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Autorità di Regolazione per Energia Reti e Ambiente

Regulatory tools for promoting environmental sustainability

The Italian experience

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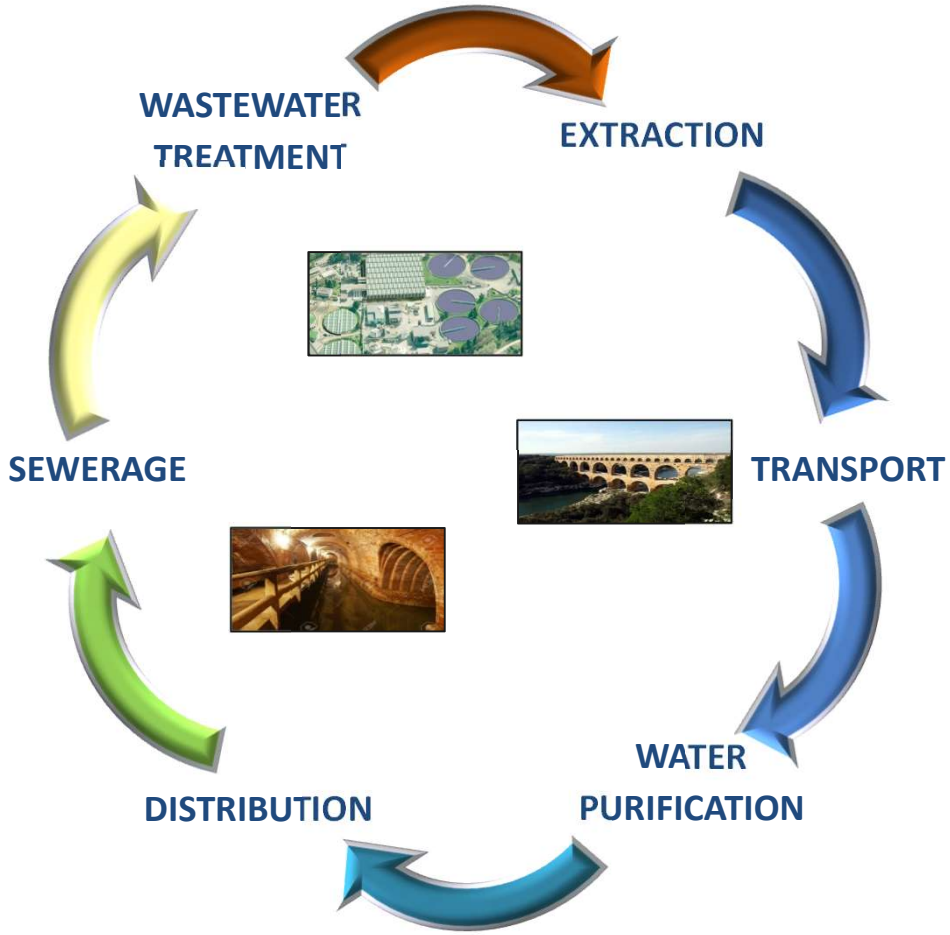
Environmental sustainability in the water system cycle

Water is taken by the environment…
… and returned to the environment



ENVIRONMENTAL SUSTAINABILITY

Condition for restarting the cycle without interruption and at affordable costs

- implies to return water in "good state", according to WFD definition

REGULATORY PRINCIPLES

- Water conservation principle
- Health issues
- Users service issues
- Full cost recovery principle
- Polluters' pay principle
- Ability to pay

The need for quality regulation…not forgetting affordability

since 2012
1st year ARERA water regulation **Tariff methodologies** (towards MTI-3)

COST REIMBURSEMENT RULES

It is too easy to react to a pushing regulatory activity on admitted costs for tariff reimbursement by reducing the quality of provided services

Quality is not free, so an opportunity judgement cannot forget the affordability issue ("who is paying for what")

