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MINISTERIO DE AGRICULTURA, ALIMENTACIÓN Y MEDIO AMBIENTE

CEDEX
CENTRO DE ESTUDIOS Y EXPERIMENTACIÓN DE OBRAS PÚBLICAS

DemEAUmed Policy –oriented session
(May 18 th, 2017)

European Regulatory Instrument for Water Reuse

Water Reuse in Spain, Royal Degree 1620/2007

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OUTLINE

I. Background

II. Royal Degree 1620/2007

II. Differences with JRC technical proposal for quality requirements for water reuse in agricultural irrigation an aquifer recharge

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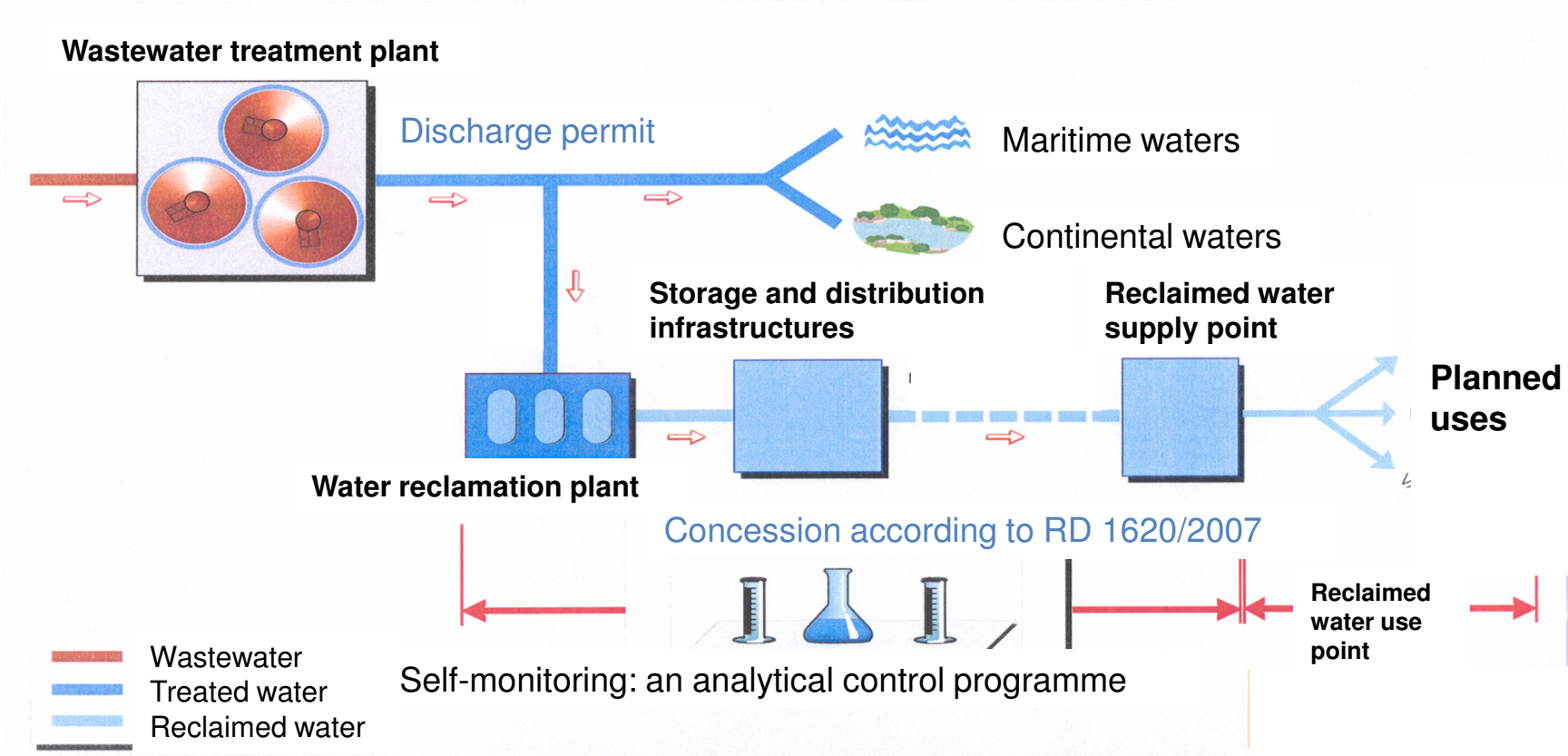
I. BACKGROUND

