Spring 6-13-2014

Surface filtration technologies for municipal wastewater reuse for irrigation – Preliminary results of demo-scale activities

Pompilio Vergine
Water Research Institute

Wastewater and Biosolids Treatment and Reuse: Bridging Modeling and Experimental Studies

13 June 2014 – Otranto (Italy)

SURFACE FILTRATION TECHNOLOGIES FOR MUNICIPAL WASTEWATER REUSE FOR IRRIGATION - PRELIMINARY RESULTS OF DEMO-SCALE ACTIVITIES

Pompilio VERGINE
Carlo SALERNO
Giovanni BERARDI
Antonio LOPEZ
Alfieri POLLICE

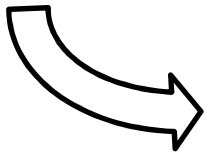
IRSA CNR, Bari, Italy

SCOPE and OBJECTIVES

Apulia region is heavily affected by water scarcity

Only 1% of the potential reuse in agriculture is actually performed

Why?



- Lack of knowledge? No (but transfer needed)
- Costs? Yes, partly due to current standards
- Public acceptance? Yes (need of dissemination)

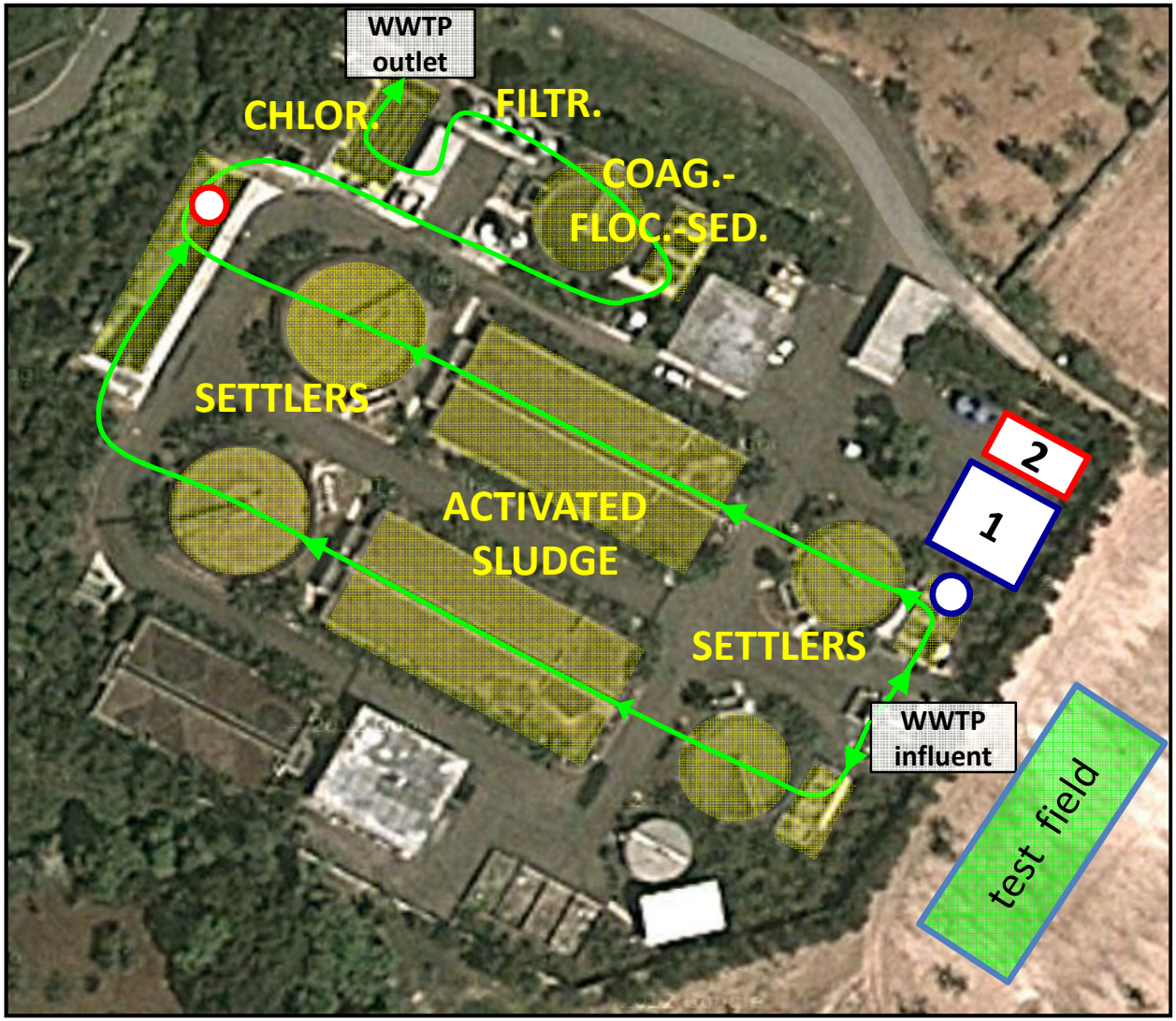
Nationally funded research project “In.Te.R.R.A.” (3 years)