QUALITY REGULATION

EU PRINCIPLES :
- **"WATER CONSERVATION"**
- **"POLLUTER PAYS"**

AFFORDABILITY

since 2016 **RQSII**

CONTRACTUAL QUALITY

- direct impact on users
- regards ancillary services (billing, service desk, timing)

RQTI since 2018

TECHNICAL QUALITY

- regards the core of water services (water availability and quality, environmental protection)
- the focus is not "how many" investments, but the results of the investments

CHANGE VS OUTPUT BASED REGULATION

since 2018 **TICSI-REMSI**

TARIFFS APPLIED TO END USERS

- allocative efficiency and equity
- reduce geographical differences
- equitable tariff progressivity: per-capita
- "polluter pays" principle explicitly declined for industrial users
- if everyone pays, tariffs become more sustainable

TIBSI since 2018

SOCIAL BONUS

- water = essential service, must be available also for disadvantaged people
- 50 lt/ person/day guaranteed
- costs socialized through an equalization component

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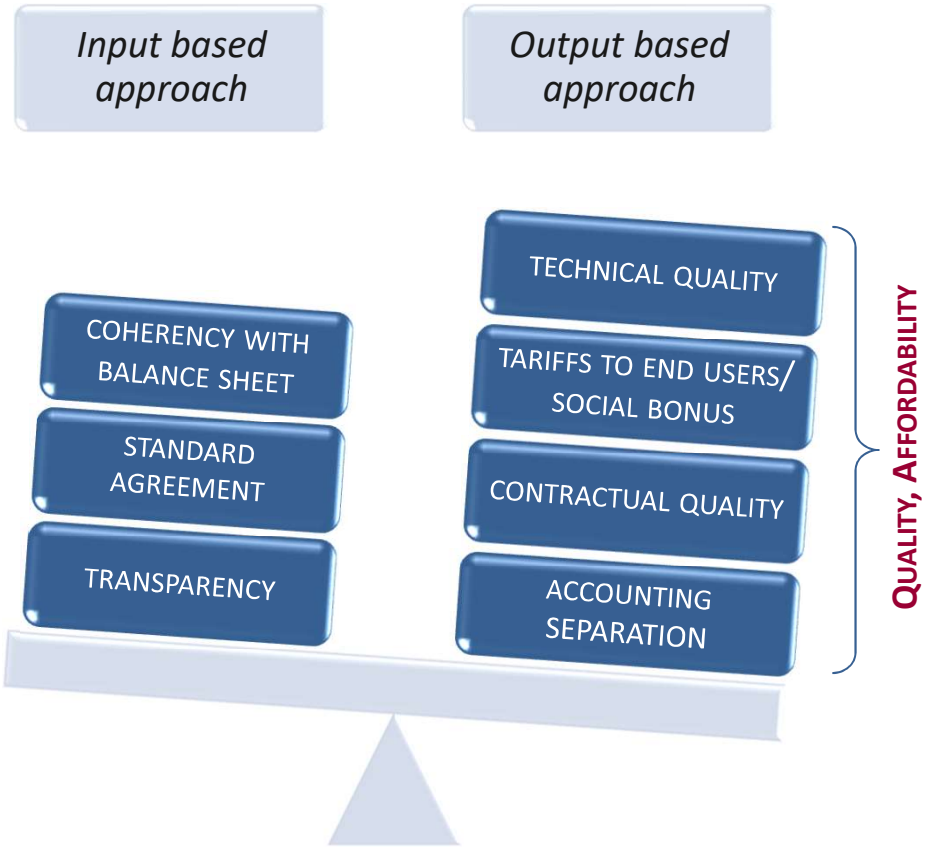
Water regulation… 2.0

- **PHASE 1**: weight on *costs reimbursement rules*
  - Transparency
  - Accountability
  - Coherency

- **PHASE 2**: weight on *outputs*
  - Efficacy: promoting investments to reach convergence among different territories and to reach quality standards
  - Efficiency: promoting investment incentives and operating costs efficiency