- ✓ **Spain exhibits the greatest amount of water reuse in Europe**
- ✓ Water reuse is included into RBMPs as part of the Program of Measures to promote an efficient and sustainable water use.
- ✓ WR as a measure for water balance and quality to prevent further deterioration of SW and GW (WFD).
- ✓ Quality requirements and authorization process according to RD 1620/2007.
- ✓ **10 years after the enforcement of RD 1620/2007**

Is RD being an effective tool to protect human health and environmental matrices?

II. ROYAL DEGREE 1620/2007



Water reuse system

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II. ROYAL DEGREE 1620/2007

USES AND APPLICATIONS		Quality	Escherichia CFU/100 ml	Nematodes eggs/10 L	Legionella spp. 100 CFU/L
•Industrial 3.2 a)	• Refrigeration towers and evaporation condensers.	A	Absence	Absence	Absence
•Residential 1.1 a) y b)	• Private garden watering. Discharge of bathroom appliances.		Absence	1	100
•Direct Recharge 5.2 a)	• Recharge of aquifers by direct injection.		Absence	1	No limit set
· Urban 1.2 a), b), c), d) · Agricultural 2.1 a) · Recreational 4.1 a)	.Watering of urban green areas .Hosing down streets. Fire-fighting systems. .Industrial car wash. Irrigation with contact .Irrigation of golf courses. -Irrigation of crops for human consumption	B	< 100 -200	< 1	< 100
· Agricultural 2.2 a), b) y c) · Industrial 3.1 c)	·Irrigation of crops for human consumption avoiding direct contact of regenerated water with edible parts. ·Irrigation of pastureland for milk or meat-producing animals. Aquaculture ·Process and cleaning water for use in food industry.	C	< 1.000	< 1	No limit set
· Environmental 5.1 a)	·Recharge of aquifers by localized seepage through the soil		< 1.000	No limit set	No limit set

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II. ROYAL DEGREE 1620/2007

USES AND APPLICATIONS		Quality	Escherichia CFU/100 ml	Nematodes eggs/10 L	Legionella spp. 100 CFU/L
· Agricultural 2.3 a), b) y c) · Industrial 3.1 a) y b)	·Localized irrigation of ligneous crops avoiding contact of regenerated water with food for human consumption. ·Irrigation of ornamental flowers, greenhouses and nurseries with no direct contact of regenerated water with crops. ·Process and cleaning water except in food industry	D	< 10.000	< 1	< 100
· Recreational 4.2 a)	·Ponds, bodies of water and running water with no public access				
· Environmental 5.3 a) y b)	·Irrigation of forests, green zones and similar areas with no public access	E	No limit set	No limit set	No limit set
· Environmental 5.4 a)	·Maintenance of wetlands, minimum flows and similar uses	F	The minimum quality required is studied on a case by case basis		

