GRUPPO CAP
LA TUA ACQUA IN BUONE MANI

IMPLEMENTATION OF A WATER REUSE RISK MANAGEMENT BASED ON SANITATION SAFETY PLAN

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SERVIZIO IDRICO INTEGRATO

DAL WATER SAFETY PLAN...

27 NOVEMBRE 2015
Kick off meeting con l'Istituto Superiore di Sanità, l'ATS e ATO Città Metropolitana per la definizione degli obiettivi e delle attività da programmare.

15 GENNAIO 2016
Momento di confronto internazionale al Museo Nazionale della Scienza e Tecnologia "Leonardo da Vinci" con il convegno "Water Safety Plan. Salute innovazione e sostenibilità nella gestione dell'acqua potabile" promosso da Gruppo CAP in collaborazione con l'Istituto Superiore di Sanità e con il patrocinio di Ministero per la Salute, Regione Lombardia, Città Metropolitana di Milano, ATO, Utilitalia, Confservizi CISPEL Lombardia.

5-6 APRILE 2016
Gruppo CAP presenta il progetto nell'assemblea annuale di SWAN (Smart Water Networks Forum).

29 DICEMBRE 2016
L'Istituto Superiore di Sanità riconosce la validità del progetto pilota avviato sul Sistema Acquedottistico di Legnano, raccomandandone l'estensione sul territorio nazionale.

2017
Fase attuativa per il WSP sperimentale del Sistema Acquedottistico Controllato (SAC) di Legnano.

2017
Implementazione di ulteriori quattro SAC sul territorio della città Metropolitana di Milano: Lambro Sud, Martesana, Nord Milano e Sempione

AL SANITATION SAFETY PLAN...

Sanitation Safety Planning (SSP) is a risk based management tool for sanitation systems in order to:

- identify and manage health risk along the sanitation chain;
- guide investment based on actual risks, to promote health benefits and minimize adverse health impacts;
- provide assurance to authorities and the public on the safety of sanitation-related products and services.

SSP provides a structure to bring together actors from different sectors to identify health risks in the sanitation system and agree on improvements and regular monitoring.

The approach ensures that control measures target the greatest health risks and emphasizes incremental improvement over time.

CAP SSP IMPLEMENTATION: RATIONALE AND REGULATION

- The reuse of treated wastewater is one of the key action to address the new challenges of climate change, included in the Sustainable Development Goal SDG 6: **"Ensure access to water and sanitation for all"** of the UN 2030 Sustainable Development Agenda, and is also a relevant aspect of the Circular Economy as stated in COM (2015)614: **"Closing the loop – An EU action plan for the circular economy".**
- Water reuse is considered as an effective way of helping to solve the water scarcity and droughts issue in the EU, and reduce the contamination burden from wastewater, as well as the costs of treatment; it is a measure to be used to meet **Water Framework Directive objectives.**
- Water reuse requirements should ensure **appropriate health and environmental protection** and thus provide public confidence in reuse practices to enhance water reuse at EU level and should be coherent with WHO risk assessment framework (Sanitation Safety Plan, SSP and Water Safety Pan, WSP).
- In Italy the **current law n.185 issued on 12 June 2003 by Minister of Environment** sets the technical standards for the reuse of domestic, urban and industrial wastewater applicable for agriculture, non-potable urban and industrial use. The proposed standards follow a quite restrictive approach, especially for some chemical compounds: in many cases the quality standards for reclaimed wastewater were the same as drinking water.

