodplains	++	++	++	++
Mangroves, marshes, dunes	+	++	++	++

# NBS for specific situations and water services

**Table 2. Some built NBS for specific situations and water services (adapted from UNEP, 2014).**

Nature-based solution	Water services			
	Water supply	Moderate extreme events	Erosion control	Water purification
Flood bypass				
Green spaces (bioretention and infiltration)				
Permeable pavements				
Farming practices (contour ridging, crop rotation, low till, grazing pressure, etc.)				
Green roofs				

*The cell colors indicate level of contribution to water service (white - insignificant contribution, dark - significant contribution).*



# Reducing diffuse pollution

Non-point (diffuse) source **pollution from agriculture**, notably nutrients, remains a critical problem worldwide, including in developed countries. It is also the one most amenable to NBS.

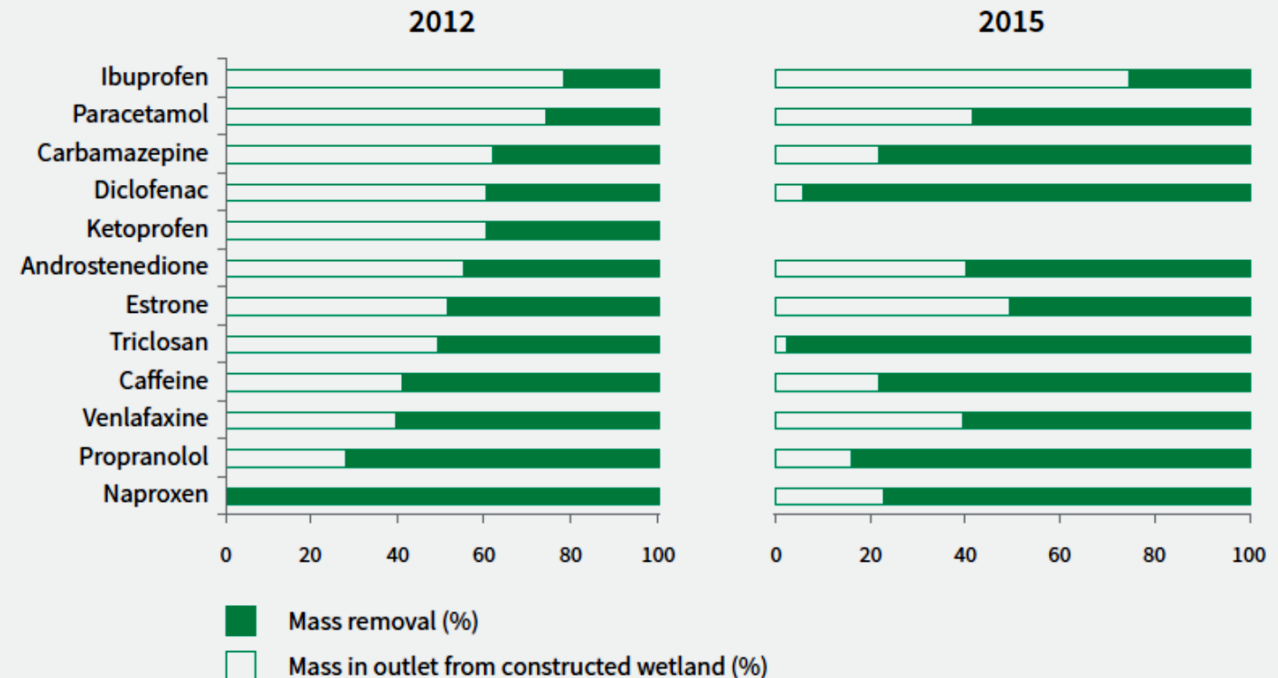
Urban green infrastructure is increasingly being used to manage and **reduce pollution from urban runoff**.



# Removing pollutants – treating wastewater

- Both natural and constructed wetlands are widely used as ‘natural’ wastewater treatment systems alone or in complement to conventional wastewater treatment processes.
- Wetlands remove a range of emerging pollutants (pharmaceuticals) with significant efficiencies for certain substances.
- Applications of constructed wetlands for industrial wastewater treatment, depending on pollutant type and loading, are growing,

Figure | Removal rates for different pharmaceuticals in a pilot-scale constructed wetland in different operating conditions in 2012 and 2015



Source: Based on UNESCO (Forthcoming).



