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European Union Network for the Implementation and Enforcement of Environmental Law

IMPEL projects:
WiNE – WRAP - SMWP

Seminari di Formazione Continua Ispettori Ambientali e Personale del Servizio VAL-RTEC

10 maggio 2024

Geneve Farabegoli

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European Union Network for the Implementation and Enforcement of Environmental Law

IMPEL presentation

IMPEL = Network of **regulators**

- The European Union Network for the Implementation and Enforcement of Environmental Law (IMPEL) is a international non-profit association of the environmental authorities of the European Union Member States, acceding and candidate countries of the EU, EEA and EFTA countries and potential candidates to join the European Community.
- Based in Brussels
- Founded in 1992
- 37 Member countries
- 57 Member organisations

Strategic ambit

Networking of environmental practitioners across Europe

Analysing implementation challenges and solutions

Supporting capacity building

Establishing a Knowledge and Innovation Centre

Coordinating Enforcement actions

Providing feedback on practica-bility of European environmental law

European Union Network for the Implementation and Enforcement of Environmental Law

CONTACT

Chemin des deux maisons 73, box 3
1200, Brussels
Belgium
Email: info@impel.eu

Expert Teams

Filter by tags

Waste and TFS

Water and land

Consciousness of the threat represented by quality and quantity degradation of water resources has increased over the years. As well as problems related to poor management of land and soils. The presence of a number of different administrative and enforcement structures...

[Read more]

Cross-cutting tools and approaches

The X-cutting Expert Team is set-up to support regulatory practitioners who are responsible for the development of systems, processes, procedures and new ways of working. The team is primarily concerned with x-cutting regulatory systems rather than sector specific ones. Th...

[Read more]

Nature protection

Halting and reversing the loss of biodiversity by 2020 is a priority within the European Union. The implementation of EU Nature legislation (the Birds and Habitat Directives) is essential to achieve the EU 2020 biodiversity target. However, implementation and enforcement need to...

[Read more]

Waste and TFS

Tags: Waste and TFS

The scope of the Waste and TFS Expert Team is on the practical implementation and enforcement of international and European Waste Shipment and Waste Management rules. The aim of the network is to promote compliance with the European Waste Shipment Regulation...

[Read more]

Industry and air

Expert Team 'Industry and Air' will mainly focus on the practical implementation and enforcement of Industry related pieces of legislation. In this area the key Directive is the Industrial Emissions Directive 2010/75/EU (IED), which replaces the IPPC Directive and seven sectoral...

[Read more]

Select language EN

Searchterm

LATEST NEWS

April 19, 2024
The Stakeholder's NPRI Kick-off Meeting of the CCDR-A in Évora, 27 March 2024, Portugal

April 16, 2024
Tender for IMPEL Video Production

April 10, 2024
Intensive Groundwater Abstraction in Málaga Province (Spain), 4-5 April 2024

April 01, 2024
IED & Circular Economy Meeting in Bratislava, 19-20 March, 2024

March 19, 2024
National Peer Review Meeting in Bologna, Italy on 20-21 February 2024

View all

impel.eu/en/projects/wastewater-in-natural-environment-wi-ne

CONTACT

Chemin des deux maisons 73, box 3
1200, Brussels
Belgium
Email: info@impel.eu

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Wastewater in Natural Environment (WiNE)

2017 Ongoing

Project description and aims

This work package targets to help Member States on the transition to the Circular Economy within the water cycle. Through the share of good practices in urban, industrial and food production water management, in terms of water use and reuse (use of treated wastewaters as an alternative water source) is intended to identify and improve solutions in terms of water use efficiency (taking into account both quality and quantity aspects), that may contribute to zero pollution solutions.

During the previous phases of this project, at industrial level, it was intended to access the water use inside recycling activities and a new indicator (the Water Circularity Index) combining quality and quantity aspects was developed. It was applied to specific industrial installations namely oil refinery, pulp and paper factory, WWTP, etc., and during 2020/21 it was intended to find the suitability of the index for local/regional activities.

This project intends to develop new tools and/or improve the previous one (The Water Circularity Index) that links the several pieces of environmental legislation to promote a transition to the circular economy through an efficient water use, in taking into account both quality and quantity aspects. For this goal, is intended to identify and link best practices in terms of water use within process or activity
and reuse (use of treated wastewaters as an alternative water source), water quality management, sludge management, water resources uses and energy balance.

From the application of The Water Circularity Index is, therefore, envisioned to find the best solutions in facilities, activities and final products to promote "reuse/circular markets" that will not only result from a better water efficient (quantity and quality) use, but also contributes to zero pollution solutions and, whenever possible, within the nexus water-food-energy-ecosystems.

Another related outcome of the work will be improving professional training, spreading knowledge and provide compliance assurance in rural areas as required for the implementation of the ECA 9- point Action Plan.

Topic
Water and land

Lead country and contact
Portugal
Ana Rebelo
Italy
Geneve Farabegoli

References
Integrated Approach Water/Integrated water approach (2017)
Tolls 2022-24

Project report(s)
Report/ Good Practices & A New Water Circularity Index/2020/ ISBN
Report (EN)/ Integrated Water Approach: Circularity Index/ 2019
Report (IT)/ Integrated Water Approach: Circularity Index/ 2019
Report (PT)/ Integrated Water Approach: Circularity Index/ 2019
Report(EN)/Urban Water Reuse/2018/ISBN
Report(IT)/Urban Water Reuse/2018
Report(PT)/Urban Water Reuse/2018
Report(EN)/ Industrial Water Management Guideline with Case Study / 2018/ISBN
Report(IT)/ Industrial Water Management Guideline with Case Study / 2018
Report(EN)/ Industrial Water Management Guideline / 2018/ ISBN
Report(IT)/ Industrial Water Management Guideline/ 2018

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WiNE project
and the water circularity index

Genève Farabegoli & Anabela Rebelo

ISPRA Istituto Superiore per la Protezione e la Ricerca Ambientale

Sistema Nazionale per la Protezione dell'Ambiente

apa portuguese environment agency

BACKGROUND INFORMATION FROM IWA* PROJECT (2017-2019)

