ISPRA
Istituto Superiore per la Protezione e la Ricerca Ambientale

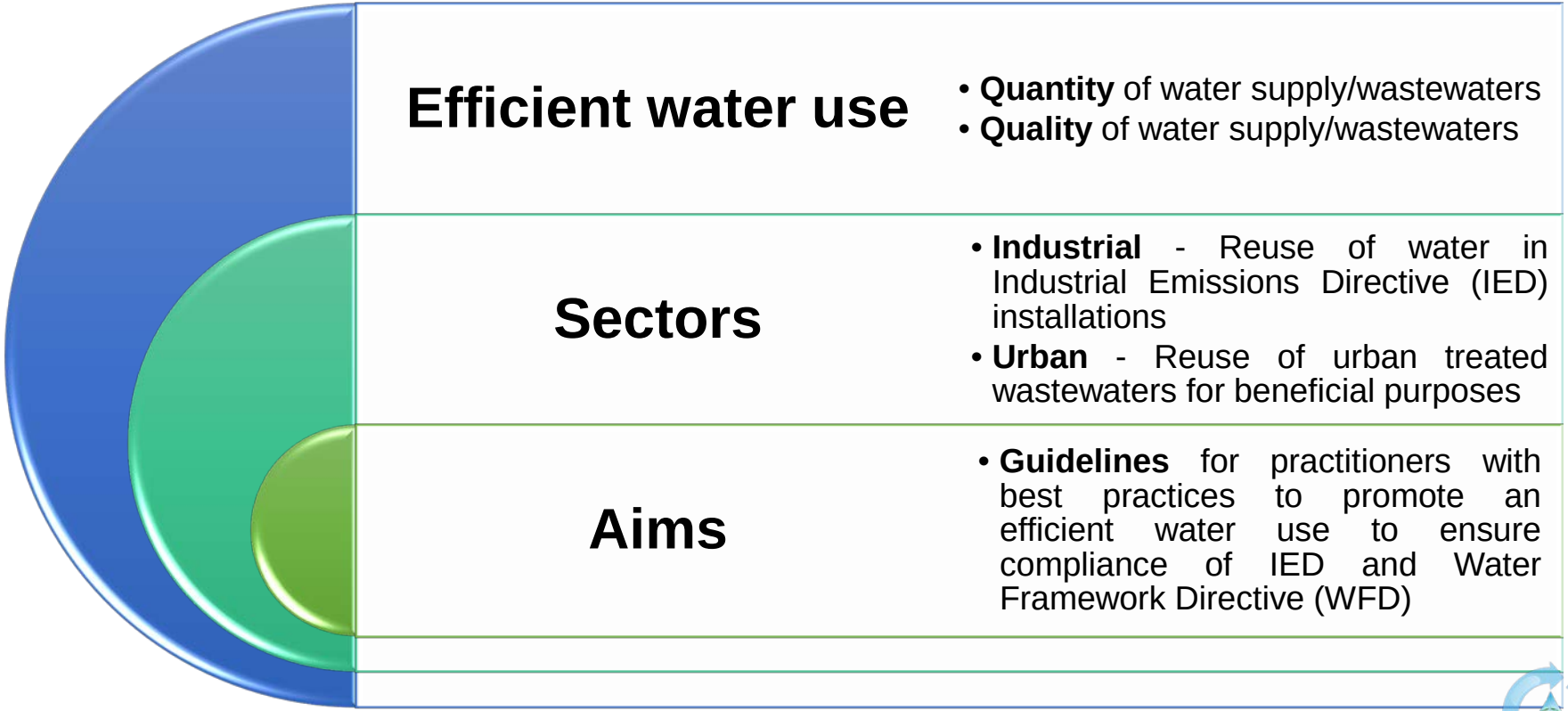
AGÊNCIA PORTUGUESA DO AMBIENTE

IMPEL
European Union Network for the Implementation and Enforcement of Environmental Law

IMPEL Project
Integrated Water Approach & Urban Reuse

Genève Farabegoli *– Italian Institute for Environmental Protection and Research*

THE AIMS OF THE PROJECT



THE PROJECT

Integrated Water Approach

Under IED installations

Urban water reuse

Agriculture irrigation

RESUME

- **Integrated Water Approach (under IED installations)**
  - Introduction
  - Outcomes of the 1st year Project
  - Project team
  - Methodology - Phase 1
  - Methodology - Phase 2
  - Methodology - Phase 3
  - Responses from the IMPEL members (case studies)
  - Responses from the IMPEL members (main findings)
  - Principles
  - Requirements
  - Drivers
  - Barriers

RESUME (CONTINUE)