# Protecting water sources

Natural ecosystems (forests, grasslands, crops, vegetated areas, etc.) **provide important regulatory functions that protect or enhance water quality**, while bringing additional economic and socio-environmental benefits.

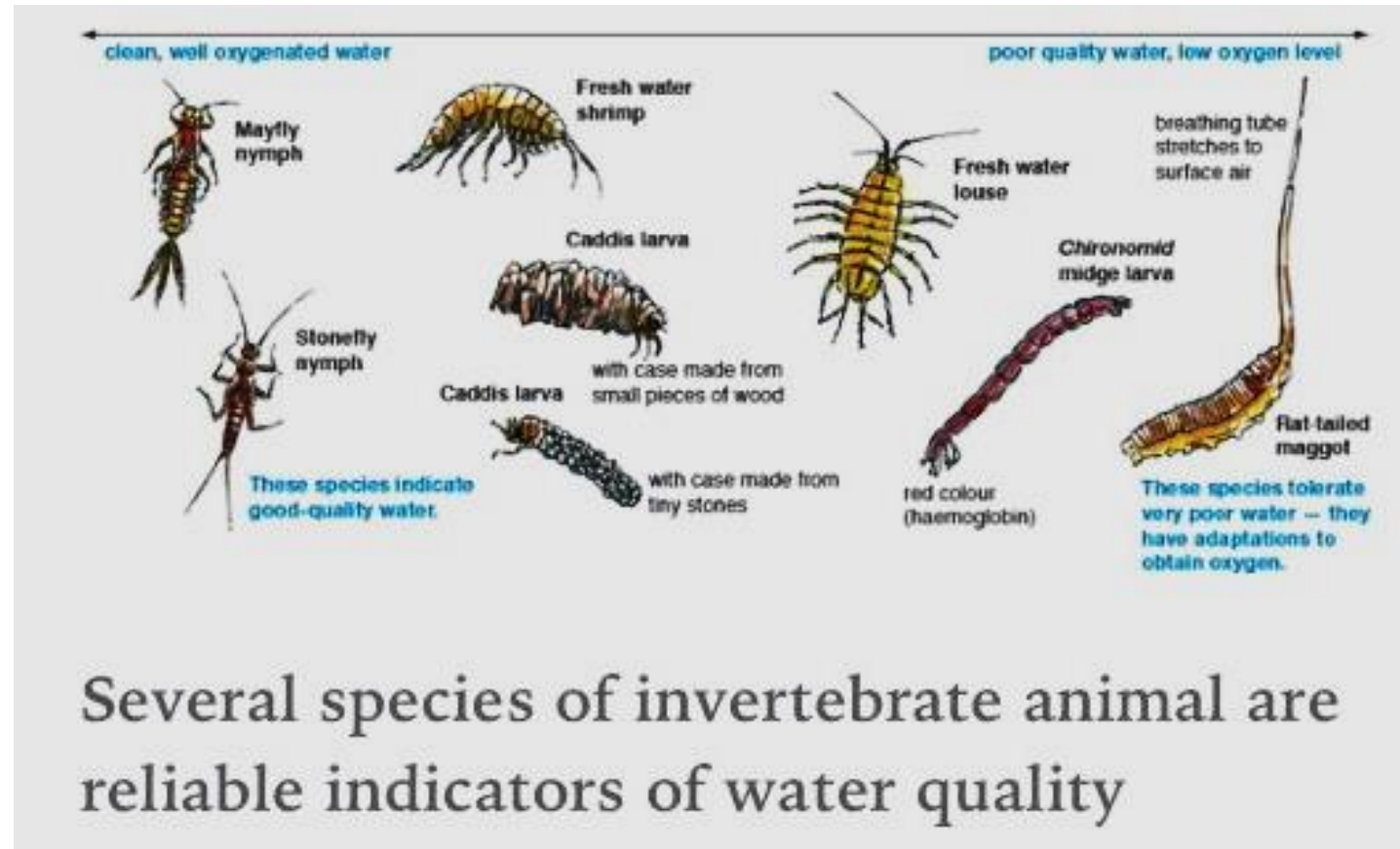




# Ecosystems provide information on water quality and

Aquatic organisms provide important information on human impacts (pollution) on water quality.