Objectives:

- Technologies to comply with local standards
- Evidence of the reliability of the processes
- Effects of different water quality on crops
- Demo scale activities to evaluate actual feasibility
- …

The experimental installations

Two pilot plants: full treatment and tertiary treatment



1) IFAS-MBR + UV

Treatment of pre-screened municipal WW

2) GDF + UV

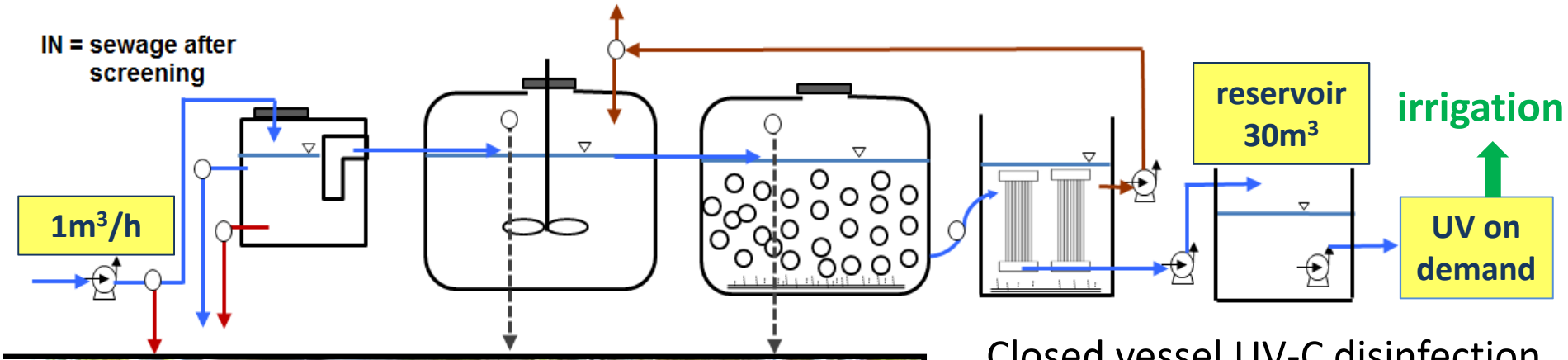
Treatment of effluent from secondary settler.

Test field (5000 m²)

Horticulture irrigated with treated effluents (including the **WWTP outlet**) and control (well water)

Pilot plant 1 - IFAS-MBR+UV

Integrated Fixed-Activated Sludge Membrane BioReactor (IFAS-MBR), followed by UV disinfection - Primary + secondary + tertiary treatment

