



WATER REUSE IN THE EUROPEAN UNION REGULATORY FRAMEWORK AND STATE OF PLAY

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Science for policy



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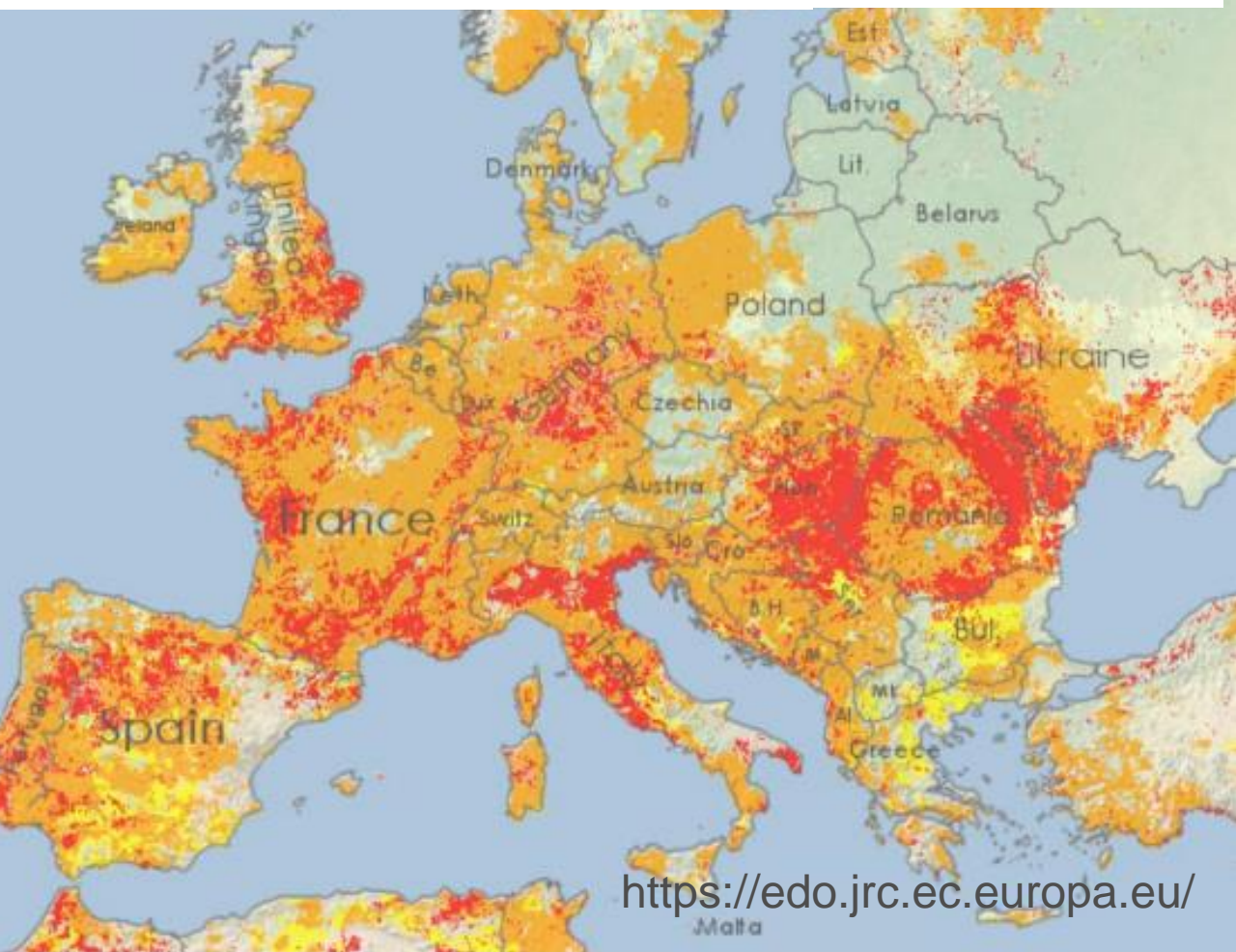
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Drought alerts in Europe August 2022
Source: JRC, GDO CEMS Analytical Report (2022)



Figure 1: Combined Drought Indicator (CDI v.2.1) – beginning of August 2022.