- Main questions
- Water Use Efficiency
- Emission Limit Values
- Check-List for water discharge permit writers
- Minimize ‘Go beyond BAT’
- Quantity versus Quality
- Solution: Integrated Water Approach under industrial and Urban cycle

INTRODUCTION

- Implementation of EU legislation on water and land is one of the top challenges in recent IMPEL research
- Aims of the project:
  - **1st Year (2017)**
    - **Collecting and comparing the procedures used within Europe** for water resources management and protection in the industry sector
    - Identifying new approaches for **reducing fresh water consumption and innovative technologies for industrial water treatment** able to provide **energy saving, sludge production minimization and water reuse for multiple purposes**
    - Using this information to develop a **guidance document (GL)** to share among IMPEL members and other non-IMPEL participants including for example the IPPC Bureau, European Environmental Agency and industry sector associations
  - **2nd Year (2018)**
    - Application of the previous guidelines to **real cases**

OUTCOMES OF THE 1ST YEAR PROJECT

A survey used to collect the information on water management in industry

- **Principles, requirements, drivers and barriers** in the industrial water management sector identified and **case studies/experiences selected**
- **Industrial Emission Directive (IED)** requirements to **Water Framework Directive (WFD)** requirements for industrial water management compared
- **Check list and suggestions for IED permit writers** provided through a guidance document

PROJECT TEAM

- **Experts from several member states:**
  - Geneve Farabegoli (IT)
  - Anabela Rebelo (PT)
  - Gabriel Dragoi (RO), Vasile Pintilie (RO),
  - Pinar Topkaya (TK)
  - Albert A. Bargués (SP)
  - Darko Blinkov (MK)
  - Peter Šimurka (SK)

METHODOLOGY - PHASE 1

- **A questionnaire divided in 6 different sections:**
  - Section A – General information
  - Section B – Regulation
  - Section C – Plant operational characteristics
  - Section D – Water usage
  - Water source
  - Water reuse
  - Section E – Wastewater treatment
  - Section F – Wastewater discharge

…and was **submitted to water and environmental agencies, industrial operators and associations, MS Competent Authorities**

METHODOLOGY - PHASE 2

Focusing the project and the GL on industrial sectors representing significant environmental issues for water consumption and discharge as well as for water reuse needs: refinery, pulp&paper, textile industry

- Addressing GL to permit writers in order to **set priorities for the permitting system when water management issues could be of major importance**

Including a check-list in the GL in order to specifically address the main water management issues such as water supply, water consumption, water saving, water reuse, wastewater treatment, etc., and suggest priorities to permit writers

- **Recirculating the questionnaire** and request it to be filled in with information, data and descriptions preferably at “case study” level related to the 3 selected sectors

QUESTIONNARIE
31 questions

GL focused on refinery and pulp&paper sectors

Phase 1: 10 Filled Questionnaires from 7 Countries

Phase 3: 14 Filled Questionnaires from 7 Countries (Focus on Case Studies)

RESPONSES FROM THE IMPEL MEMBERS (CASE STUDIES)

- Among the 14 questionnaires 3 were related to the Refinery sector and 3 to the Pulp and Paper sector
- We received only 1 questionnaire related to the Tannery sector and anything from the Textile sector
- Consequently, we decided to focus this GL only on the Refinery and the Pulp & Paper sectors
- The case studies are presented on an anonymous basis

RESPONSES FROM THE IMPEL MEMBERS – MAIN FINDINGS

Water usage:

- reuse in the same industry: 100%
- main technologies for water reuse processes: Bio-oxidation and bio-treatment, carbon and chemical treatment, filtration, settling, ion exchange, membrane separation, precipitation
- selection of the technology due to: process performance, meets requirements and cost
- main motivation for water reuse: cost savings and restricted water supply

The common wastewater treatment with the traditional primary, secondary and tertiary treatment, while innovative technologies implementation is not diffused

The common wastewater discharge is the own WWTP with natural outlet and waste are disposed in landfill

PRINCIPLES

- **Reduction of fresh water use is practiced to save money/save energy and for sustainability reasons**
- **Petroleum industry is definitely aware of the world-wide water shortages and its goal is to prevent critical possible supply restrictions in the future**
- **Petroleum industry is committed to implement environmental and water stewardships and community outreach through the integration of water resource management and risk assessment**

PRINCIPLES

- **Reduction of fresh water use is practiced by recycling production waters as is common sense in paper production**
- **Water is the main “carrier” of the papermaking process. Water consumption minimization is at the center of the attention. There is not a new approach but a continuous fine tuning. Fresh water is directly used only where it is strictly necessary**
- **Water is so relevant for the process that each and any paper mill periodically makes its own analysis of the water circuits and optimization to reduce water consumption and to guarantee paper quality**