CAP SSP IMPLEMENTATION: RATIONALE AND REGULATION

CAP SSP IMPLEMENTATION: RATIONALE AND REGULATION

- In May 2018, the **European Commission** put forward a **proposal for a regulation setting EU-wide standards** that reclaimed water would need to meet in order to be used for agricultural irrigation, with the aim of encouraging greater use of reclaimed water and contributing to alleviating water scarcity and reducing water stress by 5 %. The proposal would set :

- different requirements according to **four water quality classes** defined on the basis of the relevant crop and irrigation method.
- requirements relate to **microbiological parameters** (presence of pathogens: E. coli, Legionella spp. and intestinal nematodes) and **physico-chemical parameters** (biochemical oxygen demand, total suspended solids, and turbidity)
- monitoring reclaimed water quality on the basis of minimum requirements related to the **frequency of tests**;
- **establishing a risk management plan in consultation with relevant actors** (in particular the suppliers of waste water to be reclaimed and the end-users), on the basis of key risk management tasks listed in annex II to the proposal, to ensure potential additional hazards are addressed.

CAP SSP IMPLEMENTATION: RATIONALE AND REGULATION

Proposal for a Regulation of the European Parliament and of the Council on minimum requirements for water reuse

Classes of reclaimed water quality and allowed agricultural use and irrigation method

WATER QUALITY CLASS		CROP CATEGORY	IRRIGATION METHOD	INDICATIVE TECHNOLOGY TARGET
A	1	All food crops, including root crops consumed raw and food crops where the edible part is in direct contact with reclaimed water	All irrigation methods	Secondary treatment, filtration, and disinfection
B	1	Food crops consumed raw where the edible part is produced above ground and is not in direct contact with reclaimed water	All irrigation methods	Secondary treatment and disinfection
	2	Processed food crops		
	3	Non-food crops including crops to feed milk- or meat-producing animals		
C	1	Food crops consumed raw where the edible part is produced above ground and is not in direct contact with reclaimed water	Drip irrigation only	Secondary treatment and disinfection
	2	Processed food crops		
	3	Non-food crops including crops to feed milk- or meat-producing animals		
D	1	Industrial, energy, and seeded crops	All irrigation methods	Secondary treatment and disinfection

RISK ASSESSMENTS DOCUMENT

EUROPEAN COMMISSION

Brussels, 28.5.2018
COM(2018) 337 final

ANNEXES 1 to 2

ANNEXES

to the

Proposal for a Regulation of the European Parliament and of the Council

on minimum requirements for water reuse

{SEC(2018) 249 final} - {SWD(2018) 249 final} - {SWD(2018) 250 final}

Key risk management tasks

1. **Describe the water reuse system.**
2. **Identify potential hazards and the potential for hazardous events.**
3. **Identify the environments, populations and individuals at risk**
4. **Conduct a risk assessment covering both environmental risks and risks to human a animal health**
5. **Specify requirements for water quality and monitoring**

   (a) heavy metals;
   (b) pesticides;
   (c) disinfection by-products;
   (d) pharmaceuticals;
   (e) other substances of emerging concern;
   (f) anti-microbial resistance.

6. **Identify preventive measures**
7. **Ensure that adequate quality control systems and procedures are in place**
8. **Ensure that environmental monitoring systems are in place that will detect any negative effects**
9. **Ensure that an appropriate system is in place to manage incidents and emergenci including procedures to inform all relevant parties appropriately such event, and kee regularly updated emergency response plan.**

CAP SSP IMPLEMENTATION: OBJECTIVES

- First implementation in Italy of a **shared international environmental health risk** assessment framework (WSP/SSP approach) to assess the feasibility of the approach in the light of a possible future Italian legislation.

- Setting a proposal **of criteria and procedure for risk assessment** related to transferring of specific biological and chemical contaminants potentially affecting reclaimed wastewater to crops considering treated recycled wastewater, soil, surface water and groundwater interactions (irrigation of soil culture crops with wastewater).