Water scarcity and droughts in the EU

- 38 % of the EU population was affected by water scarcity in 2019
- 29 % of EU territory was affected by water scarcity in 2019
- €2 to 9 billion cost of droughts each year

Source: EEA Report 12/2021

The Water Reuse Regulation 741/2020



It is applicable as of 26 June 2023 and it sets out:

- **minimum water quality and monitoring requirements** in the EU for safe reuse of treated urban wastewaters in agricultural irrigation;
- **risk management provisions** to assess and address potential health risks to human and animals and environmental risks;
- **permitting requirements** for producing and supplying reclaimed water;
- **transparency**, whereby key information about any water reuse project is made available to the public.

<https://eur-lex.europa.eu/eli/reg/2020/741/oj>

Annex I: minimum requirements for water reuse

Table 1 – Classes of reclaimed water quality and permitted agricultural use and irrigation method

Minimum reclaimed water quality class	Crop category ⁽¹⁾	Irrigation method
A	All food crops consumed raw where the edible part is in direct contact with reclaimed water and root crops consumed raw	All irrigation methods
B	Food crops consumed raw where the edible part is produced above ground and is not in direct contact with reclaimed water, processed food crops and non-food crops including crops used to feed milk- or meat-producing animals	All irrigation methods
C	Food crops consumed raw where the edible part is produced above ground and is not in direct contact with reclaimed water, processed food crops and non-food crops including crops used to feed milk- or meat-producing animals	Drip irrigation ⁽²⁾ or other irrigation method that avoids direct contact with the edible part of the crop
D	Industrial, energy and seeded crops	All irrigation methods ⁽³⁾

Table 2 – Reclaimed water quality requirements for agricultural irrigation

Reclaimed water quality class	Indicative technology target	Quality requirements				
		<i>E. coli</i> (number/100 ml)	BOD ₅ (mg/l)	TSS (mg/l)	Turbidity (NTU)	Other
A	Secondary treatment, filtration, and disinfection	≤ 10	≤ 10	≤ 10	≤ 5	<i>Legionella</i> spp.: < 1 000 cfu/l where there is a risk of aerosolisation Intestinal nematodes (helminth eggs): ≤ 1 egg/l for irrigation of pastures or forage
B	Secondary treatment, and disinfection	≤ 100	In accordance with Directive 91/271/EEC (Annex I, Table 1)	In accordance with Directive 91/271/EEC (Annex I, Table 1)	-	
C	Secondary treatment, and disinfection	≤ 1 000			-	
D	Secondary treatment, and disinfection	≤ 10 000			-	

Table 3 – Minimum frequencies for routine monitoring of reclaimed water for agricultural irrigation

Reclaimed water quality class	Minimum monitoring frequencies					
	<i>E. coli</i>	BOD ₅	TSS	Turbidity	<i>Legionella</i> spp. (when applicable)	Intestinal nematodes (when applicable)
A	Once a week	Once a week	Once a week	Continuous	Twice a month	Twice a month or as determined by the reclamation facility operator according to the number of eggs in waste water entering the reclamation facility
B	Once a week	In accordance with Directive 91/271/EEC (Annex I, Section D)	In accordance with Directive 91/271/EEC (Annex I, Section D)	-	Twice a month	
C	Twice a month			-		
D	Twice a month	-	-			

Table 4 – Validation monitoring of reclaimed water for agricultural irrigation

Reclaimed water quality class	Indicator microorganisms ⁽⁴⁾	Performance targets for the treatment chain (log ₁₀ reduction)
A	<i>E. coli</i>	≥ 5,0
	Total coliphages/F-specific coliphages/somatic coliphages/coliphages ⁽⁵⁾	≥ 6,0
	<i>Clostridium perfringens</i> spores/spore-forming sulfate-reducing bacteria ⁽⁶⁾	≥ 4,0 (in case of <i>Clostridium perfringens</i> spores) ≥ 5,0 (in case of spore-forming sulfate-reducing bacteria)

Annex II: Elements for Risk Management Plan

❖ **Art. 5:**...the competent authority shall ensure that a **water reuse risk management plan** is established.