- Use of less water per unit of produced material
- Energy savings
- Reduction of CO_2 emissions (reduction of pumping)

Reduce of freshwater consumption

Water resources

- Reduce the water bodies over-exploitation
- Promote water resources replenishment

- Water use efficiency – Only looking at quantitative aspects
- Simplistic approaches to promote water reuse without linking to impacts over water bodies
- Compliance of IED without link to WFD goals

- Concentration of pollutants in wastewaters
- May promote short and long negative impacts on water bodies (acute and chronic effects on ecosystems)

Consequences

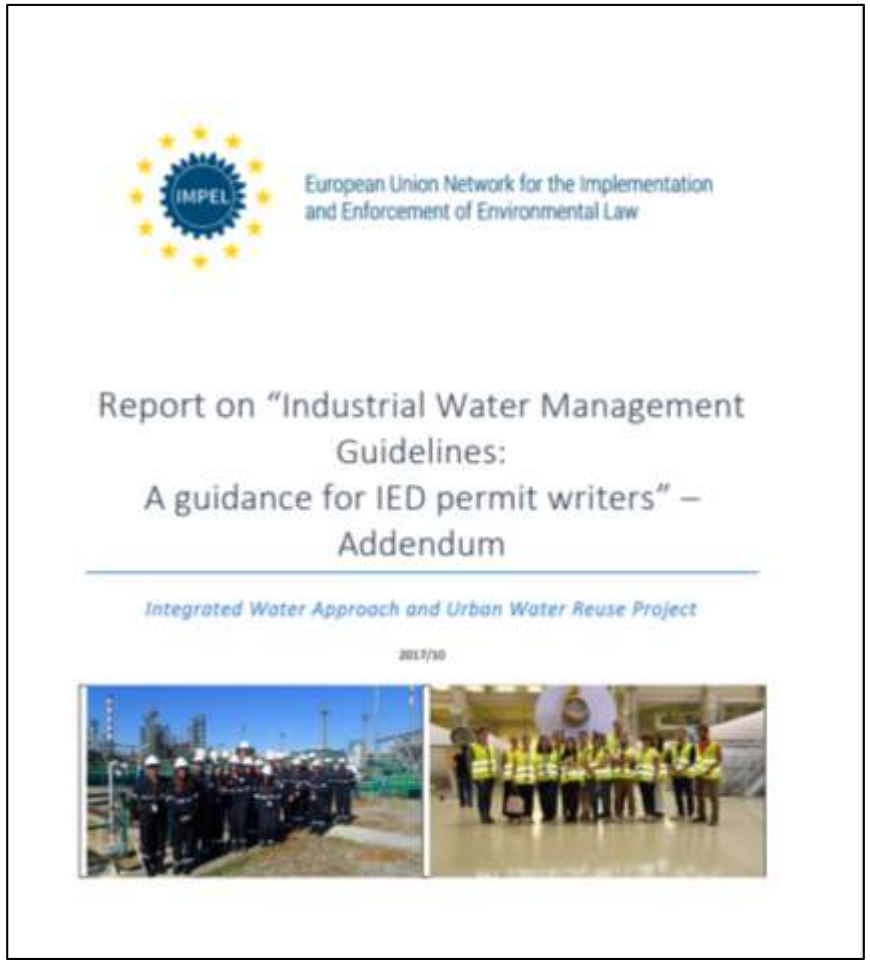
Water resources

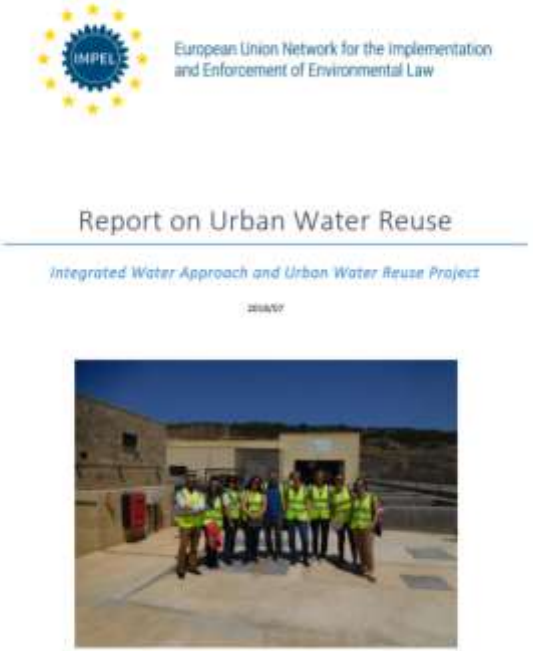
- Reduction of natural values (ecosystem lost)
- Increase of CO_2 emissions (oxidation of organic matter/algae blooms)
- Can compromise the water status

- Use an integrated approach to water use under industrial and urban cycle, at local and catchment scale
- Needs to understand the principles of circular economy in the water use cycle

* Integrated Water Approach: former name of the project

DELIVERABLES 2018-2019

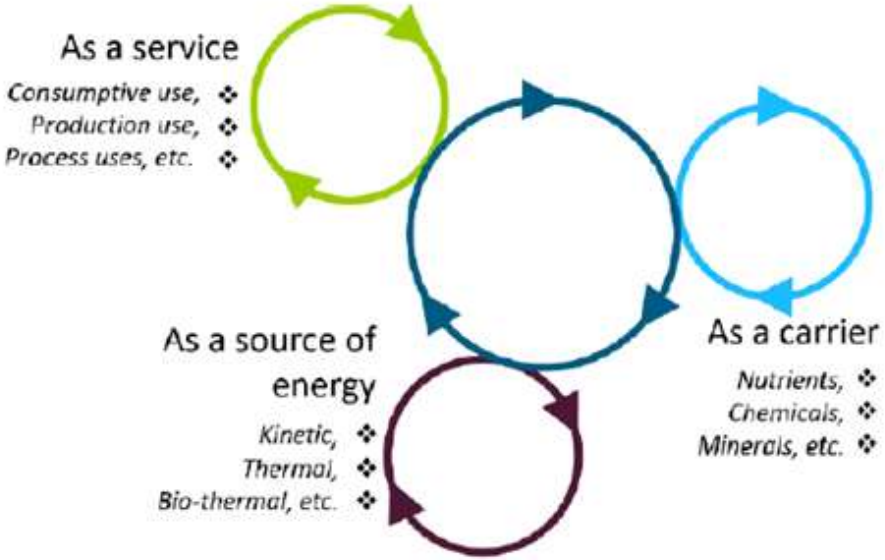




WATER CIRCULARITY

Classic approach:

- **Water use efficiency, namely the quantitative aspects through the reduction of consumptions and losses**
- **Rain waters recovery**
- **Water reuse.**
- **Use of sludge from wastewater treatment plants and manure as a source of organic matter and nutrients and for energy production**



To achieve a real transition, the above factors cannot be seen as individual indicators but instead they should be linked with the several possible processes

Important trade-offs and synergies between societal decisions on health and environment and technological developments may be overlooked due to their usual separate treatment (Hauschild *et al.*, 2022)

Hauschild, M. Z., McKone, T. E., Arnbjerg-Nielsen, K., Hald, T., Nielsen, B. F., Mabit, S. E., & Fantke, P. (2022). Risk and sustainability: trade-offs and synergies for robust decision making. Environmental Sciences Europe, 34(1), 11. doi:10.1186/s12302-021-00587-8

HOW TO DEVELOP THE INDEX?

SMART criteria: Easily accessible and measurable factors (key factors) that take into account the relationships between the water use patterns, the processes and the environmental systems were considered as inputs

S	SPECIFIC	The index accurately describes what is intended to be measured and does not include multiple measurements
M	MEASURABLE	Regardless of who uses the index, consistent results can be obtained and tracked under the same conditions
A	ACHIEVABLE	Collecting data for the index is simple, straightforward, and cost-effective
R	RELEVANT	The index is closely connected with each respective input, output or outcome
T	TIME-BOUND	The index includes a specific time frame, i.e., the validity of the environmental/ discharge permit

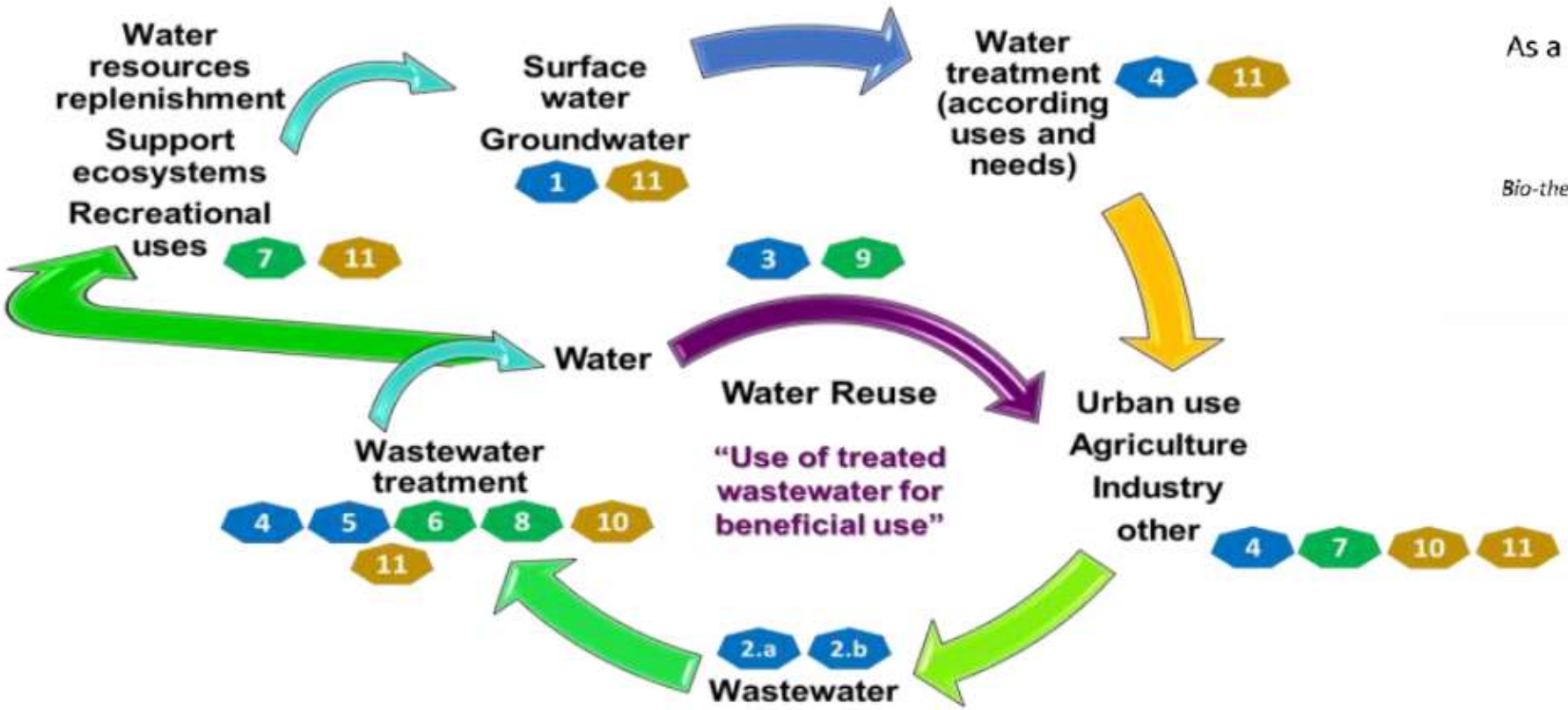
WASTEWATER IN NATURAL ENVIRONMENT – WINE 2019/20