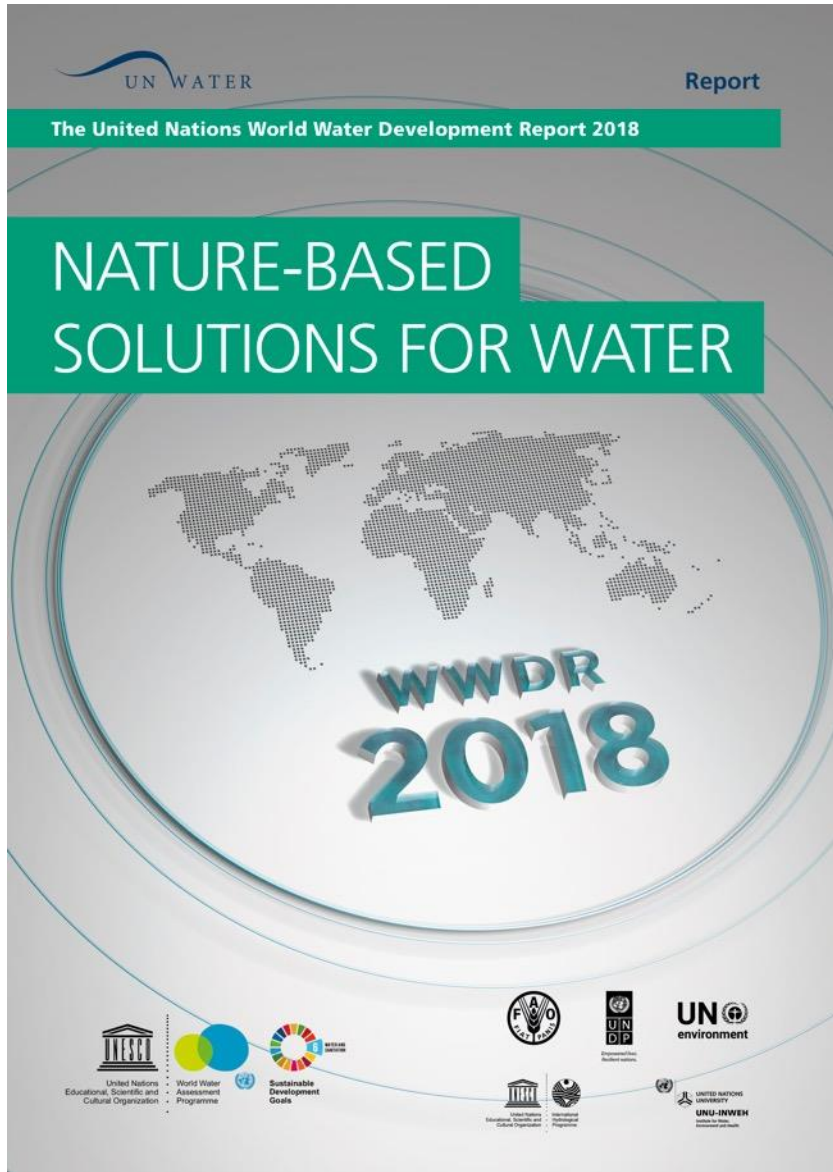
Macroinvertebrates are excellent bioindicators of the overall quality of water in rivers and of the health of aquatic ecosystems.



# NBS for improving water quality - LIMITS & co-benefits

NBS, like grey infrastructure, have limitations: They are **not a panacea**. NBS for water quality must be evaluated and applied based on locally specific conditions, taking into account pollution types and loading, local ecological and hydro-geological conditions

**NBS for water quality management bring multiple co-benefits**—both **environmental** (biodiversity, ecosystem restoration, reducing/reversing ecosystem degradation) and **socio-economic** (gender and social equality, income generation, better livelihoods, cultural and social values).



# Thank you

Working with nature to improve the management of water resources, achieve water security for all, and contribute to core aspects of sustainable development

More info at:

[www.unesco.org/water/wwap](http://www.unesco.org/water/wwap)

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