- ❖ set out any necessary **requirements...**,in addition to those specified in **Annex I**
- ❖ *identify hazards, risks and appropriate preventive and/or possible corrective measures*
- ❖ *identify additional barriers...and set out any additional requirements, ...after the point of compliance..., including conditions related to distribution, storage and use*
- ❖ *shall be based on all the **key elements of risk management** set out in **Annex II:***

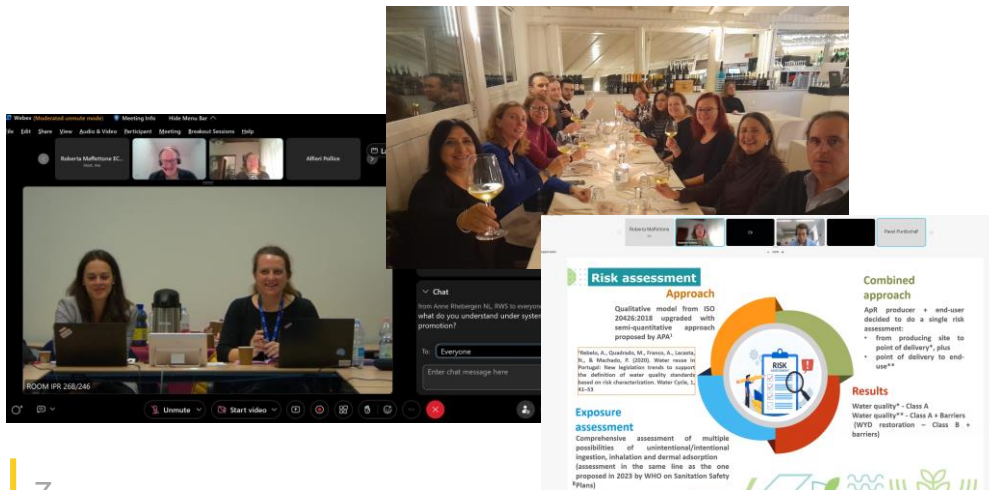
- (A) Key elements of risk management
- (B) Conditions relating to the additional requirement
- (C) Preventive measures