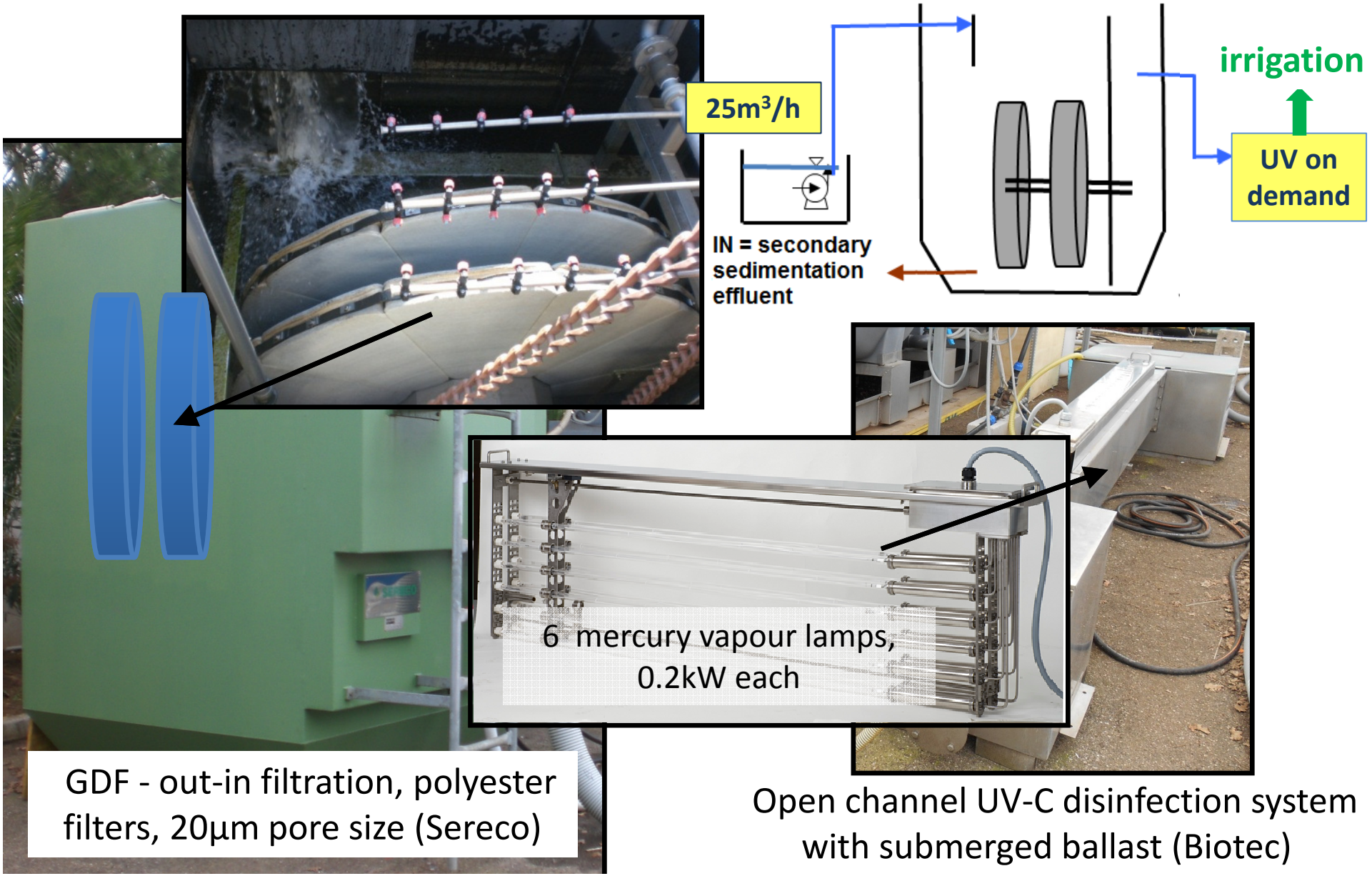


IFAS-MBR (Ecoimpianti Sud)

Closed vessel UV-C disinfection system - 2 mercury vapour lamps, 0.08kW each (Biotec)

Pilot plant 2 - GDF+UV