REQUIREMENTS

- Italy: the permitting process derives directly from IED+WFD scheme of adoption and the Water Reuse target derives from groundwater remediation prescriptions. The Water Reuse approach is then extended to the whole refinery streams after WWTP but before the effluent discharge.
- Romania: in terms of water resources, any kind of use (abstraction, retention, discharges, etc..) requires permit according to the Water Law. The conditions of use are defined taking into account the requirements of the water resources used, namely the water bodies used as water sources and receivers of waste water discharges.
- Portugal. refineries are under IED and are obliged to comply with water/wastewater requirements; permits and water resources use authorization issued by Portuguese Environment Agency; periodically monitoring and performance report disclosure to this Agency

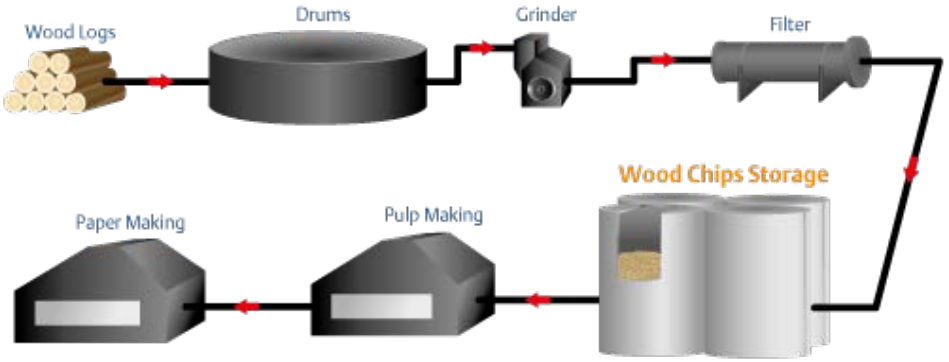
- Generally, effluent treatment targets of pulp and paper processors reflect regulatory requirements mandated by corresponding competent authorities. In some cases, effluent limitations for toxic pollutants are set in the wastewater stream discharged directly from the bleaching process and in the final discharge from the mills.
- Germany: the Authority for Industry approval is responsible for the monitoring and authorization of water authorities for the industry according to the German IED regulation. According to the IED regulation there are special monitoring plans, which go with programs for each wastewater treatment plant. Additionally, requirements of BAT are integrated into amendments of the regulation of sewage.
- Portugal: the companies/members are currently subject to strict environmental control resulting from the application of the IED which obliges them to comply with all requirements applicable. All member companies must follow the WFD in accordance with the guidelines of the river basin management plans of the regions where they are inserted

DRIVERS

- **The reduction of fresh water use is a goal for most refineries because is becoming increasingly scarce and the future regulations about water supply will be more and more restricting.**
- **In Italy, the main driver for reusing water in the refineries is the environmental compensation to comply with permit emission limit values. Another driver is the environmental policy and its sustainability approach.**
- **In Romania, the main drivers are water reduction targets, water reporting – internal ("HSE Monitor") and external, rising awareness events, as water campaign, annual awards for best performance in water management.**
- **In Portugal, the wastewater pre-treatment occurs at the site before discharge. The operator has to comply with external entity regulation. This regulation sets discharge values for certain pollutants. The operator is taxed based on these values according to the wastewater quality.**

DRIVERS

- **In Germany, the main drivers for reusing water are: Regulatory (state, regional or federal) Compliance: 100 % Cost Savings Corporate Policy**
- **In Portugal, the main drivers for reusing water are: Regulatory (state, regional or federal) Compliance: 100% Cost Savings Corporate Policy**
- **In Italy, the main drivers for reusing water are: Regulatory (state, regional or federal) Compliance: 0 % Cost Savings Corporate Policy**