Regulation of technical quality - RQTI

- gradual approach
- since 1 January 2018

Decision 917/2017/R/IDR

- **output based** (vs user or environment)
- **technology neutral**

INDICATORS

Prerequisites

- identify broad criticalities to overcome:
  - **data availability and reliability** (in general and on water consumption, in particular)
  - minimum conditions required by existing legislation:
    - **drinking water quality** (Dir. 98/83/CE)
    - **environmental impact** (Dir. 91/271/CEE)

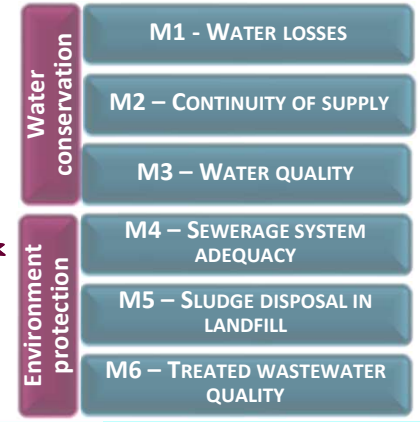
Specific standards

- conditions required by existing legislation on security of water supply (service interruptions)
- **automatic reimbursement** to users in case of not respecting standards

ID	Indicator	Specific *standard*
S1	Maximum duration of each planned interruption	24 hours
S2	Maximum time before activating a substitute emergency service in case of interruption	48 hours
S3	Minimum time notice for planned intervention implying a service interruption	48 hours

General standards

- 6 **macro-indicators** whose targets are differentiated according to the operator's state of efficiency (class of indicator)
- other indicators linked to macro in order to better describe technical condition of integrated water service
- **award/penalty** incentive mechanism



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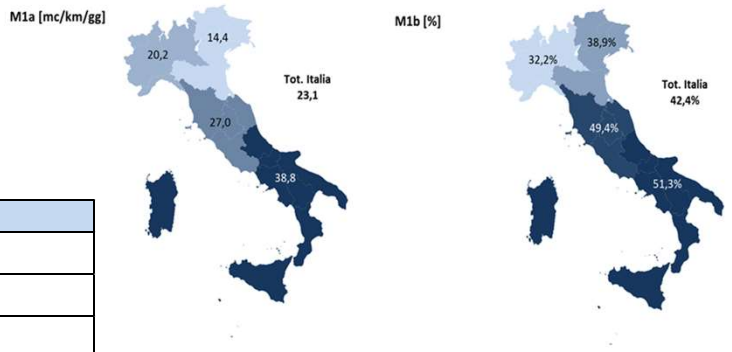
Focus on macro-indicators (1/5)

WATER SUPPLY



M1 - Water losses

ID	Indicator	Tariff type	ID Class	Targets
M1	M1a – Water losses per km [mc/km/day] M1b – Leakage rates [%]	RES	A	Conservation
			B	-2% M1a yearly
			C	-4% M1a yearly
			D	-5% M1a yearly
			E	-6% M1a yearly

Water losses (%) \ Water losses per km (mc/km/day)	M1a <15	15≤ M1a <25	25≤ M1a <40	40≤ M1a <60	M1a ≥60
M1b <25%	A				
25%≤ M1b <35%		B			
35%≤ M1b <45%			C		
45%≤ M1b <55%				D	
M1b ≥55%					E

- analysing **water losses** from two different perspectives:
  - **Technical**: impact of water infrastructure on losses
  - **Environmental**: water conservation

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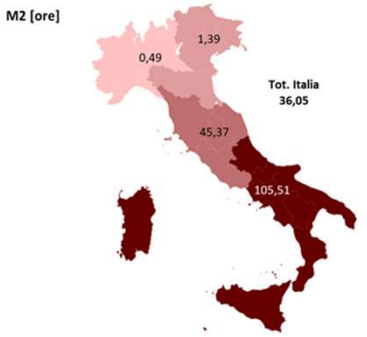
Focus on macro-indicators (2/5)