Gravity disk filter (GDF), followed by UV disinfection - Tertiary treatment



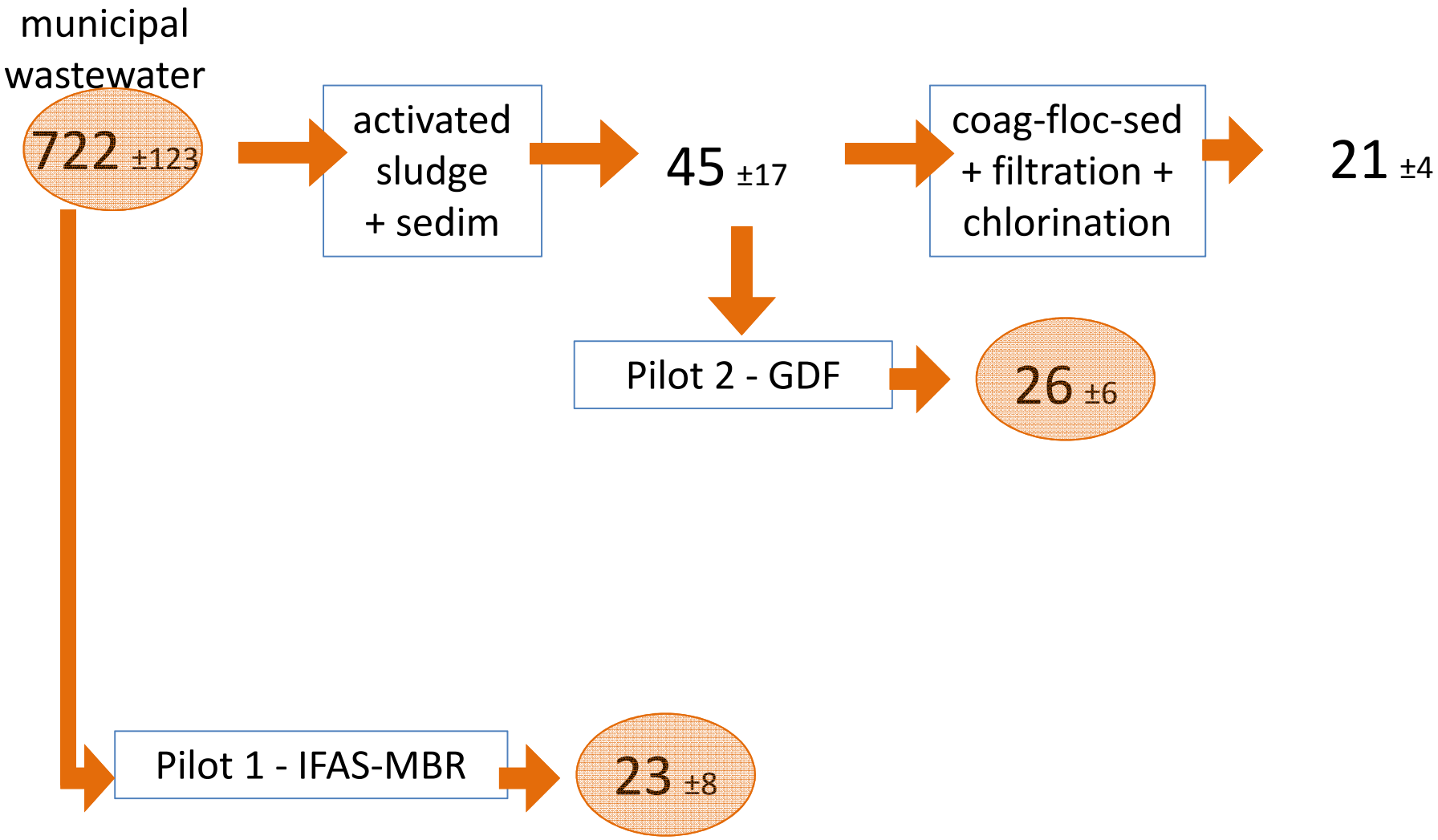
GDF - out-in filtration, polyester filters, 20µm pore size (Sereco)

