PANDORA
Pan-African Network For Rapid Research, Response and Preparedness for Infectious Diseases Epidemics

AFRICA CDC
Centres for Disease Control and Prevention
Safeguarding Africa's Health

THE GLOBAL HEALTH NETWORK
Enabling research by sharing knowledge

CHATHAM HOUSE
The Royal Institute of International Affairs

World Health Organization

'One Health' initiative that supports broad themes addressing response to emerging infections in Africa

Adopting a One Health approach to zoonotic disease risk assessment and risk communication

Workshop of Oct 6, 2022

A vision for tomorrow
Water Cycle Epidemiology (WCE)

One Sustainable Health FORUM

Water Cycle as a piece of One Health

One Health Risk Assessment / emerging diseases

Armelle HEBERT
One Environmental Health - Oct 6, 2022
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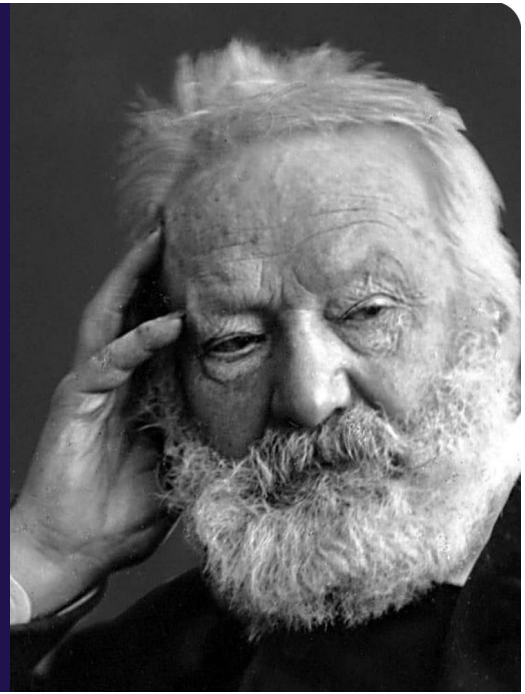
One piece of One Sustainable Health