JRC support on Regulation 741/2020

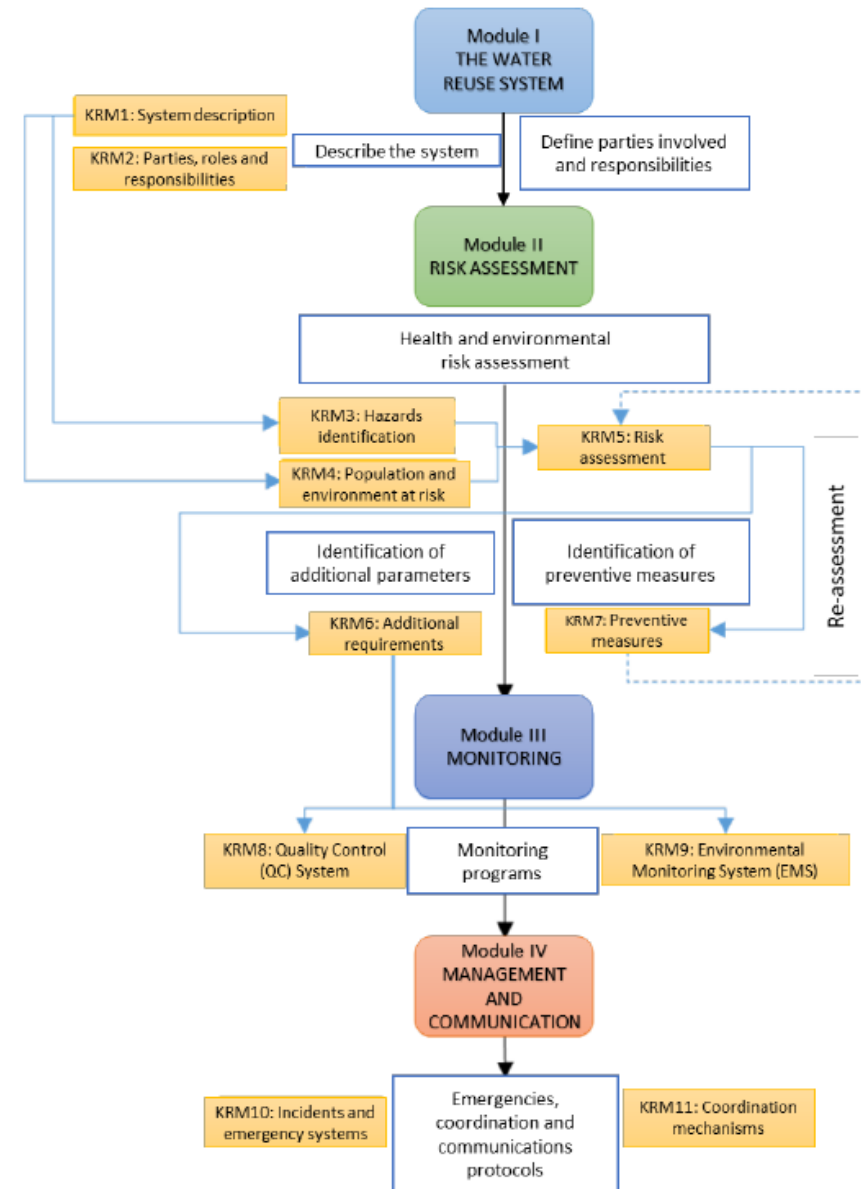


- advised on **minimum requirements** on water quality and monitoring
- provided **guidelines on risk management plan**
- organised **technical workshops** on water reuse
- participate to drafting of regulation and of technical parts of implementing acts documents
 - Commission Notice 2022/C 298/01 Guidelines
 - Technical Specifications of delegated and implementing acts (on-going)
- promote water reuse in the EU