BARRIERS

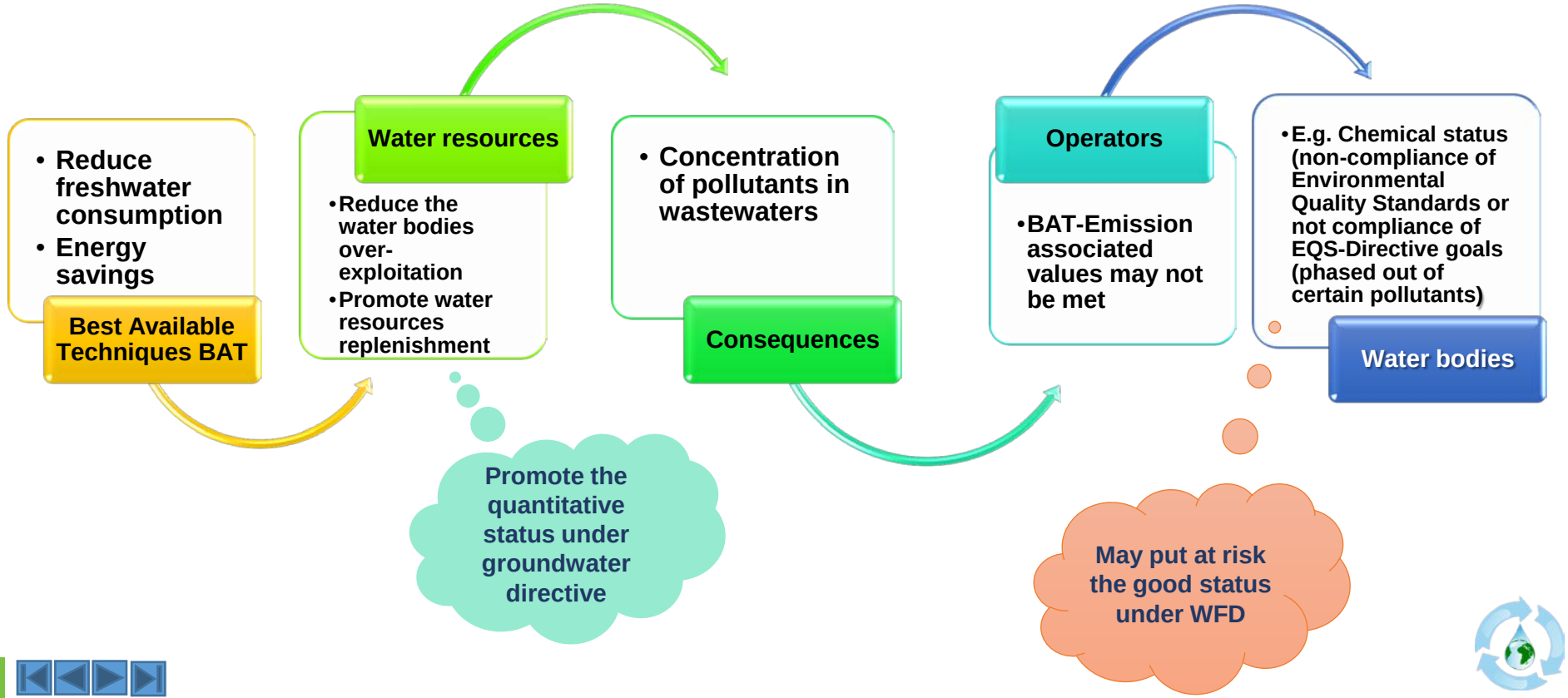
- **Inconsistent or inadequate water reuse regulations/guidelines**
- **Inconsistent and unreliable methods for identifying and optimising appropriate wastewater treatment technologies for reuse applications**
- **Difficulties in specifying and selecting effective monitoring techniques and technologies for the whole system**
- **Significant challenges in reliably assessing the environmental and public health risk/benefit of water reuse across a range of geographical scales**
- **Poorly developed business models for water reuse schemes, and markets for reclaimed water**
- **Low levels of public and government enthusiasm for water reuse**
- **Limited institutional capacity to formulate and institutionalise recycling and reuse measures**
- **Lack of financial incentives for reuse schemes**