- **Dissemination at different levels** (citizens, local-national and European associations) of the trial results to overcome the uncertainty of the different stakeholders;

SANITATION SAFETY PLAN APPROACH

WATER SAFETY PLAN AND SANITATION SAFETY PLAN

	Sanitation Safety Planning	Water Safety Planning
Similarities	Derived from WHO Guidelines for the Safe Use of Wastewater, Excreta and Greywater	Derived from the WHO Guidelines for Drinking-water Quality
	Uses risk management, HACCP, Stockholm Framework (see Note)	Uses risk management, HACCP, Stockholm Framework
	Core components: (1) system assessment; (2) monitoring; (3) management	Core components: (1) system assessment; (2) monitoring; (3) management
	Follows the sanitation chain	Follows the drinking-water supply chain
Differences	Considers multiple exposure groups for microbiological, physical and chemical hazards	Considers single exposure group (drinking-water consumer) for microbiological, physical, chemical and radiation hazards
	Expands from waste generation to its uses and discharges into the environment	Contracts from catchments and converges to the drinking-water delivery point
	Usually no clear regulatory framework – roles and responsibilities are shared over different sectors and levels	Usually operates in a clear regulatory framework
	Objectives – reduce negative health impacts of use of wastewater, excreta or greywater while maximizing the benefits of their use	Objectives — to consistently ensure the safety and acceptability of a drinking-water supply and to reduce the risk of drinking-water contamination
	Implementing agency – varies depending on objectives, skills and resources	Implementing agency – water utility or a community association for small supplies

GRUPPO CAP SSP IMPLEMENTATION: THE PARTNERS

The strategic partnership is composed by

- Gruppo CAP as project Coordinator
- 2 Universities and 3 Research Institutes involved in the project implementation and development

PROJECT COORDINATOR:

PARTNERS:

UNIVERSITY OF NORTH CAROLINA

THE WATER INSTITUTE OF UNC

ISTITUTO SUPERIORE DI SANITA'

IRSA CNR

POLITECNICO DI MILANO

SSP PLAYGROUND

Peschiera Borromeo WWTP

PESCHIERA BORROMEO WWTP

Features of the plant:

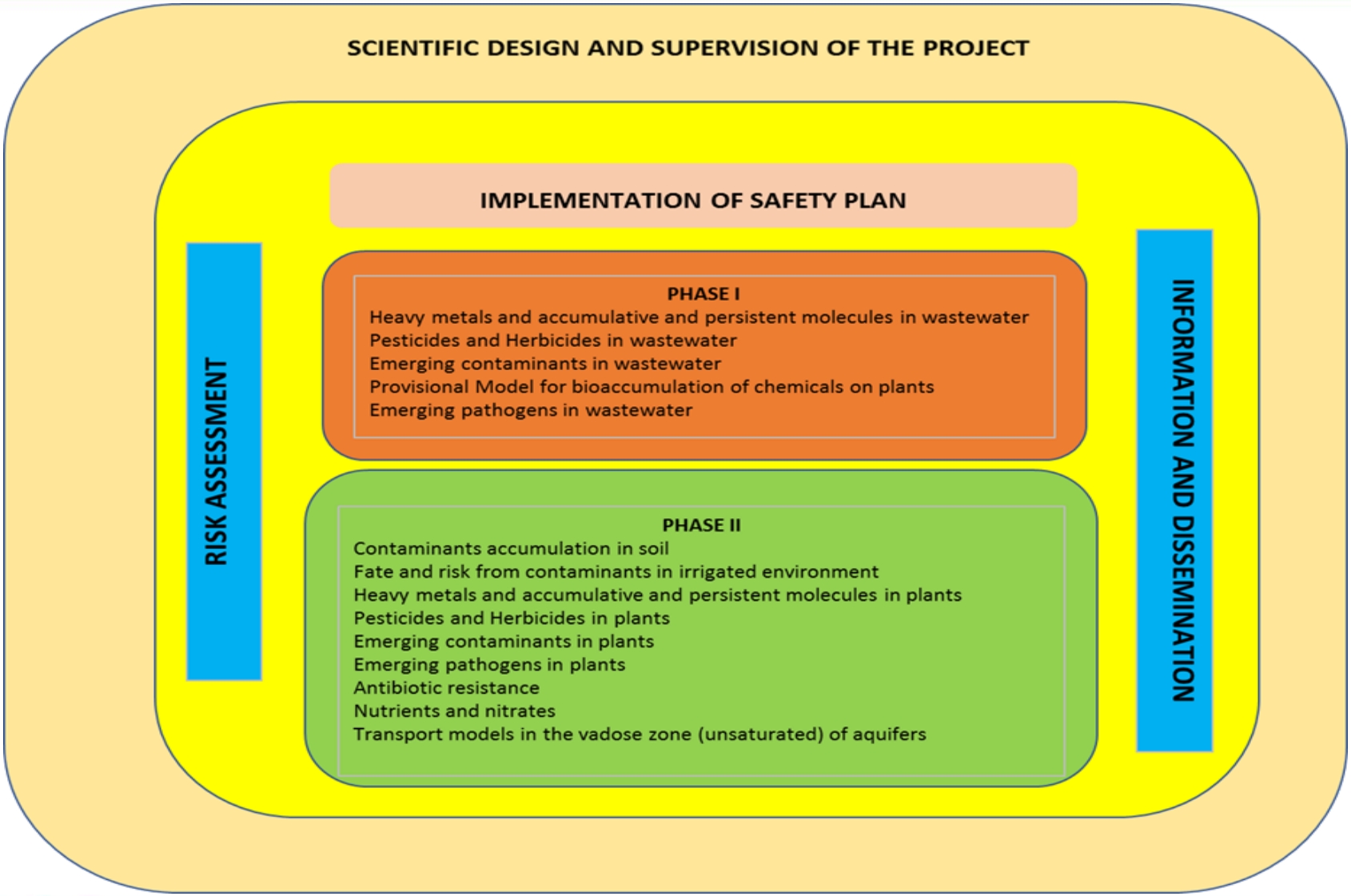
- Treatment capacity: 566.000 P.E.
- Average flow rate: 216.000 m3/day
- Two water lines receiving wastewater from different urban areas