WATER SUPPLY

M2 - Continuity of supply

ID	Indicator	Tariff type	ID Class	Class	Targets
M2	Service interruptionns [hours]	ALTRO	A	M2<6	Conservation
			B	6≤M2<12	-2% M2 yearly
			C	12≤M2	-5% M2 yearly

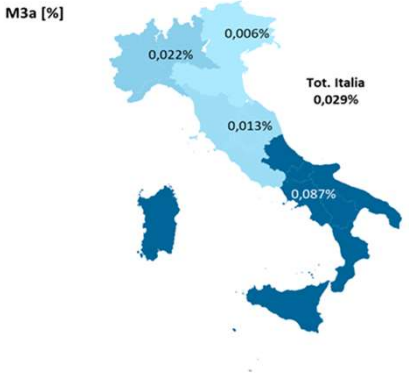


- large differences on the national territory (some have nearly no interruptions, some have frequent and recurring interruptions)
- M2 evaluate the interruption impact (weighted on the number of families/properties involved)

M3 - Water quality

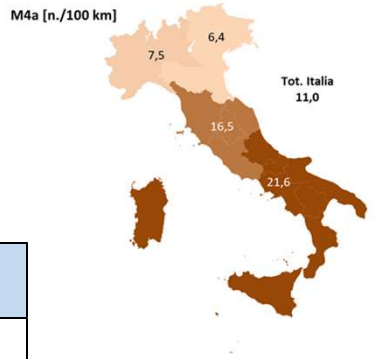
ID	Indicator	Tariff type	ID Class	Class	Targets
M3	M3a – Incidence of non potability ordinances [%] M3b – Non-compliant samples rate [%] M3c – Non-compliant parameters rate [%]	RES	A	M3a=0 M3b≤0,5% M3c≤0,1%	Conservation
			B	M3a≤0,005% M3b≤0,5% M3c>0,1%	M3a=0 -10% M3c yearly
			C	M3a≤0,005% 0,5%<M3b ≤5,0%	Moving to Class B within 2 years
			D	M3a ≤0,005% M3b >5,0%	Moving to Class C within 2 years
			E	M3a >0,005%	Moving to Class D within 2 years

- important to monitor in consideration of possible health problems



Focus on macro-indicators (3/5)

SEWERAGE



M4 - Sewerage system adequacy

ID	Indicator	Tariff type	ID Class	Class	Targets
M4	M4a Frequency of sewerage flooding/spill (n/100 km) M4b Adequacy of storm-overflow sewage to law (% non-adequated) M4c Control of storm-overflow sewage (% non-controlled)	ENV	A	M4a <1 M4b = 0 M4c ≤ 10%	Conservation
			B	M4a <1 M4b = 0 M4c > 10%	- 5% M4c yearly
			C	M4a <1 M4b ≤ 20%	- 7% M4b yearly
			D	M4a <1 M4b > 20%	- 10% M4b yearly
			E	M4a ≥ 1	- 10% M4a yearly

- M4 considers environmental problems deriving from any sewerage typology
- both normative and operational adequacy

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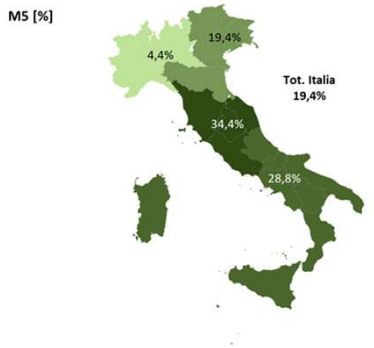
Focus on macro-indicators (4/5)