MAIN QUESTIONS

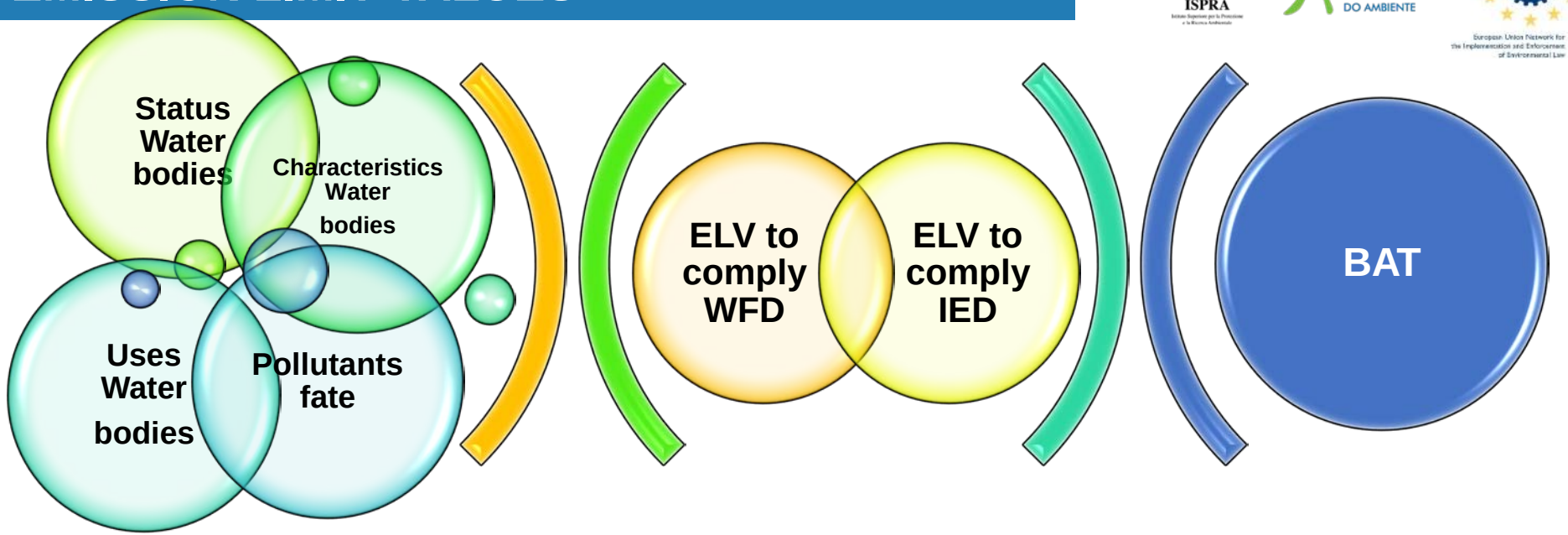
How to ensure that current and future licensing and enforcement activities are both WFD and IED proof?

How to achieve both IED and WFD goals?