Line 1: Municipalities of Brugherio (MB), Carugate, Cassina de' Pecchi, Cernusco sul Naviglio, Cologno Monzese, Peschiera Borromeo, Pioltello, Segrate e Vimodrone.
P.E. = 316.000

Line 2: Municipality of Milan and Linate district of Peschiera Borromeo
P.E. = 250.000

25-28% industrial load

GRUPPO CAP SSP IMPLEMENTATION: PROJECT STRUCTURE



GRUPPO CAP SSP IMPLEMENTATION: RESEARCH ACTIVITIES

1. Preliminary Assessment with Water Institute for Qualitative and Quantiative Risk Matrix definition
2. Selection of Target Compounds
3. Trial analysis (Phase 1 and Phase 2)
4. Risk Assessment document
5. Dissemination activities

QUALITATIVE RISK MATRIX

- INFLUENT
- TREATMENTS
- EFFLUENT
- STORAGE
- POINT OF USE
- FIELD
- CROPS

			Severity				
			Insignificant	Minor impact	Moderate impact	Major impact	Catastrophic
			1	2	3	4	5
Likelihood	Rare	1	1	2	3	4	5
	Unlikely	2	2	4	6	8	10
	Moderate	3	3	6	9	12	15
	Likely	4	4	8	12	16	20
	Almost certain	5	5	10	15	20	25
				Low	Medium	High	Very High
			Risk Rating	< 6	6 - 9	10 - 15	> 15

QUALITATIVE RISK MATRIX

INFLUENT

TREATMENTS

STORAGE

EFFLUENT

POINT OF USE

FIELD

CROPS

Node (Reference to sanitation system)	HAZARD IDENTIFICATION				RISK ASSESSMENT				EXISTING CONTROL MEASURES			RESIDUAL RISK			
	Hazardous event (examples)	Hazard (microbiological, chemical, physical, radiological)	Exposure routes (ingestion, contact, inhalation, consumption)	Exposure groups (farmers, consumers, local community)	Severity	Likelihood	Score	Risk Rating	NOTES		Effectiveness	Severity	Likelihood	Score	Risk Rating
Influent					3	1	3	Low				1	1	1	Low
Influent					2	1	2	Low				1	1	1	Low
Influent					4	1	4	Low				1	1	1	Low
Influent					4	1	4	Low				1	1	1	Low
Influent					4	1	4	Low				1	1	1	Low
Influent					4	1	4	Low				1	1	1	Low
Influent					4	1	4	Low				1	1	1	Low
Influent					4	1	4	Low				1	1	1	Low
Influent					2	1	2	Low				1	1	1	Low