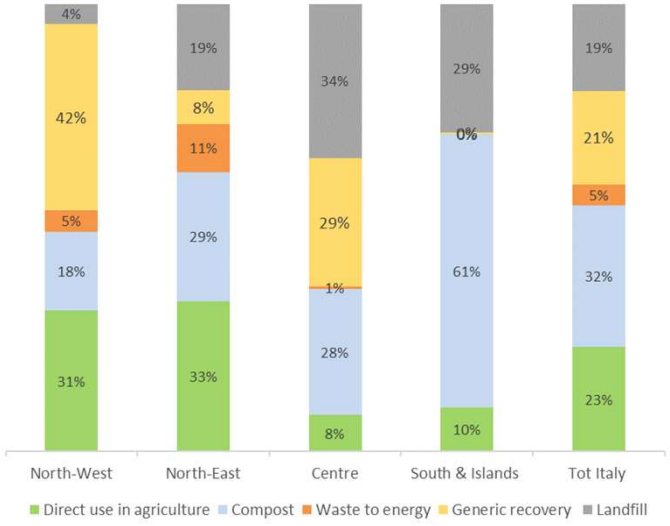
WASTEWATER TREATMENT



M5 - Sludge disposal in landfill

ID	Indicator	Tariff type	ID Class	Class	Targets
M5	Landfill sludge disposal [%]	ENV	A	M5 < 15%	Conservation
			B	15% ≤ M5<30% e $\%SS_{tot}$ ≥30% of sludge mass overall produced	-1% $MF_{tq,disc}$ yearly
			C	15% ≤ M5<30% e $\%SS_{tot}$ < 30% of sludge mass overall produced	-3% $MF_{tq,disc}$ yearly
			D	M5 ≥ 30%	-5% $MF_{tq,disc}$ yearly

Sludge recovery in 2016



- sludge disposal in landfill should be the residual solution

By discouraging landfill disposal, ARERA wants to incentive alternative options of recycling and material recovery

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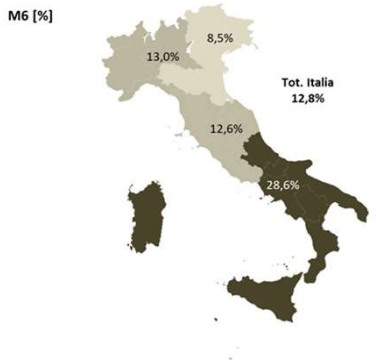
Focus on macro-indicators (5/5)

WASTEWATER TREATMENT

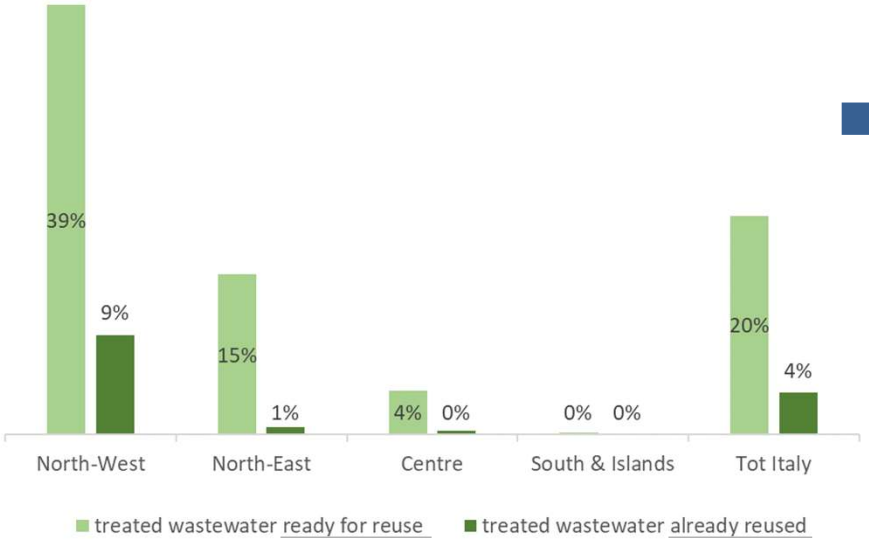
M6 - Treated wastewater quality

ID	Indicator	Tariff type	ID Class	Class	Targets
M6	Exceeding limits rate in wastewater samples [%]	ENV	A	M6 < 1%	Conservation
			B	1% ≤ M6 < 5%	-10% di M6 yearly
			C	5% ≤ M6 < 10%	-15% di M6 yearly
			D	M6 ≥ 10%	-20% di M6 yearly