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II. ROYAL DEGREE 1620/2007

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TR-T5a

- PHY-CHEM DECANTATION
- FILTRATION
- MEMBRANE
- INVERSE OSMOSIS
- DISINFECTION

E.coli absence

QUALITY A

TR-T5b

- PHY-CHEM DECANTATION
- FILTRATION
- RED
- UV RADIATION
- DISINFECTION

E.coli ≤100 cfu/100mL

QUALITY B




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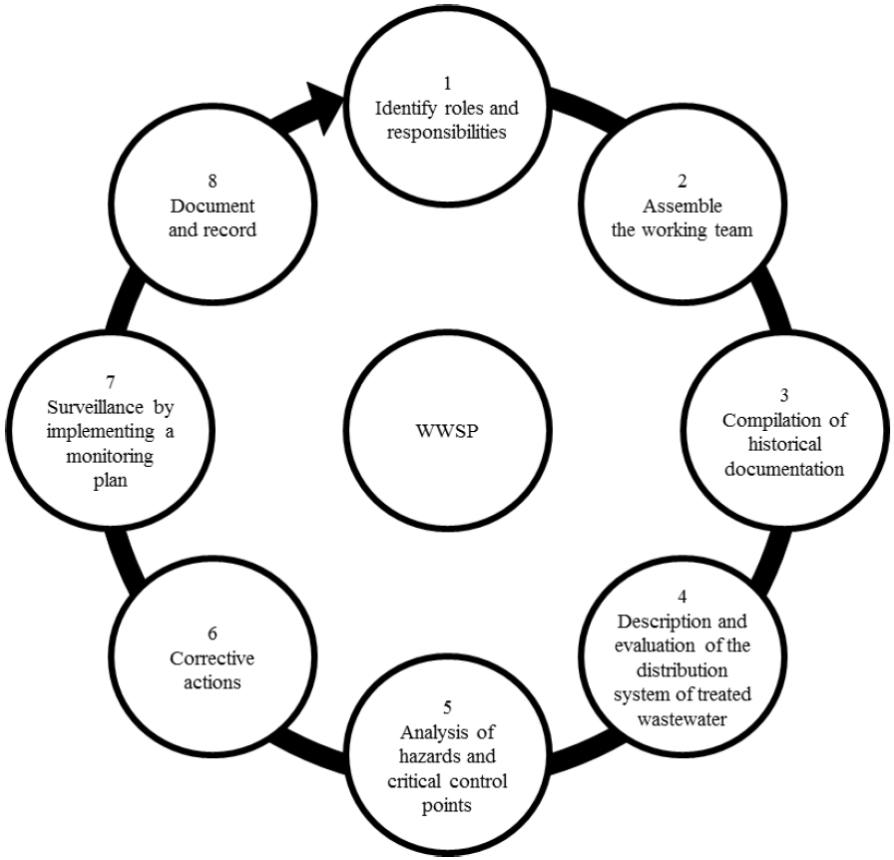
III. DIFFERENCES WITH JRC TECHNICAL PROPOSAL

Risk management approach for water reuse

Safety Plan for Water Reuse



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III. DIFFERENCES WITH JRC TECHNICAL PROPOSAL

Verification monitoring in irrigation (indicators and limits values)

Reclaimed water quality class	Indicative technology target	Quality criteria				
		E. coli (cfu/100 ml)	BOD_5 (mg/l)	TSS* (mg/l)	Turbidity (NTU)	Other criteria
Class A	Secondary treatment, filtration, and disinfection (advanced water treatments)	≤10 or below detection limit	≤10	≤10	≤5	Additional physico-chemical parameters (see Table 3). *Legionella* analysis have to be performed for greenhouses irrigation if there is risk of aerosolization (<1,000 cfu/l)
Class B	Secondary treatment, and disinfection	≤100	≤25	≤35	-	
Class C	Secondary treatment, and disinfection	≤1,000	≤25	≤35	-	
Class D	Secondary treatment, and storage, stabilization ponds or constructed wetlands.	≤10,000	≤25	≤35	-	

Nematodes

RD1620/2007
E.Coli: < 100 UFC /100 mL Turbidity < 10 NTU

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III. DIFFERENCES WITH JRC TECHNICAL PROPOSAL

Verification monitoring in aquifer (indicators and limits values)

Managed aquifer recharge category	Indicative technology target	Quality criteria			
		E. coli (cfu/100 ml)	TSS (mg/l)	Turbidity (NTU)	Other criteria
Managed aquifer recharge by direct injection	Secondary treatment, filtration, and disinfection (advanced water treatments)	≤10 or below detection limit	≤10	≤2	Additional parameters to be defined by MS.
Managed aquifer recharge by surface spreading	Secondary treatment, and disinfection	≤1,000			

- ✓ Monitoring requirements are similar
- ✓ Validation is mandatory in direct injection
- ✓ Preventive measures