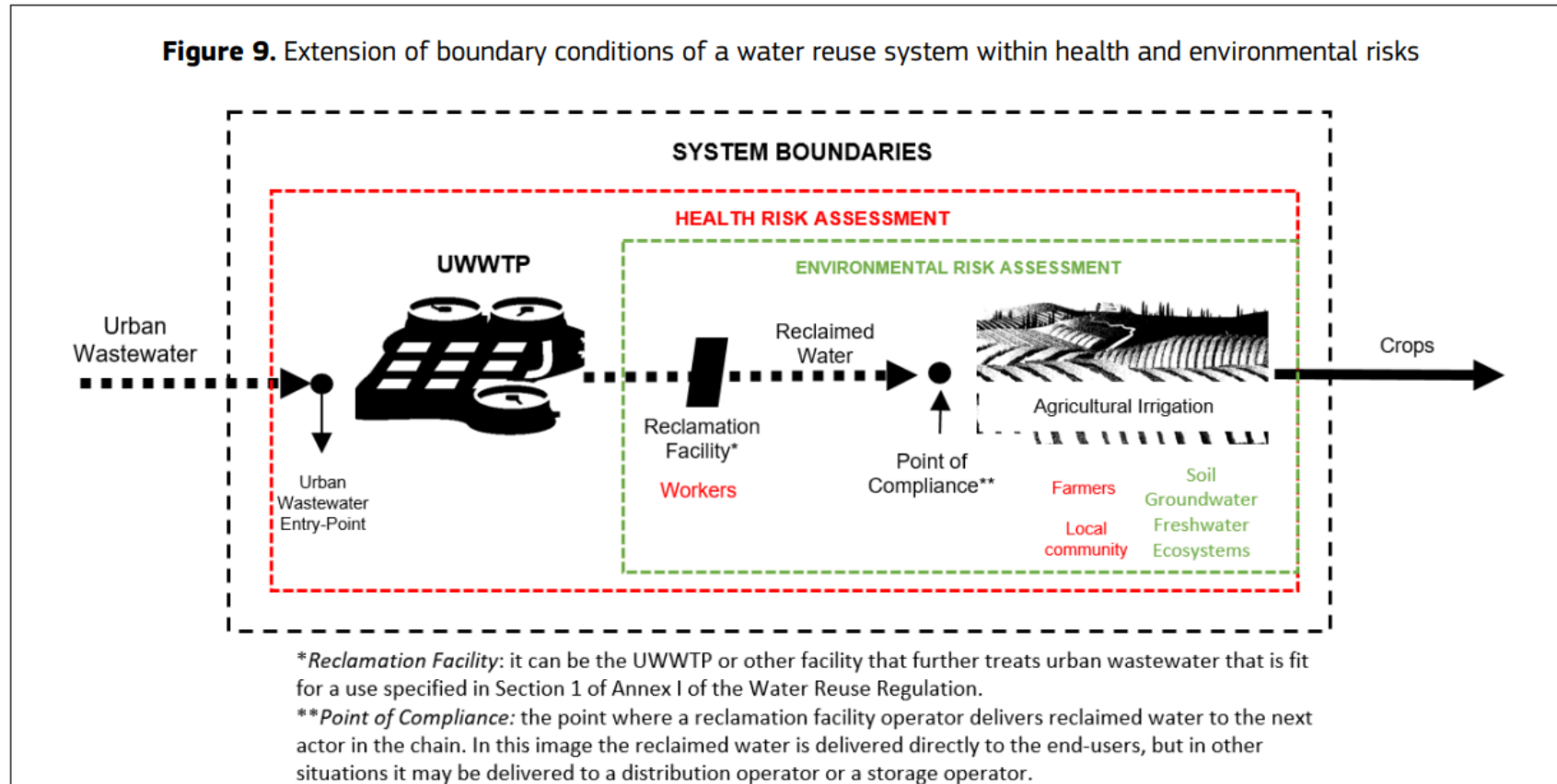
JRC Guidelines on RMP

- ❖ Based on established guidelines and standards:
 - WHO Guidelines
 - Australian Guidelines
 - ISO 16075:2020 and ISO 20426:2018
- ❖ Includes several examples and methodologies
 - Qualitative health risk assessment
 - Quantitative health risk assessment
 - Environmental risk assessment on freshwater resources
- ❖ Includes 14 case studies with examples collected during technical workshops

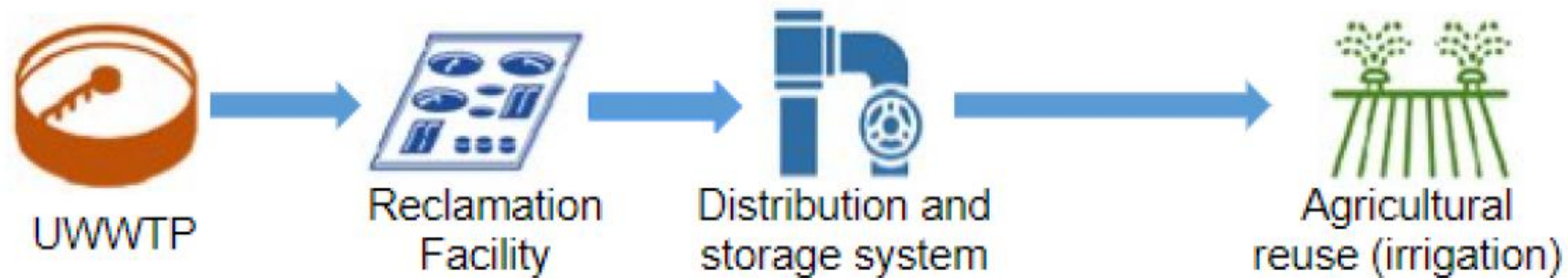


Risk Management Plan

Risk management: systematic management that consistently ensures that water reuse is safe in a specific context [Article 3(9), Regulation (EU) 2020/741].



The Water Reuse System (KRM1 and KRM2)



Description of the system (KRM1)

- Sources and quality of urban wastewater
- Treatments
- Storage
- Distribution system
- Intended uses and crop categories (e.g. root crops)
- Irrigation methods (e.g. surface, sprinkler)
- Point(s) of compliance
- Any barriers applied after the PoC

Parties involved and responsibilities (KRM2)

- Reclamation facility operators (operate, manage and maintain)
- Operators of storage and/or distribution facilities of reclaimed water
- End-users (e.g. farmers, consortia of irrigators, association of farmers)
- Authorities (e.g. water, health, environmental other than the designated competent authority)

The Water Reuse System (KRM3 and KRM4)

Hazards and hazardous events (KRM3)

HAZARDS: any **pathogens, pollutants** and/or **substances** in reclaimed water that might pose risk to human and animal health and environment.