- essential for environmental protection

Wastewater reuse in 2016



- Reuse potentialities are not completely exploited, increasing treatment and wastewater quality
- Reuse allows to diversify sources, thus keeping high quality water sources for priority use

Award/penalty mechanism for technical quality

Symmetric, multi stadium mechanism to incentivize technical quality performance

	basic	advanced	excellence	
To maintain the state of efficiency (class A)	▪ (not) maintaining "A class"	▪ better (worse) operators for each macro-indicator	▪ better operators, considering all macro-indicators	penalties deducted
Mandatory to improve efficiency (other classes)	▪ overcoming (not reaching) the improving efficiency target	▪ better operators' improvement (worse operators' failure) for each macro-indicator		penalties allocated in a fund
	Predefined "jackpot" (minority game theory)	*Award/penalty in % of regulated revenues*		

TOPSIS method for scoring function

Technique for Order of Preference by Similarity to Ideal Solution

More and more interrelation with tariff methodology…

Until now

- coherency check among balance sheet data, planning and targets
- operating costs efficiency but virtually no quantitative limits for investments

Since 2020 Consultation documents

Added focus on:

1 incentives for **energy saving**

$$CO_{EE}^{a} = \left\{ min\left[\quad CO_{EE}^{actual,a-2}; \left(\overline{CO_{EE}^{average,a-2}} * kWh^{a-2}\right) * 1{,}1 \right] + \underbrace{\left(\gamma_{EE} * \Delta_{saving}^{a}\right)}_{\text{sharing mechanism}} \right\} * \prod_{t=a-1}^{a} (1 + I^{t})$$

where:

$$\Delta_{saving}^{a} = \left(\frac{\sum_{n=3}^{6} kWh^{a-n}}{4} - kWh^{a-2} \right) * min\left(\quad CO_{EE}^{actual,a-2} / kWh^{a-2}; \overline{CO_{EE}^{average,a-2}} * 1{,}1 \right)$$

kWh saving compared to the previous 4 years

and

- $\gamma_{EE} = 0$ if $\Delta_{saving}^{a} < 0$
- $\gamma_{EE} = 0{,}25$ if $\Delta_{saving}^{a} > 0$

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…every Capex linked to its target…

Since 2020 Consultation documents

Added focus on:

2 investments "accounting separation"

per quality target

Activity	Macro-indicator	Assets	Years for depreciation
Aqueduct	M1-M2-MC1	Pipelines	40
	M1-M2-M3	Hydraulic infrastructures	40
	M1-M2	Tanks	40
	M1-M2-M3	Lifting equipment and pumps	8
	M3	Drinking water treatment plants	20
	M3	Other drinking water treatments (e.g. disinfection, filtration, softening…)	12
	M1-MC1-MC2	Meters	10
	M1-M2-M3	Information systems	5
	M1-M2-M3	Telecontrol and data transmission systems	8
Sewerage	M4	Pipelines	50
	M4	Siphons and storm-overflow sewage	40
	M4	Stormwater detention basins and structures for first flush separation	40
	M4	Lifting equipment and pumps	8
	M4	Meters	10
	M4	Information systems	5
	M4	Telecontrol and data transmission systems	8