One Sustainable Health FORUM

Back to the Sewer

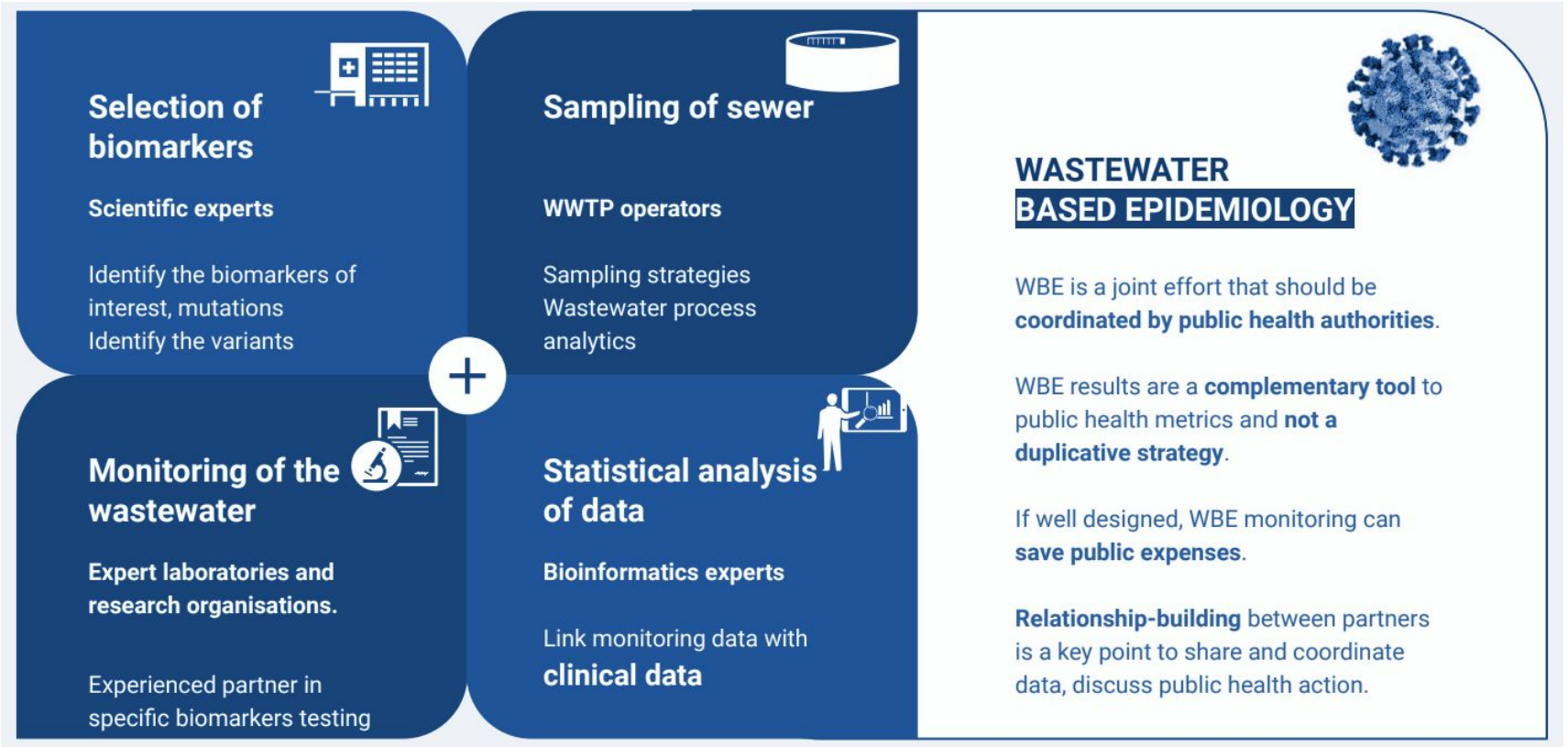
"The sewer is the conscience of the city.
Everything there converges and confronts everything else.
In that livid spot there are shades,
but there are no longer any secrets."

Victor Hugo The Intestine of Leviathan,
Les Misérables (1862)