Open channel UV-C disinfection system with submerged ballast (Biotec)

Comparative analysis - COD removal

Average values (± stdev) from the period 1/10/12-30/9/13
*All values are expressed as **mgCOD/L***

*Local standard for reuse = **100 mgCOD/L***



Comparative analysis - Nitrogen removal

Average values (± stdev) from the period 1/10/12-30/9/13
*All values are expressed as **mgN/L***

*Local standard for reuse = **35 mgN/L***

municipal wastewater

64 ±14 TKN

activated sludge + sedim

12 ±1

coag-floc-sed + filtration + chlorination

12 ±1

mainly N-NO_3

Pilot 2 GDF

11 ±2

mainly N-NO_3

operated for only partial N removal

Pilot 1 - IFAS-MBR

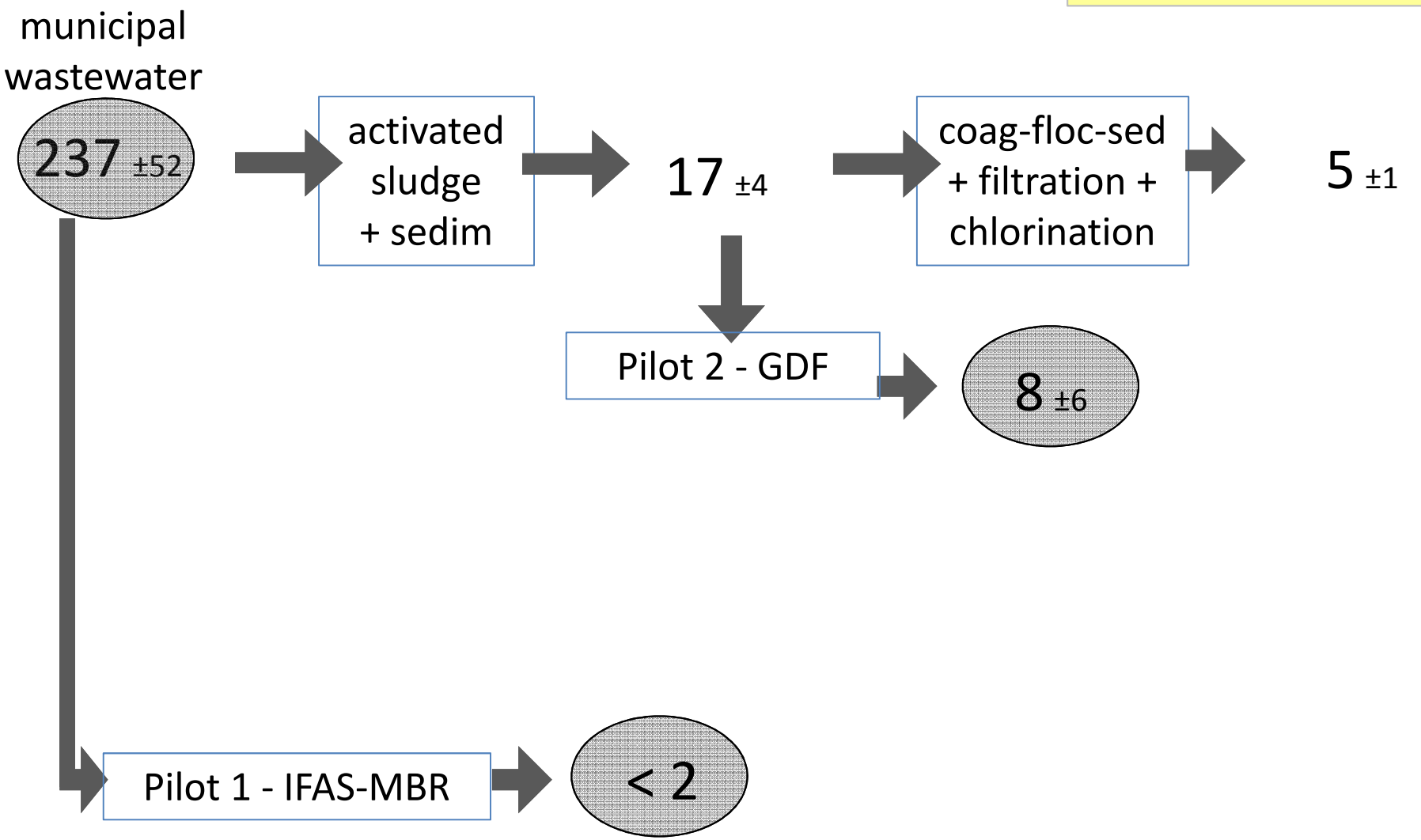
42 ±21

mainly N-NO_3

Comparative analysis - Solids removal

Average values (± stdev) from the period 1/10/12-30/9/13
*All values are expressed as **mgTSS/L***