Activity	Macro-indicator	Assets	Years for depreciation
Wastewater treatment	M5-M6	Lifting equipment and pumps	8
	M6	Natural wastewater treatment (e.g. phytoremediation)	40
	M6	Wastewater plants – preliminary and primary treatments	20
	M5-M6	Wastewater plants – secondary treatments	20
	M6	Wastewater plants – tertiary and advanced treatments	20
	M5	Sludge treatment sections (thickening, stabilization, dewatering, digestion)	20
	M5	Sludge drying plants	20
	M5	Plants for sludge recovery (e.g. pyrolysis, gasification)	20
	M5-M6	Meters	10
	M5-M6	Information systems	5
	M6	Telecontrol and data transmission systems	8
Common assets	M1-M2-M3-M4-M5-M6	Other plants	20
	M3-M6	Laboratories and facilities	10
	MC1-MC2-M1-M2-M3-M4-M5-M6	Information systems	5
	M1-M2-M3-M4-M5-M6	Telecontrol and data transmission systems	8
	MC1-MC2- M1-M2-M3-M4-M5-M6	Vehicles	5
	-	Land	-
	MC1-MC2	Not industrial buildings	40
	M1-M2-M3-M4-M5-M6	Industrial buildings	40
	-	Light constructions	20
	M1-M2-M3-M4-M5-M6	Studies, research, patents, rights to use	5
	M3-M6-MC1-MC2	Other tangible and intangible fixed assets	7

…towards a circular economy

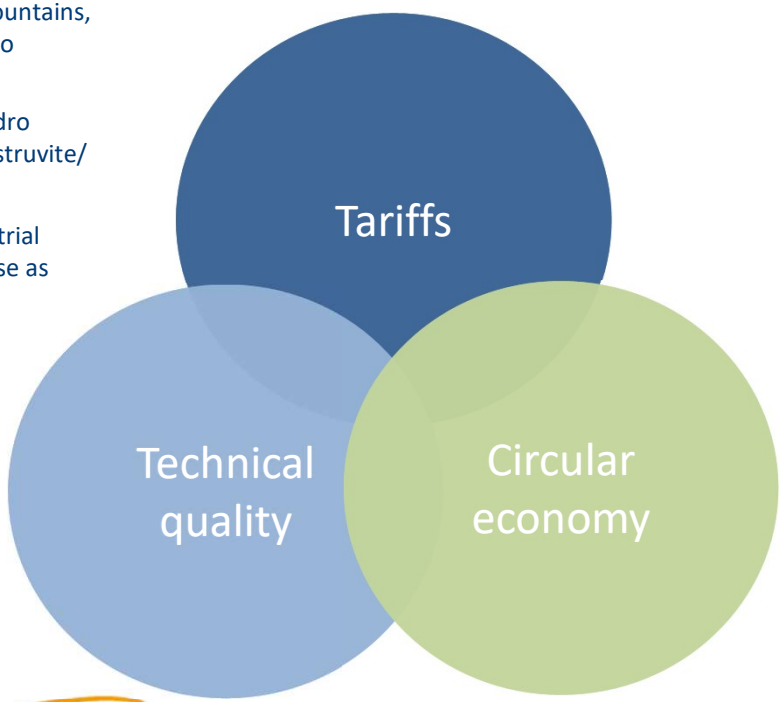
Since 2020 Consultation documents

Added focus on:

3 incentives for other activities with effects on:

- **energy efficiency** — Installation of soft starters and inverters, pressure management, energy recovery devices…
- **plastic use reduction** — Installation of high quality fountains, tap water as an alternative to bottled water
- **energy and raw material recovery** — Biogas from sludge, mini hydro power plants, biopolymers/struvite/ phosphorus… from sludge
- **wastewater reuse** — Reuse for irrigation or industrial purposes, plant internal reuse as technical water

75% revenue sharing mechanism



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Coordinated regulatory measures for coordinated targets

approach:

output based

in a framework of:

economic incentives

technological neutrality

stimulus for:

efficiency

efficacy

innovation

BROAD AIMS

valuable services

at affordable prices

preserving the environment

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