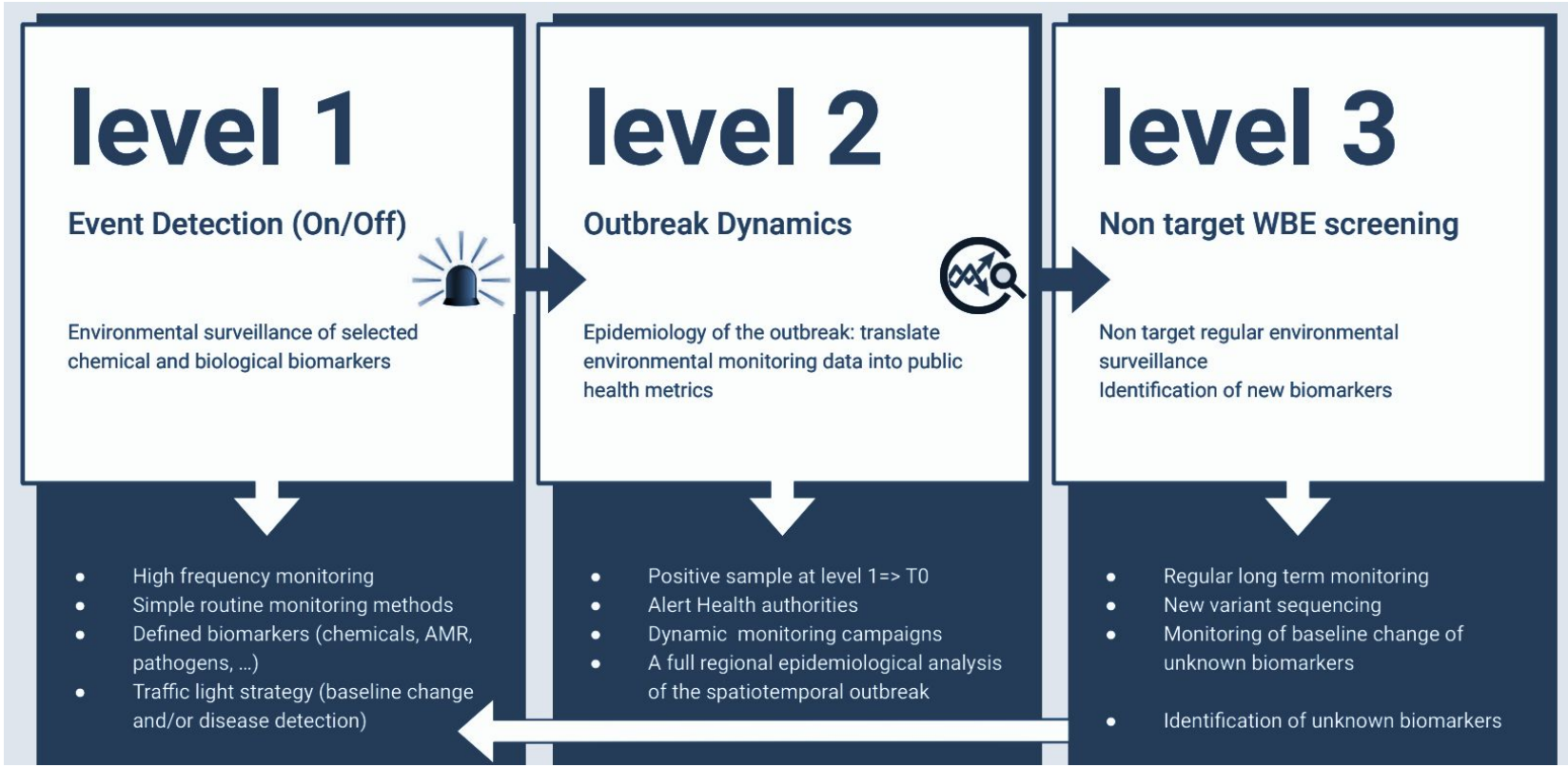
from Remonnay, Ismahane, Veolia, World Water Forum, Dakar 2022

WASTEWATER BASED EPIDEMIOLOGY (WBE)
Lessons from the Covid-19



from Remonnay, Ismahane, Veolia, World Water Forum, Dakar 2022

TOWARDS 2030
THE FUTURE OF ENVIRONMENTAL MONITORING



from Remonnay, Ismahane, Veolia, World Water Forum, Dakar 2022

WATER CYCLE EPIDEMIOLOGY, WCE

Key piece of One Health indicator / Risk Assessment

1. **Raw wastewater:**
   WBE for human health and AMR

2. **Treated wastewater:**
   WCE for environmental health /resources protection

3. **Surface water:**
   WCE for human, animal & environmental health

from Remonnay, Ismahane, Veolia, World Water Forum, Dakar 2022

RESEARCH NEEDS
Multidisciplinary expertises

Sampling strategies WWTP	Sampling strategies in the sewer *	Laboratory monitoring techniques	On-site sensing *
Biomarkers and trigger values *	Chemical targeted and non targeted monitoring	Scientific experts (AMR, Pathogens, Chemicals)	Mathematical modelling & Statistics *
Health Experts	Coordinated communication *	Ethical guidelines *	Biological targeted and non targeted monitoring