HAZARDOUS EVENT: an **incident** or a **situation** that **introduces or releases the hazard**; amplifies the concentration of a hazard; or fails to remove a hazard (e.g. human error, treatment failure, damage)

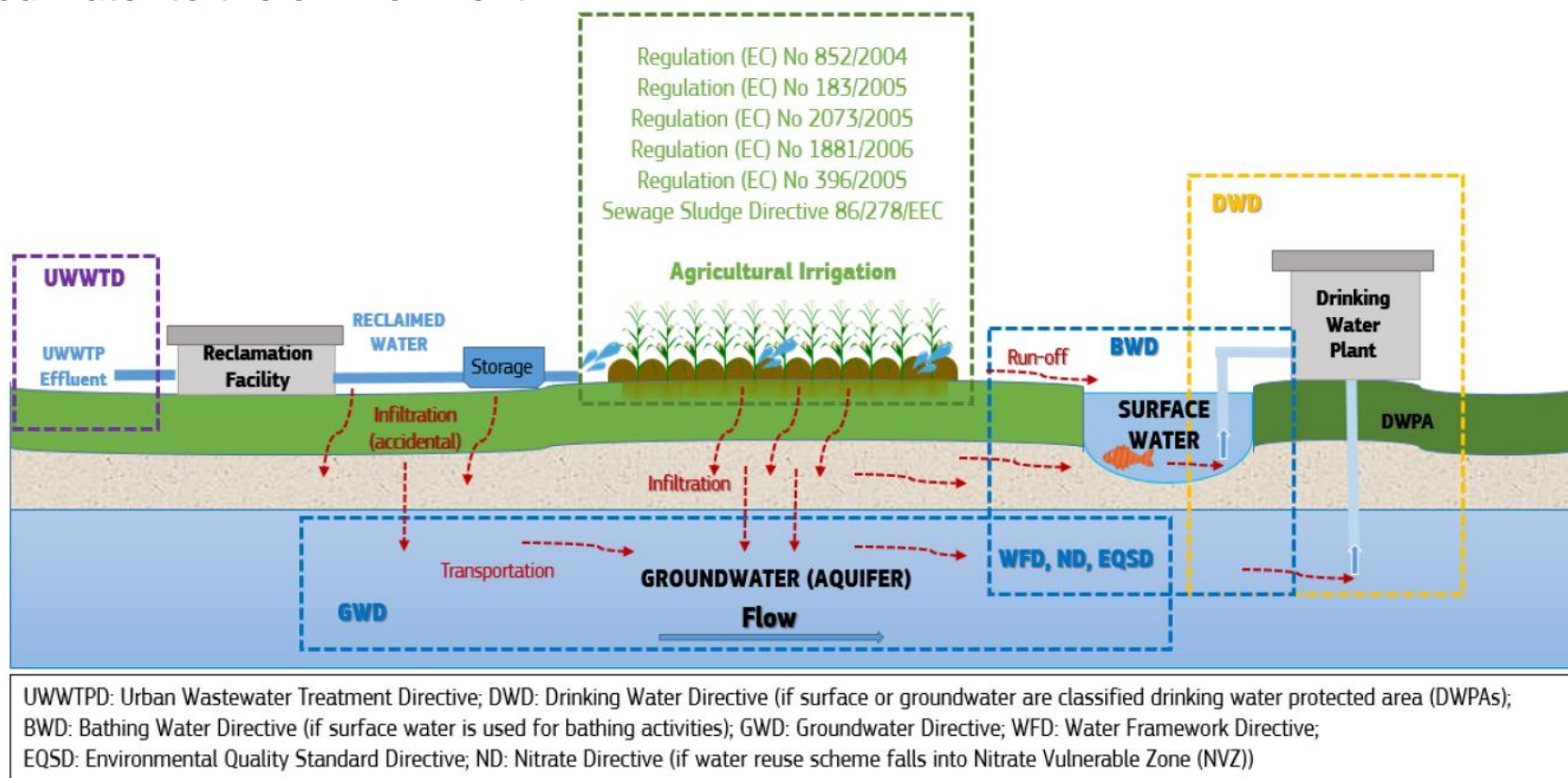
Environments and populations at risk (KRM4)



- Ingestion, contact, inhalation of reclaimed water
- Infiltration to groundwater
- Run off to surface water

The Water Reuse System (KRM3 and KRM4)

Identification of applicable legislation (point 5 Annex II) to the water reuse system assessing potential routes of reclaimed water to the environment



Risk Assessment (KRM5)

A **risk** is the likelihood of identified hazards causing harm in a specified timeframe, taking into account the severity of the consequences (Article 3(15)).