*Local standard for reuse = **10 mg/L***

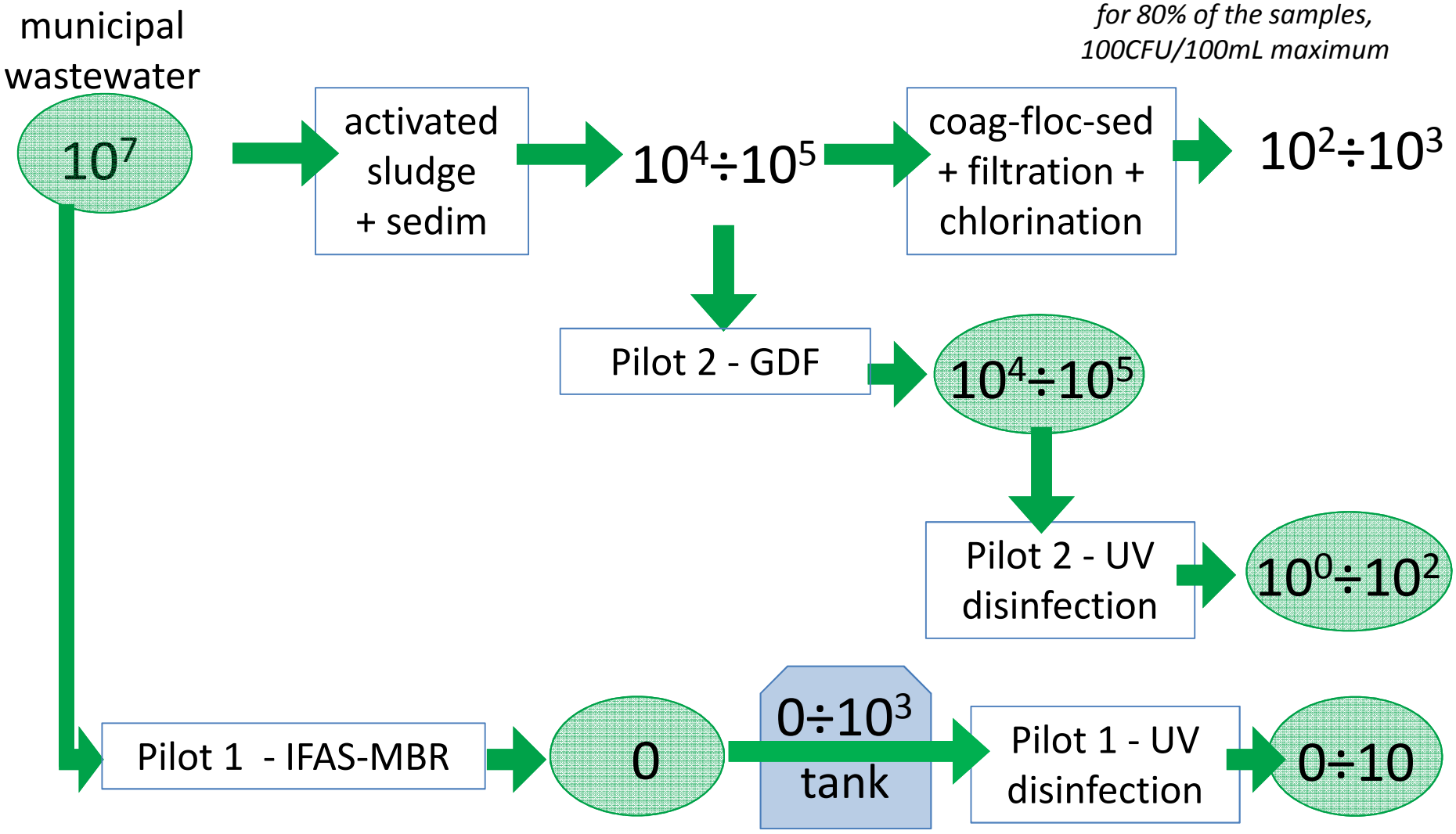


Comparative analysis – E.coli removal

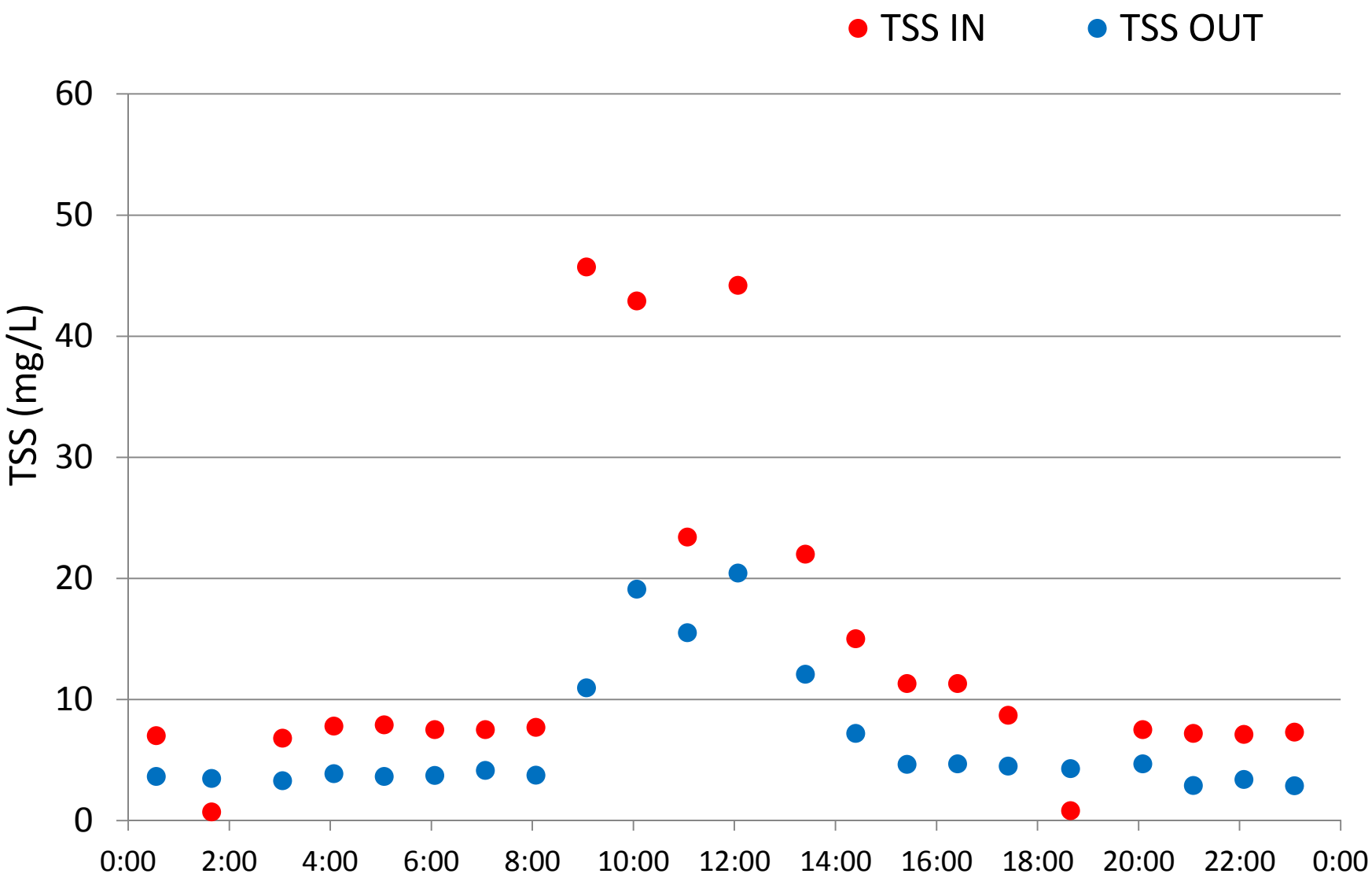
Range of values from the period 1/10/12-30/9/13
*All values are expressed as **CFU/100mL***