RESULTS: WATER USE EFFICIENCY



EMISSION LIMIT VALUES



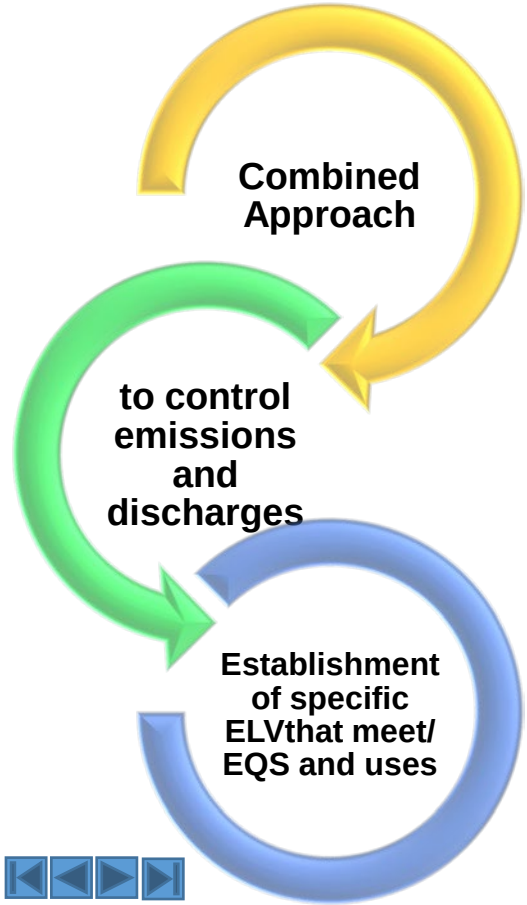
WFD

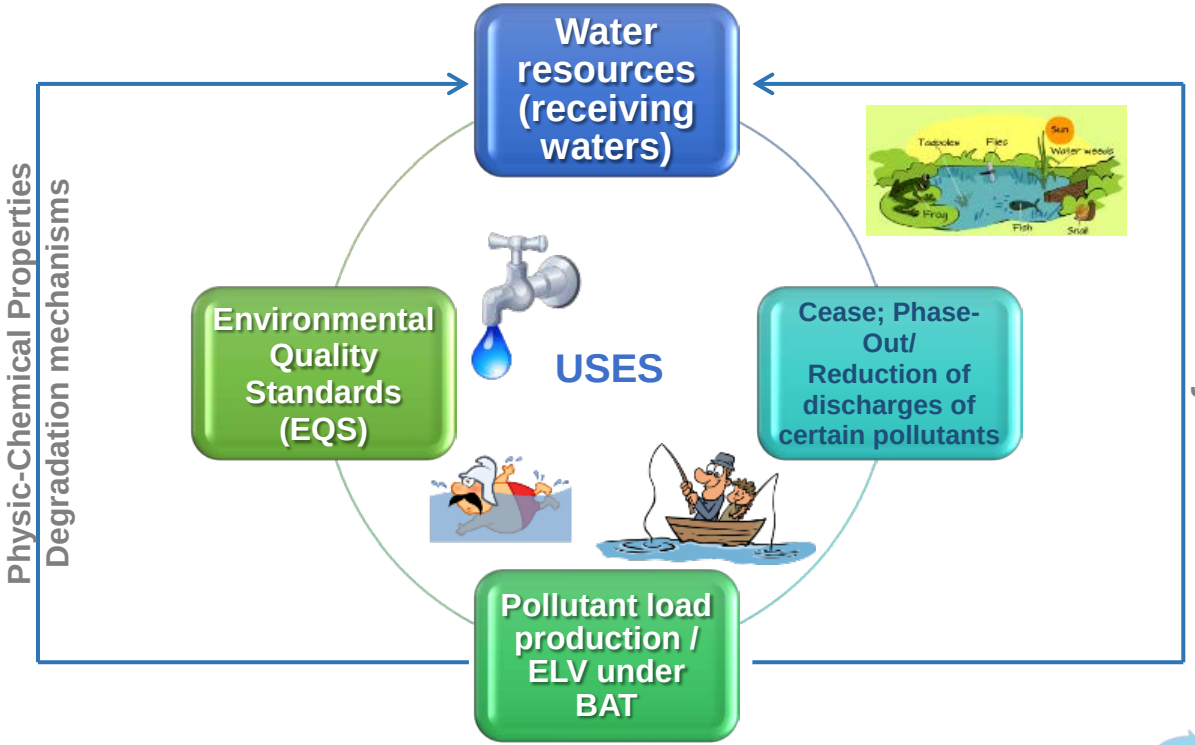
Based on natural behavior

IED

Based on equipment performance

WASTEWATERS – COMBINED APPROACH (WFD)





ELV IN CONCENTRATION VS MASS LOADS

Concentration

- **Average values:** Promotes safety against chronic effects
- **Maximum admissible values:** Promotes safety against acute effects

Mass loads per time

- **Average values without maximum admissible values:** Can put the receptors at risk due to the acute effects of some pollutants

Mass loads per units of production

- Do not ensure protection of the receptor water bodies (status and uses may be at risk)

ELV: FLAT VALUES VS FIT-FOR-PURPOSE VALUES

Flat values

Are the same for all installations and locations

Can put at risk water bodies status and surrounding uses

Fit-for-purpose values

Ensures protection at local level

Adequate installation compliance to local level requirements

Checklist

Wastewater discharges

BREF-BAT

Water Status and Uses

CHECK-LIST FOR WATER DISCHARGE PERMIT WRITERS

1. Is the water status of the receiving water body less than good? If no go to the question 5

RBMP

2. If yes, which are the critical parameters for its achievement?

RBMP

3. Do the wastewaters of the installation contribute to the enrichment of the content of this (these) critical parameter(s)? If no go to the question 5.

Project

4. It was (were) defined a BAT–associated emission levels (BAT-AEL) for this (these) parameters on the respective BREF document? If yes, is(are) this(these) value(s) sufficient to contribute for the achievement of the good status? If yes go to question 6.

BREF

CONT.

5. • The BREF document defines BAT-AEL that allows the non-deterioration of the water status? If yes go to the question 7.

BREF

6. • Refined Emission Limit Value(s) (ELV) according the need of achievement/maintaining the water good statu was(were) defined?

Water authority +Project

7. • The reducing of the water consumption and or promotion of water reuse is an obstacle for the ELV (or BAT-AEL) compliance?

Project

CONT.

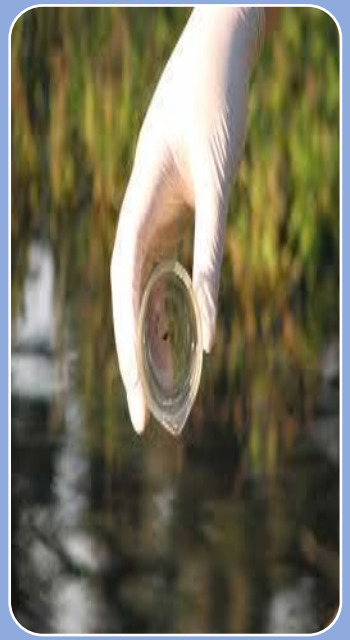
8. Can a mixing zone be applied?

- **9. If no, is(are) the refined ELV achievable and or affordable? If no, please define a mixing zone.**

10. Is there any possibility of discharges integration and or to be taken other measures that increase the dispersion of the discharges in the receiving waters?