from Remonnay, Ismahane, Veolia, World Water Forum, Dakar 2022

Challenges for low income countries
& Perspectives

➔ Need for prioritising targeted markers/biomarkers

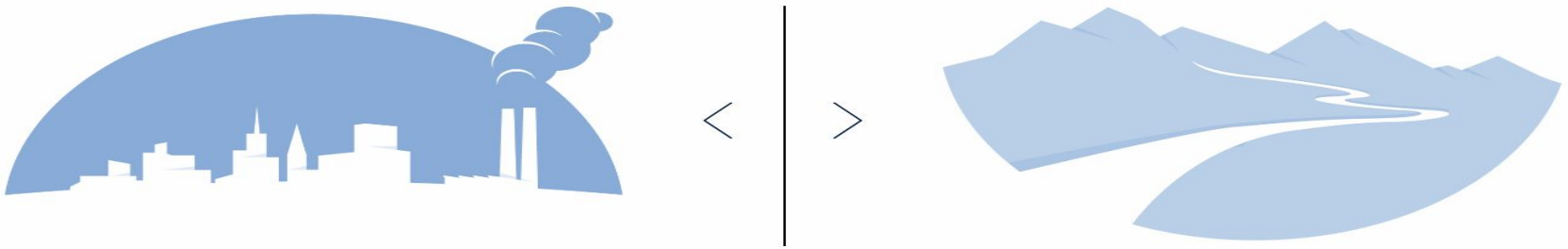
➔ Need to establish/strengthen successful coordination/communication between partners

➔ **Empower the Municipalities/Cities to own and sustain sanitation systems**

➔ **Develop Regional Institutions and Members States Capacities**

from Remonnay, Ismahane, Veolia, World Water Forum, Dakar 2022

Water Chemical Pollution : From early tracking to risk Assessment

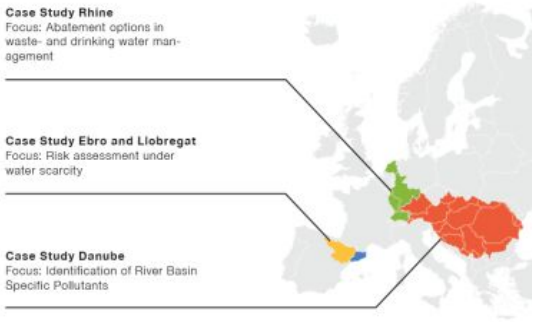


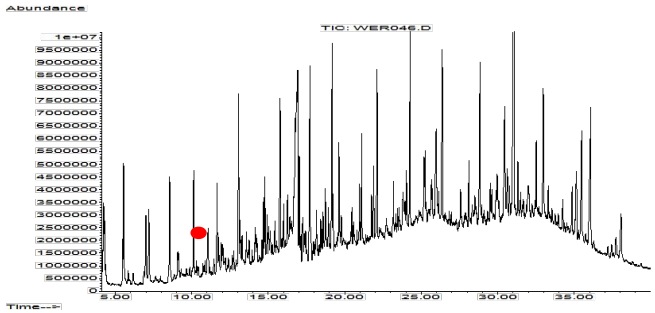
Water Cycle Epidemiology (WCE) - WasteWater based Epidemiology (WBE)

Water Cycle
One piece of One Sustainable Health

One Sustainable Health FORUM

UE strategy for a non-toxic Aquatic Environment





Chemical status ≠ Chemical Contamination

EU_{WFD} 45 PP ≠ 70 to 100.000 detected pollutants

Chemical Exposome

One Health

FP7 Holistic Solutions : UE strategy for a non-toxic Aquatic Environment

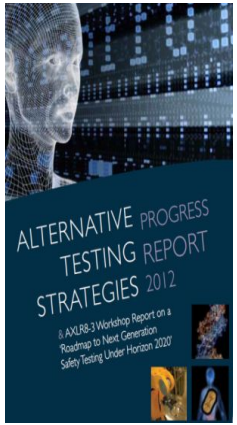
- **Scenarios :** Based on pollutants emissions, their current and future use
- **Retrospectif** : Effect-based monitoring to identify priority complex mixtures
- **Prospectif** : Europe modelling of water concentrations, internal exposure, risks for 10^5 chemicals
- **Solutions :** Tools, model knowledge base and decision support system /abatement options

Alternatives Testing Strategies

of water chemical mixtures early toxic modes of actions

US EPA Chemical testing in 21st Century: Tox21

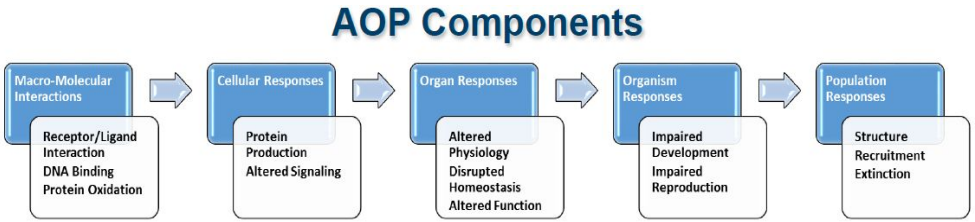
- Identify important biological pathways disrupted by chemicals
- Getting it safe early saves costs later
- Shifting the burden upstream