*Local standard for reuse = **10 CFU/100mL***

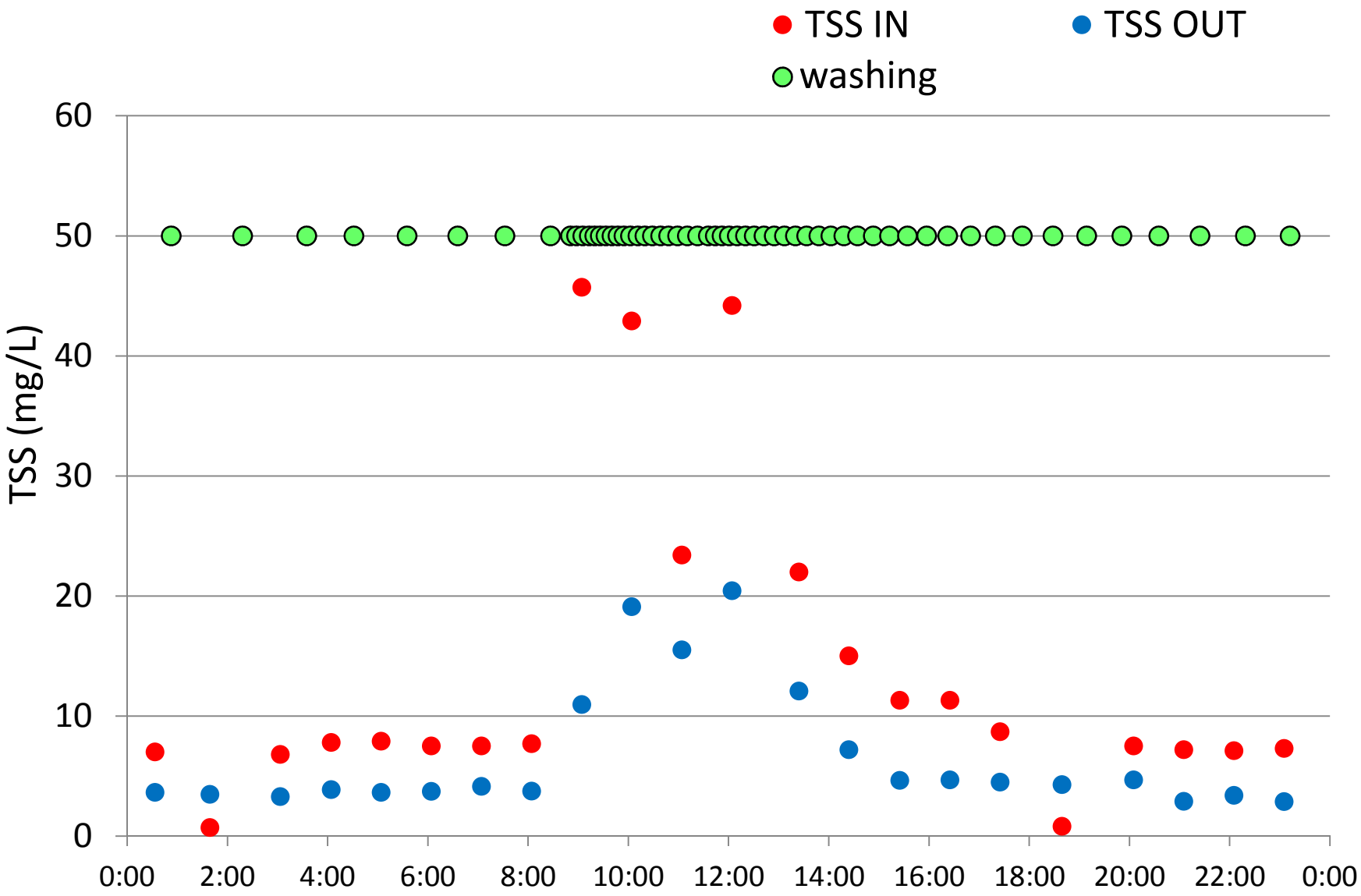
for 80% of the samples, 100CFU/100mL maximum