- **(If the all measures that could be applied to the discharge are not enough to ensure achievable/affordable ELV, then appropriate measures must be taken to reduce discharged loads to not jeopardize the goals for the water body under the WFD requirements.**

CONT.



11. Was a monitoring program, upstream (if needed) and downstream, outside the exterior limit of the mixing zone defined? (This program will allow showing that the discharge is not contributing to the deterioration of the quality of the water body).

RESUME OF CHECKLIST (WASTEWATER)

Question 1: NO

Question 5: YES

Question 7: NO

BAT-AEL = ELV

WATER ABSTRACTION

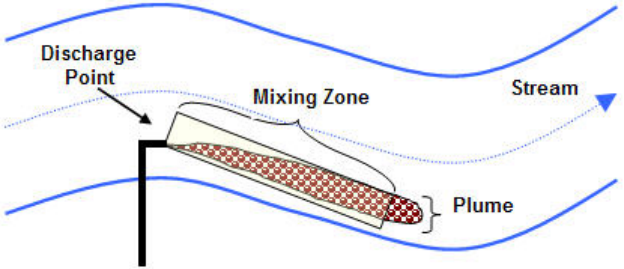
- **12. Regarding the freshwater consumption, is its abstraction contributing for endanger of ecological flows (surface water) or the quantitative status (groundwater). If yes, additional measures are needed to reduce water consumption and in this case return to question 7**

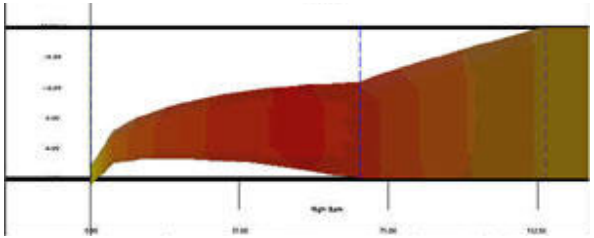
MINIMIZE ‘GO BEYOND BAT’

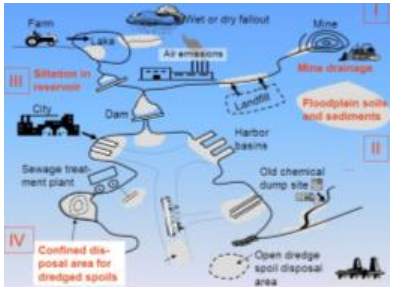
Definition of mixing zones

Promotion of plumes dispersion/ dilution on water resources: Find synergies among processes inside installations or synergies among installations/sectors

Catchment scale approach to find synergies among installations/sectors to reduce impacts on water bodies Downstream/Upstream synergies







QUANTITY VERSUS QUALITY

Freshwater consumption reduction

Water reuse
(intra/inter process/sector)

Quantity

Water use efficiency

Quality

Wastewater discharge management to prevent acute and chronic effects (Promote Good Status)

Discharge management: on-site measures and/or catchment scale measures, mixing zones, plume dispersion measures, fit-for-purpose ELV,

SOLUTION: INTEGRATED WATER APPROACH UNDER INDUSTRIAL AND URBAN CYCLE

Support ecosystems

Recreational uses

Surface water

Goundwater

Water treatment (according uses and needs)