Risk assessment is the process to understand the nature and the level of any risks, associated to **each hazard identified in the reclaimed water**, to each exposed population and environment. Methodologies can be qualitative, semi-quantitative and quantitative (latter high number of data)

$$\text{Level of Risk} = \text{Likelihood} \times \text{Consequence (or Severity)}$$

Table 11. Matrix for qualitative risk assessment

LIKELIHOOD	CONSEQUENCES				
	1 – Insignificant	2 – Minor	3 – Moderate	4 – Major	5 – Catastrophic
A – Rare	Very low	Very low	Low	Low	Moderate
B – Unlikely	Very low	Low	Low	Moderate	High
C – Possible	Low	Low	Moderate	High	High
D – Likely	Low	Moderate	High	High	Very high
E – Almost certain	Moderate	High	High	Very high	Very high

Source: ISO 20426 (ISO, 2018)

Risk Assessment (KRM5)

Environmental risk assessment for freshwater resources (mod from 16075-1 (2020))

Table 16. Example of vulnerability ⁽¹⁾ level of groundwater and surface water

INFILTRATION RATE			No infiltration to groundwater	Low infiltration to groundwater	Medium infiltration to groundwater	High infiltration to groundwater
			I	II	III	IV
Sensitivity to Groundwater	Shallow aquifer or no clay protection	I	1	2	3	3
	Deep aquifer with clay protection	II	1	2	2	3
	Deep aquifer with significant clay protection	III	1	1	2	2
	No aquifer with hydrological continuity to the area	IV	1	1	2	2
SURFACE RUN-OFF			High surface run-off	Medium surface run-off	Low surface run-off	No surface run-off
			IV	III	II	I
Sensitivity to surface water			3	3	2	1

⁽¹⁾ The term *vulnerability* was substitute to the original term *risk* used in table C1 of ISO 16075-1 (2020) to avoid misinterpretation with the *risk levels* used in this document to indicate the combination of likelihood with severity of damage according to Table 13 and Table 14.

Source: ISO 16075-1 (2020)

Env risk assessment on soil and crops

Substances that might have effect on soil and crops (agronomic hazards: salinity, boron, nutrients) can be assessed by comparing their levels with ISO water quality standards (e.g. Annex B and C of ISO 16075-1 (2020))

Additional requirement (KRM6)



Additional or stricter requirements:

- Selected from the list of hazards (pathogens, pollutants, parameters, substances)
- For water quality and monitoring
- Based on environmental and health risk assessment
- It could include not yet regulated contaminants (e.g. CECs)
- They should be selected considering scientific evidence and site-specific conditions

Preventive measures (KRM7, 8, 9, 10 and 11)



Action or activity that can prevent, eliminate or reduce a health or environmental risk (Art. 3(10)).