Worldwide improvement in Chemical Safety Assessment Alternative testing strategies

- Rapid, efficiently
- Cost effective
- More relevant biosystems to humans
- Larger number of substances & mixtures
- Using fewer or no animals

Based on Early Toxic MoA & Adverse Outcome Pathways



Supported by Institutional bodies at international level

United States Environmental Protection Agency · UNEP United Nations Environment Programm · World Health Organization · NICHUS · OECD Better Policies for Better Lives

10y From innovations to implementation

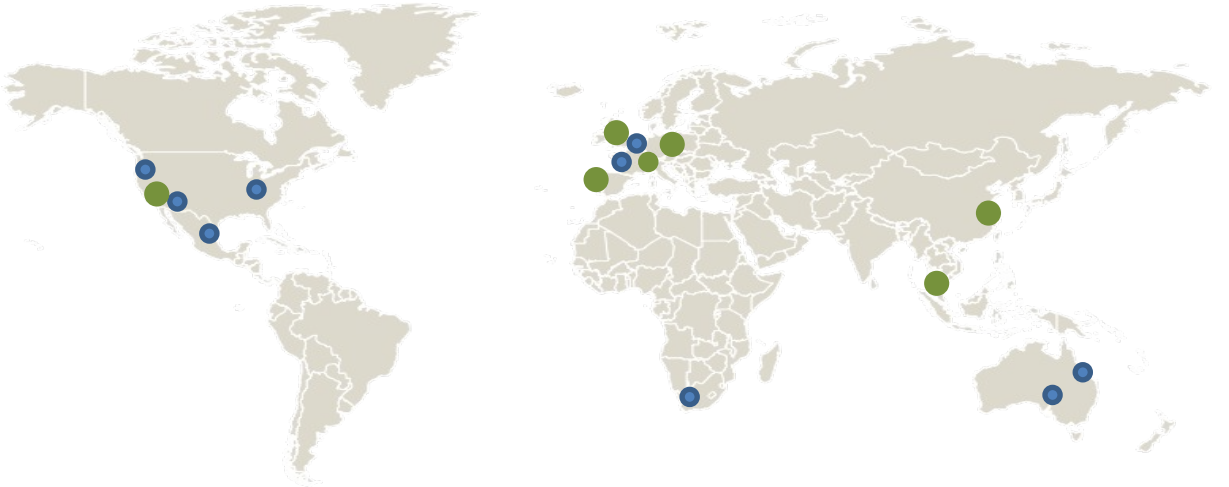
Endocrine Toolbox

ER, AR, TR, GR, PR, MR, RXR

Adaptative Stress Toolbox

induced / Residual Chlorine

- Drinking Water
- Surface Water
- Treated Waste Waters
- Aquifer Recharge
- ReUse Water (Aqua 4 Fit)
- (In)Direct Potable REUSE



International Demonstration

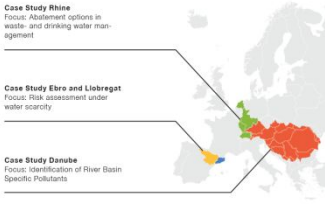
FP7 - H2020 EU projects

Global Water Research Coalition

DEMEAU

Demonstrating promising technologies to address emerging pollutants in water and waste water

solutions



Effect Based Monitoring in Water Safety Planning

in Drinking Water, Surface Water, Treated Waste W, ReUse Water

under + predictive + protective harmonized water safety standards

EBM in WSP

2008-2018

EU new approaches for the Monitoring & Safety assessment of chemicals in surface waters

Assessing and managing mixture risk – future work under the Common Implementation Strategy for the Water Framework Directive