RD1620/2007
Direct injection : E.Coli: 0 UFC /100 mL TSS 10 mg/L
Turbidity < 2NTU

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III. DIFFERENCES WITH JRC TECHNICAL PROPOSAL

Preventive measures → Guidance manual for good practice

Reclaimed water quality class	Crop category	Irrigation method	Preventive measures
Class A	Food crops consumed raw Processed food crops Non-food crops	All irrigation methods allowed	Additional preventive measures have to be considered and applied if necessary (section 4.5.).
Class B	Food crops consumed raw - with inedible skin (skin removed before consumption) - fruit trees Processed food crops Non-food crops	All irrigation methods allowed	Livestock: withholding period of minimum 4 hours after irrigation before pasture of lactating dairy, or until pasture is dry. Fodder dried or ensiled. Pigs must not be exposed to pasture or fodder. Prohibition of harvesting of wet or dropped produce. Additional preventive measures have to be considered and applied if necessary (section 4.5.).
	Food crops consumed raw	Drip irrigation only	Prohibition of harvesting of wet or dropped produce.

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III. DIFFERENCES WITH JRC TECHNICAL PROPOSAL

Additional preventive measures

Mandatory for MS to consider in order to reduce potential adverse effects on health and environmental matrices, according to site specific conditions.

- **Source control programs and oversight of industrial and commercial discharges**

- **Site characteristics evaluation:** assessment of soil, possible impacts on groundwater, adverse effects on surface waters, vulnerability of existing drinking water sources, behavior of substances depends on climate, Nitrates Directive, control surface run-off.

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III. DIFFERENCES WITH JRC TECHNICAL PROPOSAL

Minimum frequencies for verification monitoring

Reclaimed water quality classes	Minimum monitoring frequencies				
	E. coli (*Legionella* if applicable)	BOD_5	TSS	Turbidity	Other criteria
Class A	Once a week	Once a week	Once a week	Continuous (Daily)	According to MS responsible authorities
Class B	Once a week	Once a month	Once a month	-	Electrical conductivity monitored in continuous, if feasible, or daily.
Class C	Once a week	Once a month	Once a month	-	
Class D	Once a week	-	-	-	

TSS, BOD_5 and Turbidity must be conformed at **100%** of the samples and RD1620 for TSS is 50%

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III. DIFFERENCES WITH JRC TECHNICAL PROPOSAL

Validation monitoring is mandatory for MS, Class A

Reclaimed water quality class	Indicator microorganisms	Performance targets for the treatment train (log_{10} reduction)	Minimum monitoring frequency
Class A	***E. coli***	≥ 5.0	Validation monitoring has to be performed: - Before the reuse scheme is put into place - When equipment is upgraded - When new equipment or processes are added
	F-specific coliphages	≥ 6.0	
	***Clostridium perfringens* spores**	≥ 5.0	

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III. DIFFERENCES WITH JRC TECHNICAL PROPOSAL

Operational monitoring is mandatory in treatment processes

Treatment process	Operational monitoring	Indicative frequency
Secondary treatment (activated sludge)	Flow rate Nitrate, nitrites BOD_5 Suspended solids, solids retention time Dissolved oxygen Hydraulic retention time	Continuous (on-line) for flow rate, dissolved oxygen Weekly for other parameters
Low-rate biological systems (stabilization ponds)	Flow rate BOD_5, (facultative and maturation ponds)	Continuous (on-line) for flow rate Weekly for other parameters
Soil-aquifer treatment		
Media filtration system		
Membrane filtration technology	**Transmembrane pressure** **Turbidity** **Electrical conductivity**	**Continuous (on-line)**
Ultraviolet light disinfection (UV)	Flow rate Turbidity upstream UV intensity and/or calculated dose UV transmissivity	Continuous (on-line)
Ozone/Biological Activated Carbon	Ozone dose Temperature	Continuous (on-line)
Chlorination	Free chlorine residual, Ct pH Temperature	Continuous (on-line)

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THANK YOU FOR YOUR ATTENTION

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