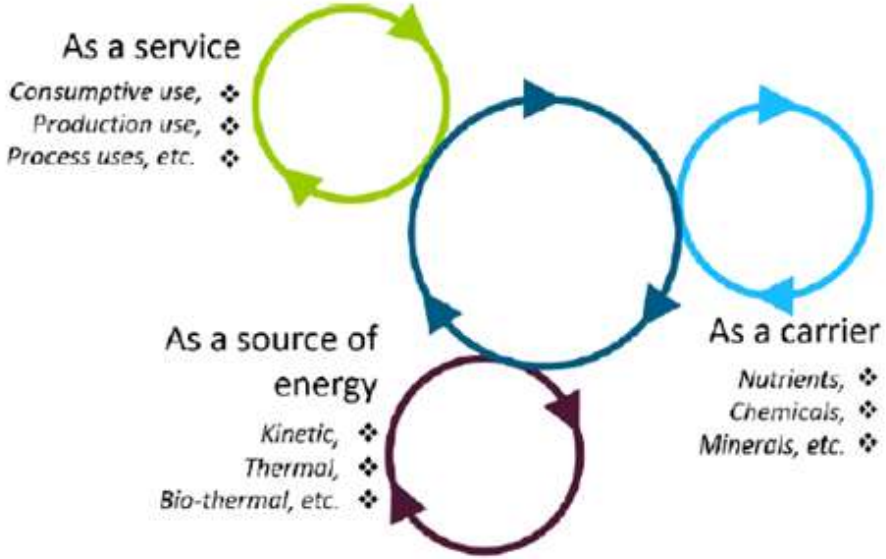
Circularity Index (IC) developed to endorse the transition to the circular economy: Tool to measure the circularity of a certain process or installation

Key-Factors

1. Freshwater consumption
2. Wastewater discharges:
   a. Non-IED installations
   b. IED installations
3. Water reuse
4. Best management practice and technologies
5. Priority substances (PS), priority hazardous substances (PHS) and other pollutants (OP) and specific pollutants (SP)
6. Microplastics and/or compounds of emergent concern
7. Biodiversity
8. Recovery of nutrients
9. Internal industrial symbiosis
10. Sludge
11. Voluntary and incentive instruments

WATER CIRCULARITY





Key Factors: Distributed by 3 levels of Importance

WASTEWATER IN NATURAL ENVIRONMENT – WINE 2019/20

$$I_c = \frac{\sum(f_{i\ s\text{-}key} \times f_{i\ w})}{N_f}$$

INDEX

$$f_{i\ w} = \frac{\left| f_{i\ s\text{-}key_{+++,++or+}} \right|}{F_{key_{+++,\ ++or+}} \times n_{s\text{-}key\ app_{+++,++or+}}}$$

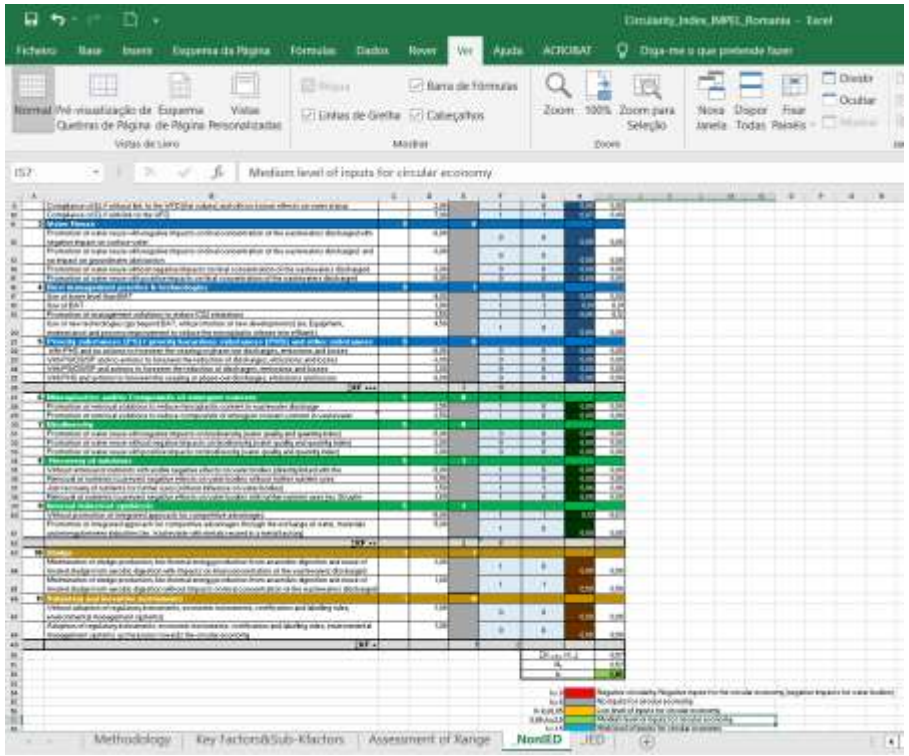
WEIGHTING FACTOR

$$N_f = \frac{n_{F_{key+++}} \times 9 + n_{F_{key++}} \times 5 + n_{F_{key+}} \times 1}{5 \times 9 + 4 \times 5 + 2 \times 1} = \frac{9n_{F_{key+++}} + 5n_{F_{key++}} + n_{F_{key+}}}{67}$$

NORMALIZATION FACTOR

	Ic <0	Negative Circularity: Negative inputs for the circular economy (negative impacts for water bodies)
	Ic = 0	No inputs for circular economy
	0 < Ic ≤ 0,85	Low Circularity: Low level of inputs for circular economy
	0,85 < Ic ≤ 1,5	Medium Circularity: Medium level of inputs for circular economy
	Ic > 1,5	High Circularity: High level of inputs for circular economy