IWA Tokyo – GWRC Workshop - Sept 19 of 2018

Armelle Hebert
Eureau representative
member of the EBM TaskForce delegated by EU Commission

2018-2022

Effect-Based Trigger Values (EBTV)

for different water quality classes
considering hazards for human and environment health

Derivation of effect-based trigger values (EBT)

- for drinking water **DW**
- and surface water **SW**

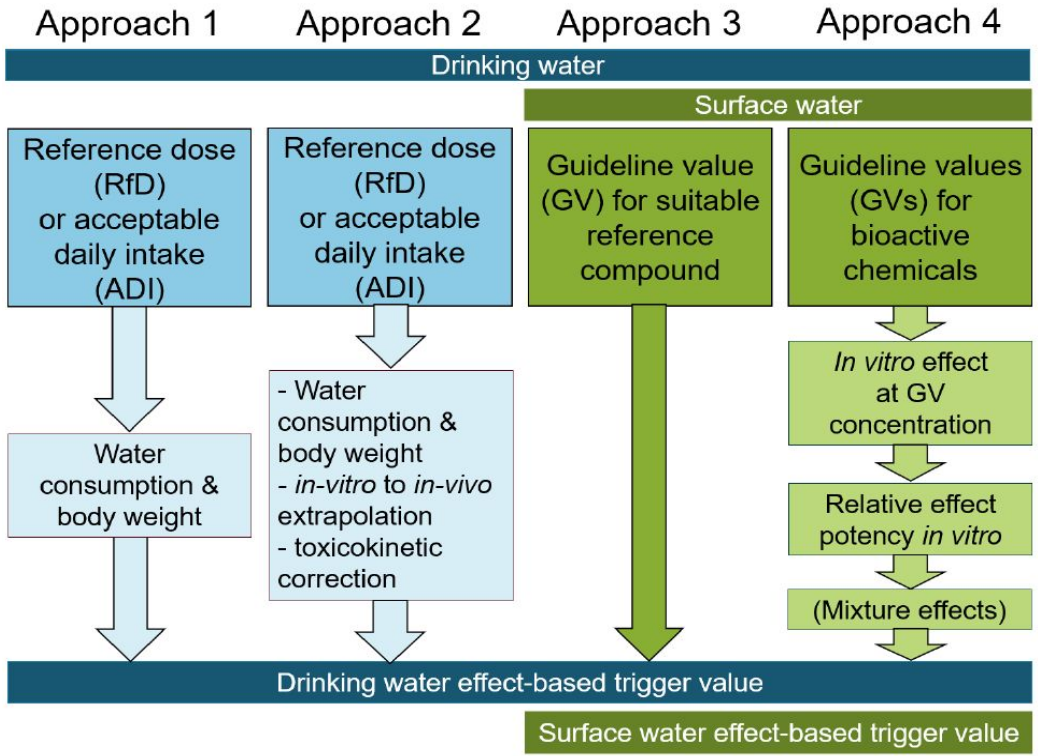
by different approaches:

(1) from an acceptable daily intake (ADI)

(2) from an ADI incorporating toxicokinetics

(3) from an established guideline value (GV)