Urban use

Agriculture

Industry

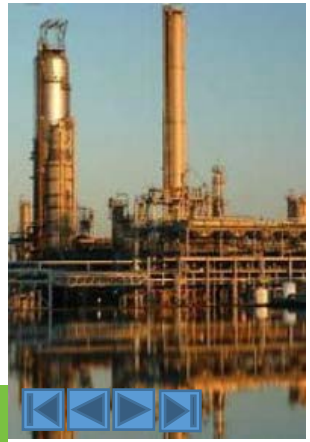
other

Wastewater

Wastewater treatment

Water Reuse

Water

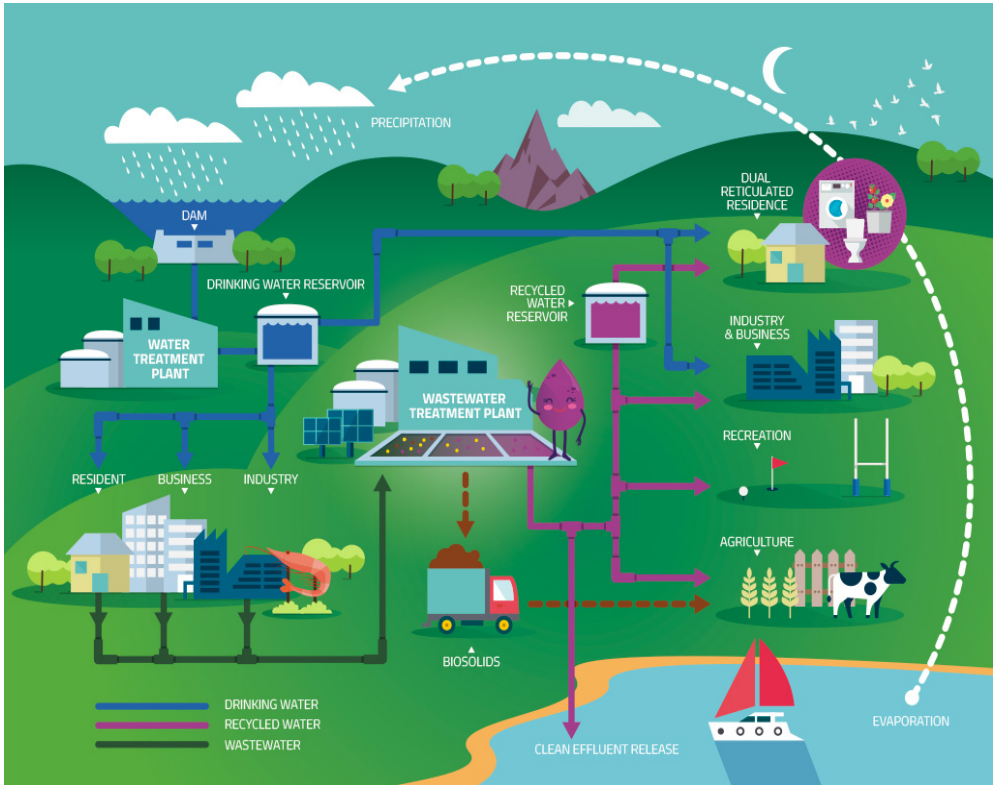


INTRODUCTION

The increasing water scarcity and water pollution control efforts in many countries have made treated municipal and industrial wastewater a suitable economic means of augmenting the existing water supply, especially when compared to expensive alternatives such as desalination or the development of new water sources involving dams and reservoirs

Water reuse makes it possible to close the urban water cycle at a point closer to cities by producing “new water” from municipal wastewater and reducing wastewater discharge to the environment.

WATER REUSE UNDER THE CIRCULAR ECONOMY



Integrated approach: The water cycle should be managed from catchment to consumer, back to catchment

Under the Circular Economy:

- **Considers the consumption and production of resources across this entire value chain, creating synergies within the water cycle for more efficient water management**
- **Promotes:**
  - **A cost-effective management**
  - **The reduction of pressures over waterbodies (e.g. over abstractions and reduces the discharged pollution loads)**
  - **The nutrients recovery**

WATER REUSE IN THE EUROPEAN CONTEXT

- European Commission is developing a legislative proposal for Water Reuse for agriculture irrigation
- Water sources: Treated wastewater under the Urban Treated Wastewater Directive (91/271/EEC)
- Purpose: Agriculture irrigation and managed aquifer recharge
- Are proposed minimum quality standards without jeopardizing a fit-for-purpose approach

AIMS OF THE PROJECT

- This project is an opportunity to learn how water can be used for different purposes (e.g. agriculture irrigation) with the complementary reduction of the direct discharge loads to water resources
- Is intended the exchange of information to identify:
  - Best practices;
  - Safe use approaches;
  - Permitting process among IMPEL members and possible constraints due to the new European legislative proposal
- Development of report aiming the use of water reuse as a tool to achieve the objectives of the Water Framework Directive (WFD) in certain areas

FIRST OUTCOMES (IED INSTALLATIONS – GUIDELINES)

Definition of a checklist for wastewater discharge permit writers to ensure the protection of the receiving water bodies status

Identification of good water management practices (at local and catchment scale) to avoid/to minimize going beyond BAT

PROJECT TEAM (2018)

- **In 2018 the project team as enlarged and IMPEL members involved are:**
  - Italy
  - Portugal
  - Turkey
  - Romania
  - Malta
  - Belgium
  - Ireland
  - Cyprus
  - Latvia
  - Netherlands
  - Austria
  - Slovenia
  - Finland
  - United Kingdom
  - Iceland
  - Republic of Macedonia

FINAL REMARKS

Integrated Water Approach

Enhance the guidelines on industrial water management best practices for two industrial sectors (Oil Refinery and Pulp & Paper) developed in 2017 and test the sectors in practice

Urban Water Reuse

Exchange current best practices with respect to water reuse of treated urban wastewaters for agriculture irrigation purposes

Methodology

Collection of information based on site visits