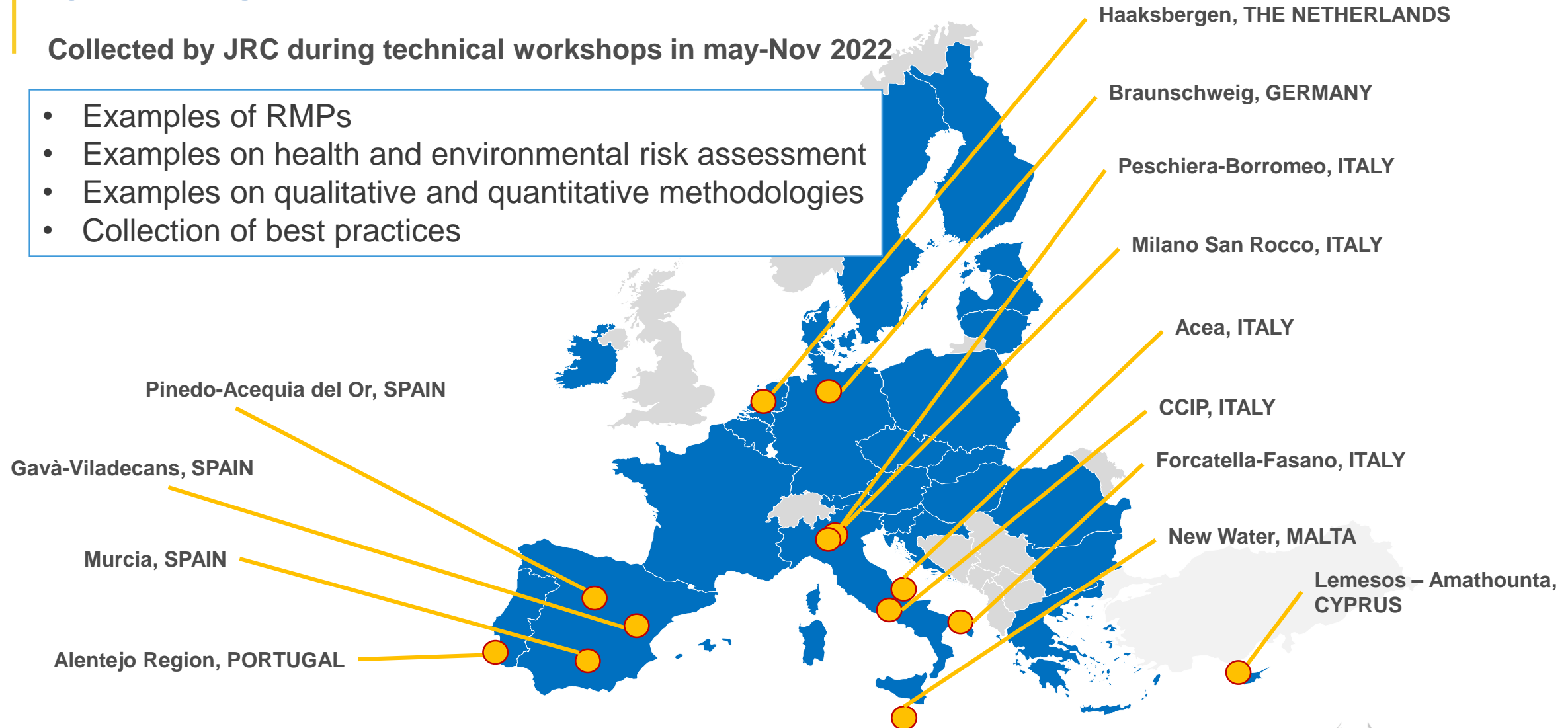
In the RMP:

- treatment, an irrigation method, a barrier or any requirement that could reduce the risk (point (C) 7)
- list of procedures in a quality control system (monitoring and maintenance programmes) (point (C) 8)
- any procedure or activity in an environmental monitoring systems (point (C) 9)
- any procedure and activity in an emergency management system (point (C) 10)
- coordination mechanisms between the responsible parties of a water reuse system (point (C) 11)

Case Studies on RMP

Collected by JRC during technical workshops in may-Nov 2022

- Examples of RMPs
- Examples on health and environmental risk assessment
- Examples on qualitative and quantitative methodologies
- Collection of best practices



Technical Workshops - Highlights

- Established EU practises (10-20 years) on re-using treated urban wastewater in industrial uses, with high-quality water and examples on risk assessment and management:
 - 4.3 Mm³/year used for paper-mill (Madrid, Spain)
 - 1.7 Mm³/year reused for cooling systems and industrial cleaning in petrol-chemical industries (Tarragona, Spain)
 - 3.5 Mm³/year reused as process water at Solvay industry (Italy)
 - Potential of reuse in industrial applications in Baltic Region
- EU examples on use of reclaimed water for amenity-related applications:
 - Examples on risk assessment and management for urban uses in Lisbon (Portugal)
 - Examples of urban uses in Madrid (Spain), for environmental restoration (Italy), and at Zoo-Marine (Portugal)
 - Potential of reuse for green areas irrigation, street cleaning and snow production in Baltic Region

On-going and future activities

- Water Portal with e-exhibition of Water Reuse Case studies and examples of risk management (on-going)
- Delegated Act on Technical Specifications on Key-Risk Management Elements (on-going)
- Further workshops focusing on other applications (e.g. industrial, amenity-related)
 - ***Use of reclaimed water for industrial applications – EU experiences*** on 20th June
 - ***Use of reclaimed water for urban and amenity-related applications – EU experiences***, on 26th September
 - ***Use of reclaimed water for agricultural irrigation*** in November/December (TBD)

Please connect with us

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