UPGRADE CONTROL MEASURES				VALIDATION OF CONTROL MEASURES	RASSESSMENT OF RISK				OPERATIONAL MONITORING	NOTES	VERIFICATION MONITORING
Corrective action	In charge	Deadline	Costs		Severity	Likelihood	Score	Risk Rating			

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QUANTITATIVE MICROBIOLOGICAL RISK ASSESSMENT

Pathogen	E coli
Description	
Parameters	
Influent conc.	1,00E+09

Line 1	Influent		Treatments												
			Pre-treatment		Primary sedimentation		Activated sludge oxidation		Secondary sedimentation		Biological filtration		Disinfection peracetic acid	
R	1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09
R^M_{pre}	1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09
R^M_{pri}	1	1,00E+09			1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09
R^M_{ox}	1	1,00E+09					1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09
R^M_{sec}	1	1,00E+09							1	1,00E+09	1	1,00E+09	1	1,00E+09
R^M_{fltr}	1	1,00E+09									1	1,00E+09	1	1,00E+09
R^M_{dsnf}	1	1,00E+09											1	1,00E+09

Effluent		Storage		Point of use		Crops		**Total crops removal R^T_{crop}**	**Crops final conc.**	Soil		**Total soil removal R^T_{soil}**	**Soil final conc.**
1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09
1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09
1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09
1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09
1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09
1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09
1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09	1	1,00E+09

GRUPPO CAP SSP IMPLEMENTATION: TRIAL ANALYSIS PHASE 1

Heavy metals and accumulative and persistent molecules in water

- Determination of Heavy metals and of chlorinated and brominated compounds, PCBs, PBDEs, or polycyclic aromatic hydrocarbons for several wastewater samples (LINE 1 and LINE 2) obtained with different operative process conditions in the plant operative units

Emerging Contaminants in wastewater

- quantitative analysis of the main emerging contaminants present in the wastewaters (LINE 1 and LINE 2) of the plant of Peschiera Borromeo

Pesticides and Herbicides in wastewater

- Determination of the most common pesticides and herbicides used by farmers in Lombardia in wastewater samples (LINE 1 and LINE 2) obtained with different operative process conditions in the plant operative units

Provisional Model for bioaccumulation of chemicals on plants

- Quantitative data produced for the selected list of emerging contaminants will be used for a theoretical assessment of the risk of bioaccumulating in the terrestrial trophic chain during the irrigation activities

GRUPPO CAP SSP IMPLEMENTATION: TRIAL ANALYSIS PHASE 1

Emerging Pathogens in Water

- Documenting reference pathogen occurrence in raw and treated wastewater and removal from treatment processes. The reference pathogens in this study include pathogens belonging both to the group of enteric bacteria and that of viruses:
  - Campylobacter and Salmonella are selected for bacteria
  - Enteric viruses (Norovirus, Adenovirus, Enterovirus and Hepatitis A Virus)
  - Microbial indicators (E. Coli, Enterococci and Somatic Coliphages) will be also studied

GRUPPO CAP SSP IMPLEMENTATION: TRIAL ANALYSIS PHASE 2

- *Heavy metals and accumulative and persistent molecules in plants*
- *Antibiotic Resistances*
- *Pesticides and Herbicides in plants*
- *Nutrients and Nitrates*
- *Emerging Contaminants in Plants*
- *Transport Model of the contaminants into the Aquifers*
- *Emerging Pathogens in Plants*
- *Acitivities of Information and Dissemination*
- *Contaminants Accumulation in Soil*

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GRAZIE PER L'ATTENZIONE

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