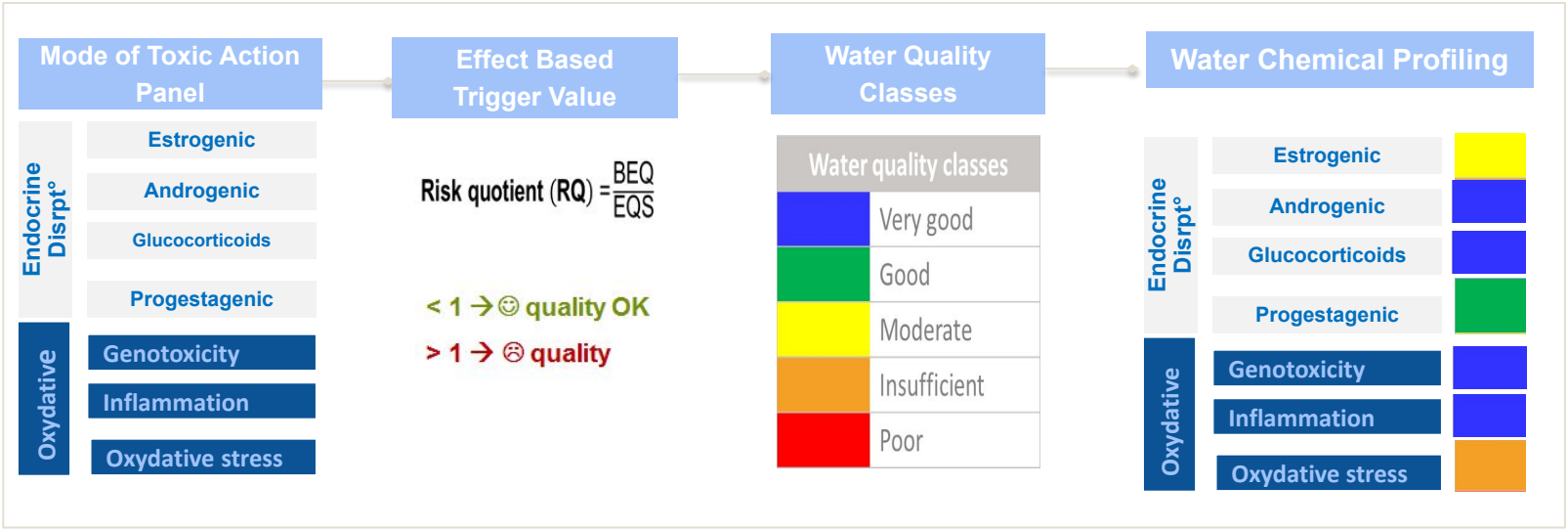
(4) from an established GV incorporating relative potencies and mixture factors.



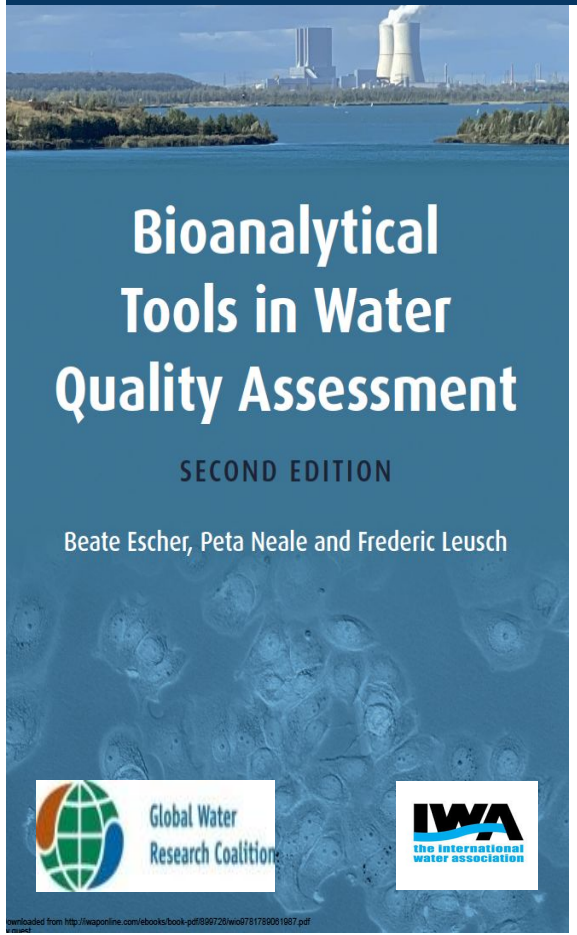
Innovative Water Chemical Quality Classes & Safety Framework

AQUA 4 FIT > Which quality for which uses > Target population to be protected

- **Ecosystem health** (WWTP, SW, Aquifer Recharge)
- **Human health** (DWTP, IPR, DPR, Aquifer Recharge)



For further information



Factsheet - Use of effect-based monitoring for the assessment of risks of low-level mixtures of chemical in water on man and the environment

further elements on demand

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