Excel tool 1.0



KEY-FACTORS

Key Factor	Key and sub-key factors	Key factor value (F_{key})	Sub-Key factor value ($f_{i\ s\text{-}key}$)
1	**Freshwater consumption**	**9**	
	Measures to reduce consumption without linking the impacts on the quality of wastewaters and contributing directly to its degradation		-9,00
	Measures to reduce consumption without linking impacts on the quality of wastewaters (with non-significant variation on wastewater quality, e.g., reduction on groundwater abstraction with low impacts on wastewaters)		1,00
	Measures to reduce consumption with measures to reduce possible effects of effluents concentration		4,00
	Reducing abstraction directly from water body (ex. Rainwater collection and reuse) promoting		4.00
2.b	**Wastewater discharges IED installations**	**9**	
	Compliance of BREF-EAV without link to the WFD		-9,00
	Situations where BREF-EAV can be equal to ELV, according check-list		2,00
	Compliance of ELV (ELV defined according WFD principles, where ELV needs to be lower than BREF-EAV, according check-list)		7,00
3	**Water Reuse**	**9**	
	Promotion of water reuse with negative impacts on final concentration of the wastewaters discharged with negative impact on surface water		-6,00
	Promotion of water reuse with negative impacts on final concentration of the wastewaters discharged and no impact on groundwater abstraction		-3,00
	Promotion of water reuse without negative impacts on final concentration of the wastewaters discharged		3,00
	Promotion of water reuse with positive impacts on final concentration of the wastewaters discharged		6,00
4	**Best management practice & Technologies**	**9**	

Positive & Negative Impacts

KEY-FACTORS

Key Factor	Key and sub-key factors	Key factor value (F_{key})	Sub-Key factor value ($f_{i\ s\text{-}key}$)
6	**Microplastics and/or Compounds of emergent concern**	5	
	Promotion of removal solutions to reduce microplastic content in wastewater discharge		2,50
	Promotion of removal solutions to reduce compounds of emergent concern content in wastewater discharge		2,50
7	**Biodiversity**	5	
	Promotion of water reuse with negative impacts on biodiversity (water quality and quantity index)		-5,00
	Promotion of water reuse without negative impacts on biodiversity (water quality and quantity index)		2,00
	Promotion of water reuse with positive impacts on biodiversity (water quality and quantity index)		3,00
8	**Recovery of nutrients**	5	
	Without removal of nutrients with visible negative effects on water bodies (directly linked with the installation)		-5,00
	Removal of nutrients to prevent negative effects on water bodies without further nutrient uses		0,50
	Just recovery of nutrients for further uses (without influence on water bodies)		1,50
	Removal of nutrients to prevent negative effects on water bodies with further nutrient uses (ex. Struvite recovery)		3,00
10	Sludge	1	
	Minimization of sludge production, bio-thermal energy production from anaerobic digestion and reuse of treated sludge from aerobic digestion with impacts on final concentration of the wastewaters discharged		-1,00
	Minimization of sludge production, bio-thermal energy production from anaerobic digestion and reuse of treated sludge from aerobic digestion without impacts on final concentration of the wastewaters discharged		1,00
11	Voluntary and incentive instruments	1	

Positive & Negative Impacts

RESULTS FROM REAL CASES

Case study	IED Installation	NON IED Installation	Description of WWTP	Ic
A 1	X		Pulp mill before permit review	-1,24
A 2	X		Pulp mill after permit review	1,19
A 3		X	Urban WWTP	1,91
B 1	X		Pulp and paper industry	0,35
B 2	X		Biorefinery	2,13
B 3	X		Oil refinery	-1,01
C 1		X	Urban WWTP with industrial connections	3,48
C 2	X		Company cleaning and shredders plastic barrels	1,46
D 1	X		Pulp and paper industry and urban wastewater	1,39
D 2	X		Fertilizer production plant	1,00
D 3	X		Large smelter	2,94
E 1	X		Pulp and paper industry	0,52
E 2	X		Brewery	1,09

WATER CIRCULARITY INDEX AND UWWTP

- **The Index allows to measure some important interlinks such as:**
  - **Compliance of ELV defined according WFD principles or just simple flat values defined on current legislation**
  - **Removal of nutrients to prevent negative effects on water bodies and/or further nutrient uses (with/without influence on water bodies)**
  - **Promotion of water reuse and its relationship with impacts on concentration of discharge TWW and biodiversity**
  - **Removal of PS/PHS, microplastics and compounds of emergent concern (CoC)**

Considering the effects of non removal of microplastics and CoC

Case study	IED Installation	NON IED Installation	Description of WWTP	Ic^1	Ic^2
A 3		X	Urban WWTP	1,91	1,69
C 1		X	Urban WWTP with industrial connections	3,48	2,68
D 1	X		Pulp and paper industry and urban wastewater	1,39	1,08

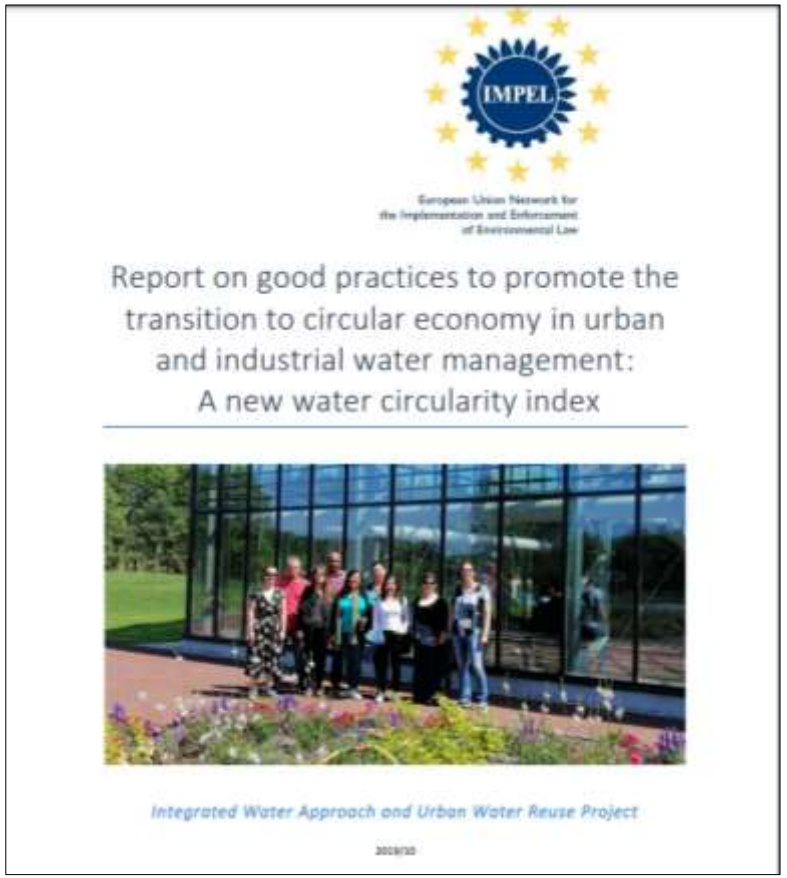
Without considering effects of non removal of microplastics and CoC

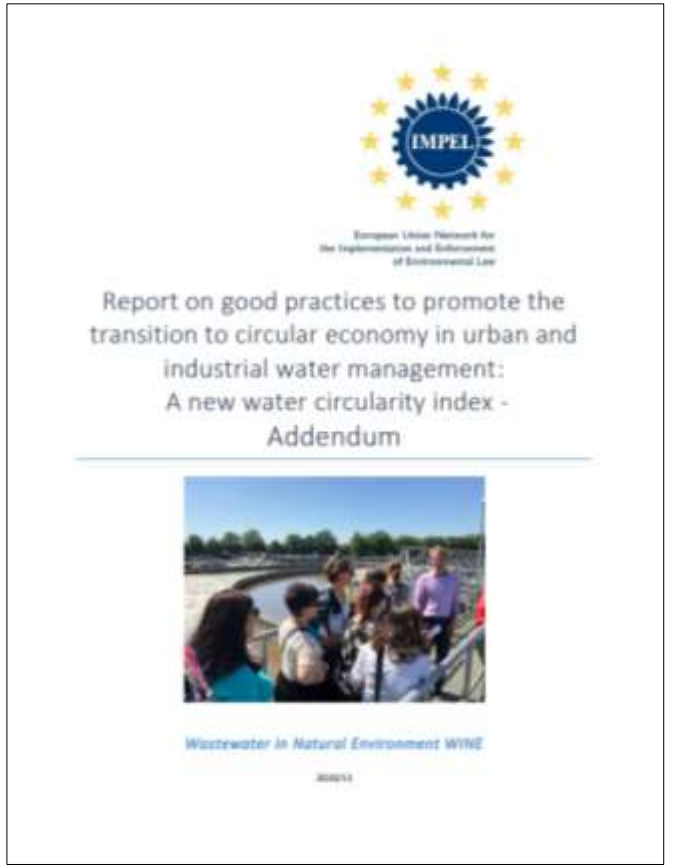
HIGH CIRCULARITY VS NEGATIVE CIRCULARITY

- ELV compliance according WFD criteria
- Use of new technologies
- Consideration of PHS and measures to cease, phase-out emmissions, discharges and losses
- Promotion of Water reuse with positive impacts on biodiversity
- Promotion of an integrated approach for competitive advantages
- Ruduction of sludge production with no impact on final effluent concentration
- Adoption of voluntary and incentive instruments

- Measures to reduce water consumption with a negative impact on wastewater quality and which directly contribute to the degradation of the receiving environment
- Compliance of EAV-BAT (IED instalations) with no link to WFD
- Promotion of water reuse with negative impacts on final concentration with negative impacts on surface water
- Without removal of nutrients and with consequent visible negative effects on the water bodies
- Without adoption of voluntary and incentive instruments

DELIVERABLES 2019-2020





WINE PHASE 2 – 2021

Critical activities/facilities with high pressure over water bodies

Regional/local activities with significant impact in terms of water use (e.g., high water consumption, high discharge loads, seasonal activities, etc.)

Food production activities that uses or intended to use treated wastewaters and/or biosolids or sludge

REGIONAL OR LOCAL ACTIVITIES

- **Local and or seasonal activities with significant impact in terms of water use but important for local communities' economy**

SUGARCANE PRODUCTION: WASTES AND BY-PRODUCTS

The sugarcane (*Saccharum officinarum*) is one of the most important crops in the History of Madeira Island.

The production of sugarcane in Madeira Island dates back to the 15th century, having contributed inexorably to the economic, social and cultural development of the Region through trade and sugar exports. Currently, sugarcane is mainly used in the production of cane honey and sugarcane rum (agricultural rum).

- **Problems: Bagasse & Vinasse**
  - **Bagasse may be used as substrate for mushroom production, for pellets or for cosmetic industry**
  - **Vinasse requires specific treatment (high pH and organic load) prior discharge into water bodies or to be used as a fertilizer for banana crop production**

Circularity water index: Allows to find the solutions that promotes a higher transition to a circular model and to identify better synergies. Also helps industry understanding the importance of environmental compliance for the "sustainability" of their products

WINE PHASE 3 – 2022-2024

This project phase intends to improve the Water Circularity Index and its application to identify and link best practices in terms of water use within process or activity and reuse (use of treated wastewaters as an alternative water source), water quality management, sludge management, water resources uses and energy balance.

During this phase have been held 3 site-visits (one of each type of activity above identified) to achieve the real conditions for a better comprehension of the interlinkage of all water uses aspects in the target activities.

This allowed to collect the most appropriate information for the index calculation. The site-visits have been also used for training and capacity building. The algorithms and input factors (Index) have been improved according all the information collected through the project lifetime.

A final Conference is scheduled to present the Water Circularity Index and its benefits to the Member States, European Commission and other stakeholders, such as, research institutions, representatives of activities or NGO.

MAIN GOAL & TEAM

This project intends to improve the Water Circularity Index and its application to identify and link best practices in terms of:

- **Water use within process or activity and reuse (use of treated wastewaters as an alternative water source)**
- **Water quality management**
- **Sludge management**
- **Water resources uses**
- **Energy balance**

WINE PHASE 3 – 2022-2024 MILESTONES

March 2022
Preparation of the site-visits

23 June 2022
Kick -off meeting

29-30 September 2022
1st Site-visit & training in Madeira, Portugal

23-24 March 2023
2nd Site-visit & training in Murcia, Spain

21-22 September 2023
3rd Site-visit & training in Ruzomberok, Slovakia

October 2023
Workshop in Romania & **April 2004** project team meeting in Finland

June- October 2024
Drafting of the report

November 2024
Final Conference in Cyprus

December 2024
Deliver the final report to GA

Budget

40.000 € for 3-year project

WATER REUSE: CROPS IRRIGATION

Options to use freshwater/reclaimed water depends on the location of farmers and type of crops and the quality of water from the diverse sources…

Are used appropriate efficient water use measures (type of crops, location and growing cycle)?

Are being used condensate/rain water from greenhouses roofs?

Is the water used by farmers affecting other uses?

…

CAN THIS INDEX BECAME A LABEL?

FINAL REMARKS

- The index allows the impact of integrated approaches to water use to be assessed. It confirms the promotion of water circularity depending on the management options chosen
- Application to IED and non-IED installations and water reuse solutions enables the cumulative impact of efficient water use to be assessed both in terms of quantity and quality
- The index can/should be refined to include energy aspects and further integrate impacts on CO_2 emissions
- The definition of factors applicable at the final product level could support the adoption of best practices in water use with relevance to regional and/or seasonal products
- An indicator that promotes integrated compliance with environmental legislation

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WRAP project

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WATER RISK ASSESSMENT PROJECT

European Union Network for the Implementation and Enforcement of Environmental Law

Work Package 1 – Wastewater in Natural Environment (WiNE) – Phase 4

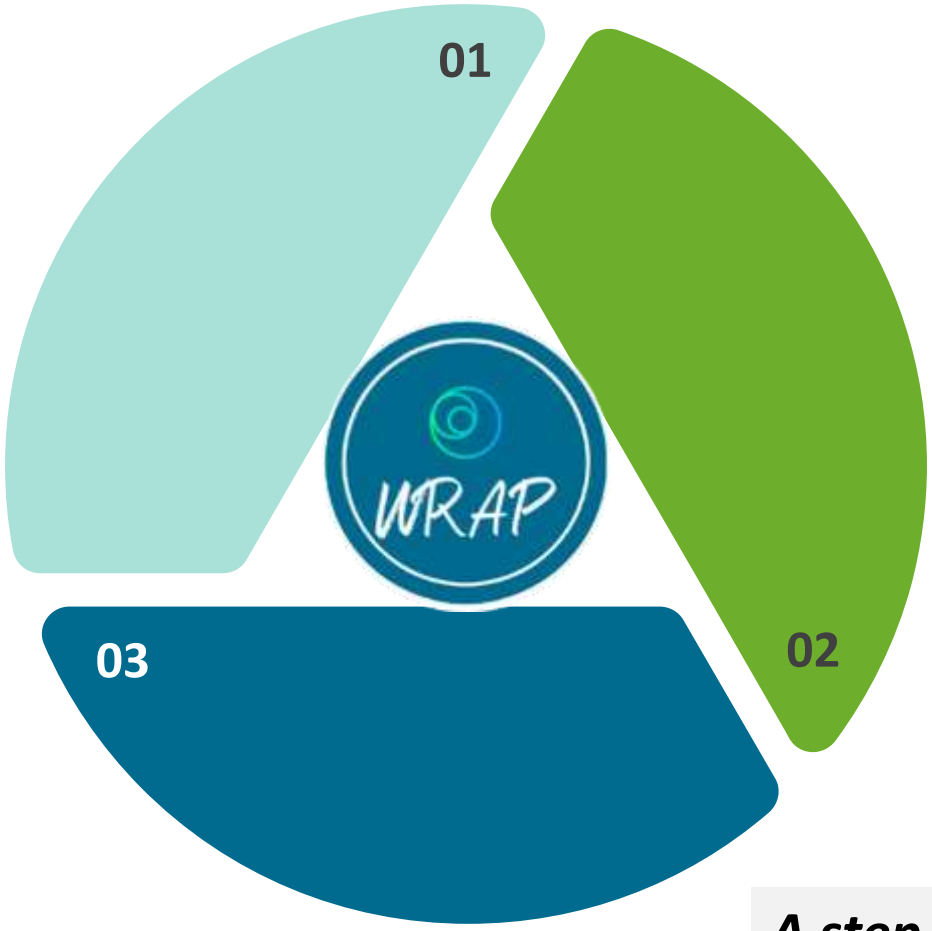
Guidance document:

- Lessons learned from the implementation of the Regulation for Water Reuse (with a focus on the results from the risk assessment)
- Industial reuse: best practices for industrial reuse in IED and non-IED installations

Work Package 3 – Water Damage Key Assessment (WDKA)

Guidance document and tools to measure "substantial damage" to water and to identify possible scope under ECD and ELD:

- Aplication of the methodology developed by PT authorities to real cases in other countries
- Application of risk assessment methodologies to real cases scenarios



Work Package 2 – Catchment Areas and Risk Assessment (CARA)

Guidance document and tools to develop the risk assessment for water resources focusing on new legal requirements:

- New drinking water directive: Risk assessment and risk management of the catchment areas for abstraction points of water intended for human consumption
- New urban wastewater water directive (proposal): Risk assessment for areas of accumulation of micropollutants
- Improve water safety for other uses (like irrigation) through risk assessment methodologies

A step towards water resilience by increasing our knowledge of risk assessment over water!

WATER RISK ASSESSMENT PROJECT

European Union Network for the Implementation and Enforcement of Environmental Law

WRAP

Prior2025

Use of knowledge and products from prior phases (Integrated water approach & WiNE)

2025

3 site-visits (WP1, WP2, WP3) & Workshop

2026

3 site-visits (WP1, WP2, WP3) & Workshop

2027

Workshop & Final conference

Final Products

- **Guidance Documents**
- **Tools (possible use of AI)**

To facilitate the transfer of knowledge from IMPEL's experts, the tool will be developed to be used directly under KIP

To build on the experience of other projects (CAED, Environmental crimes, W&L Conference, Supporting IED Implementation, Waste Management and Circular Economy, GIEDA for sharing best practices and find ways to collect inputs for the risk assessment procedures)

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Self-Monitoring in Water Permits (SMWP)

European Union Network for the Implementation and Enforcement of Environmental Law

Data gap to assess the contribution of industries to water pollution in Europe

Data from WFD implementation: There is a need to pay more attention to the overall pressures on water bodies, such as wastewater discharges (urban, non-urban and industrial) and freshwater abstraction

Environmental Compliance and Governance Forum:

IMPEL will lead work on tools for verification of self-monitoring and reporting by economic operators

Data gap to assess the contribution of industries to water pollution in Europe

Difficulties in implementation and validation noticed in several IMPEL projects

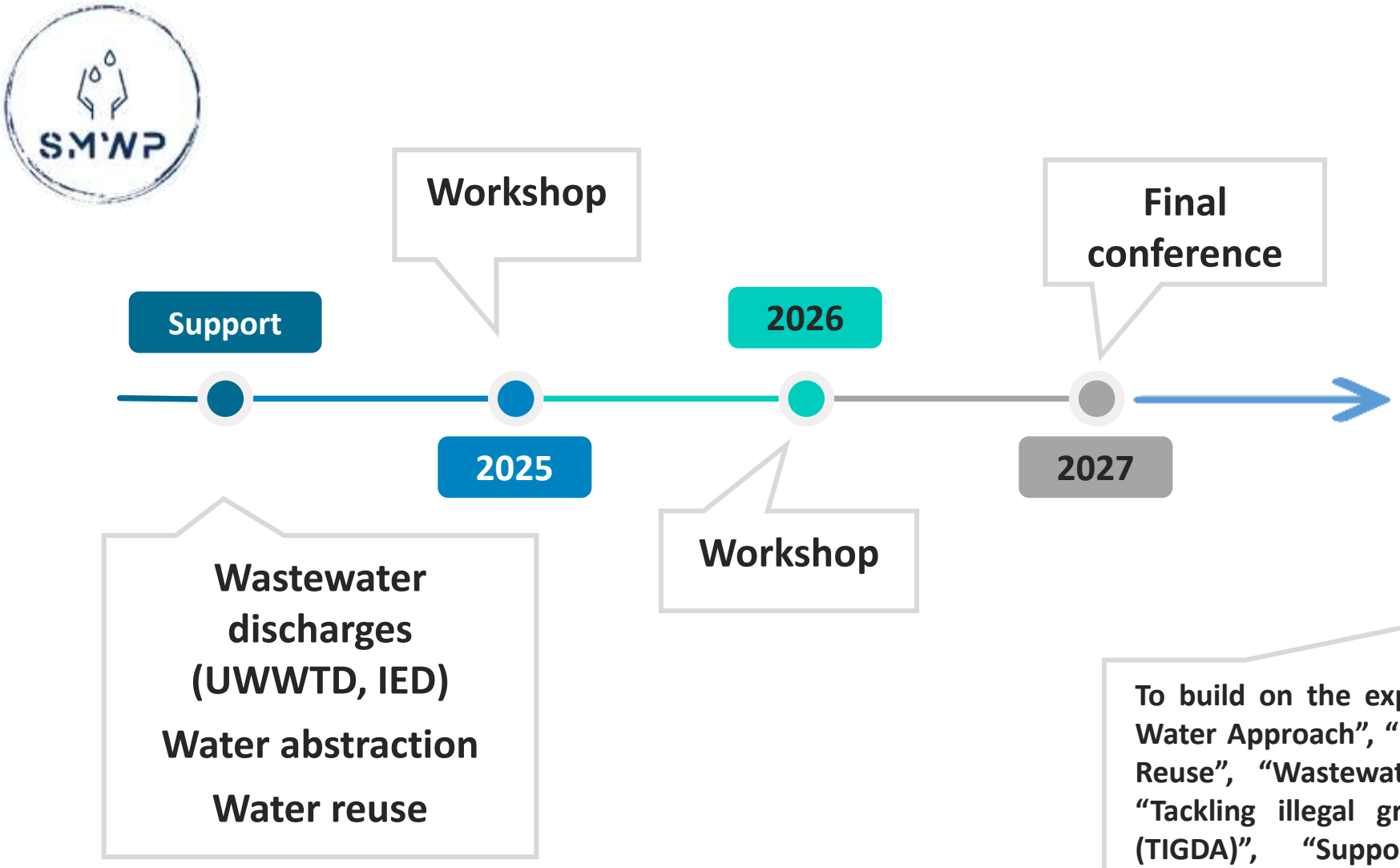
Action 9 -Strategies for verification of self–monitoring and reporting

A greater focus on self-monitoring and validation of self-reporting has been suggested and integrated in Actions

Multiple challenges in using self-monitoring data for inspections and enforcement (quantity & quality of data and time lapse between data generation and its evaluation)

Self-Monitoring in Water Permits (SMWP)

European Union Network for the Implementation and Enforcement of Environmental Law



Final Products

- **Guidance document with mechanisms, procedures, practices, and tools to ensure reliable self-monitoring and reporting (possible use of AI)**

To facilitate the transfer of knowledge from IMPEL's experts, the tool will be developed to be used directly under KIP

To build on the experience of other projects (Integrated Water Approach", "Integrated Water Approach and Water Reuse", "Wastewater in Natural Environment WiNE", "Tackling illegal groundwater drilling and abstractions (TIGDA)", "Supporting IED Implementation" and Environmental Crimes)

European Union Network for the Implementation and Enforcement of Environmental Law

Thank you for your attention!

https://www.impel.eu/en