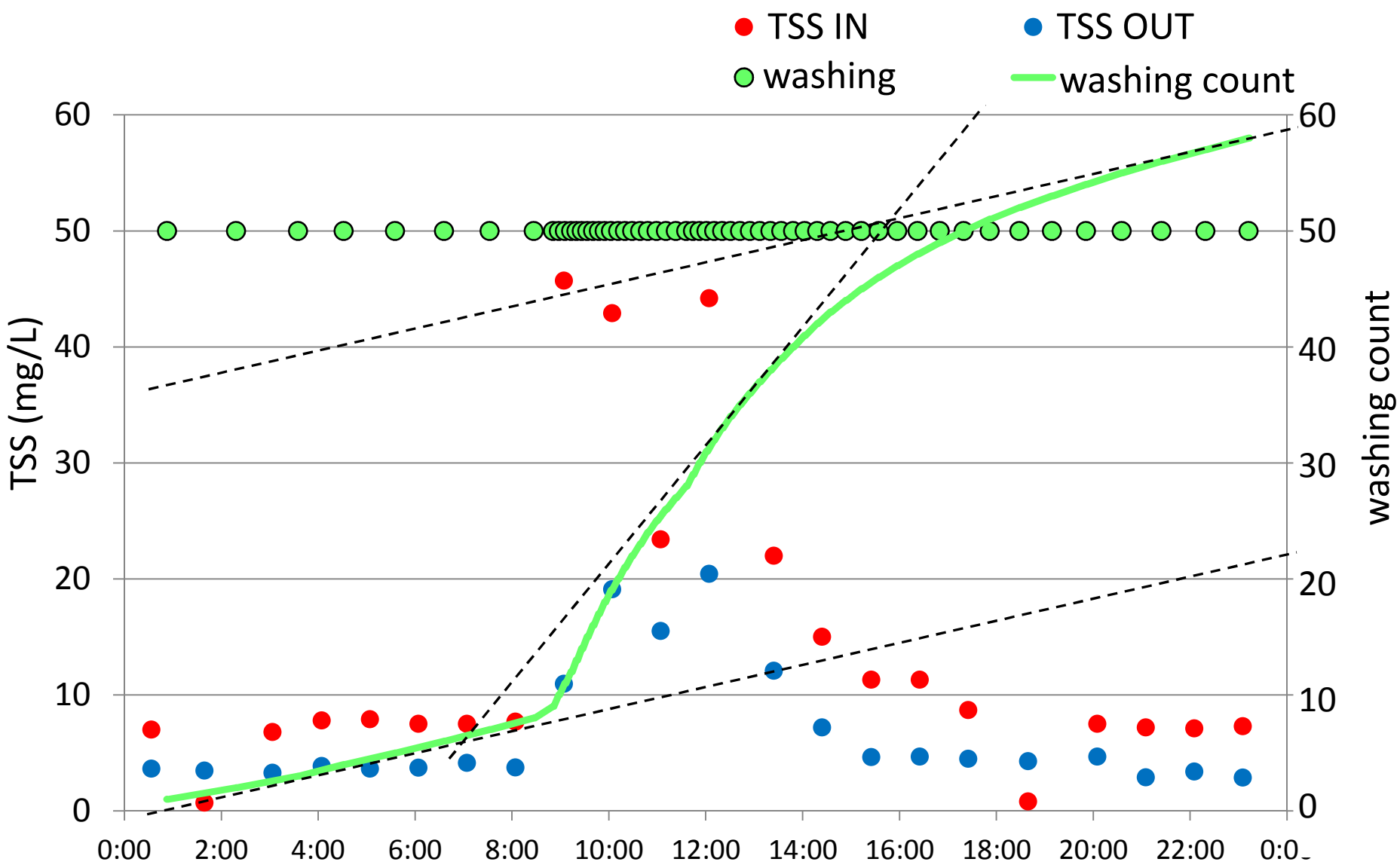
Pilot plant 2 – GDF – solids removal



Pilot plant 2 – GDF – solids removal



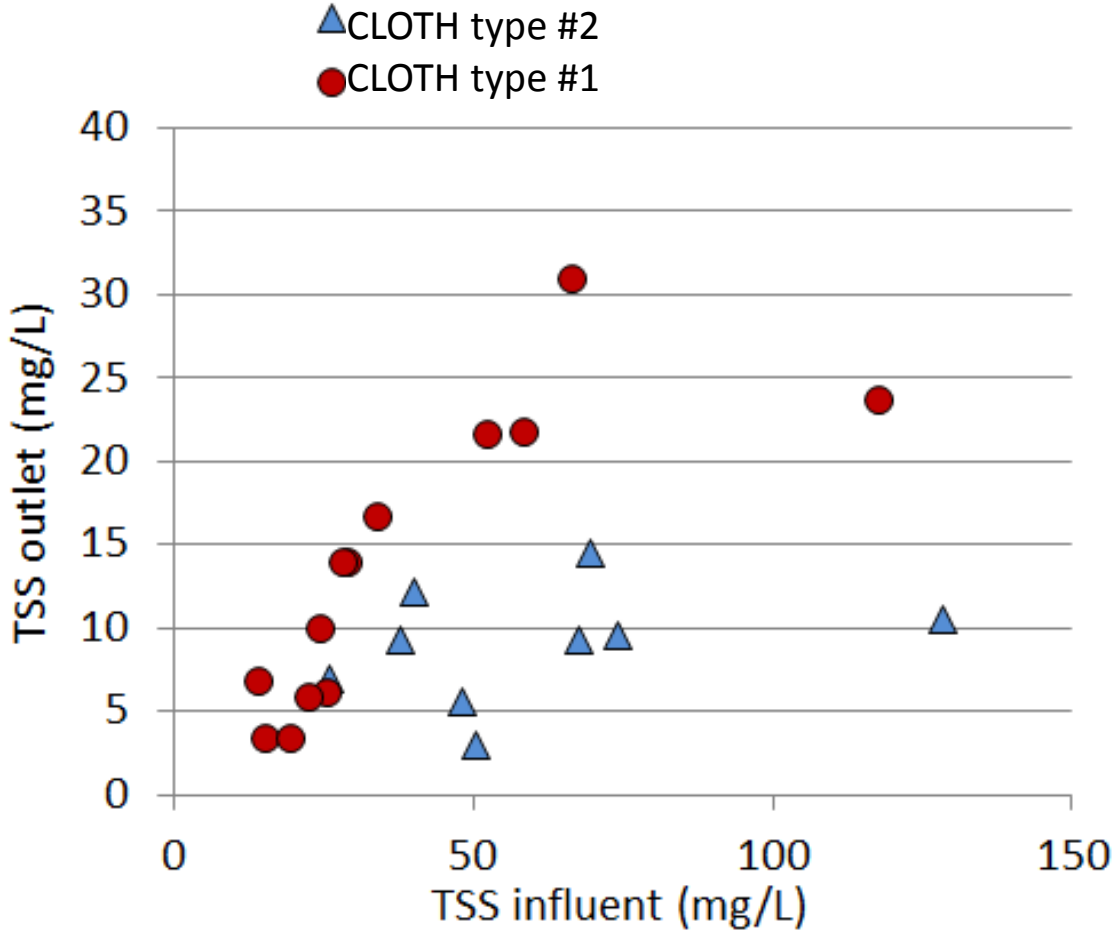
Pilot plant 2 – GDF – solids removal



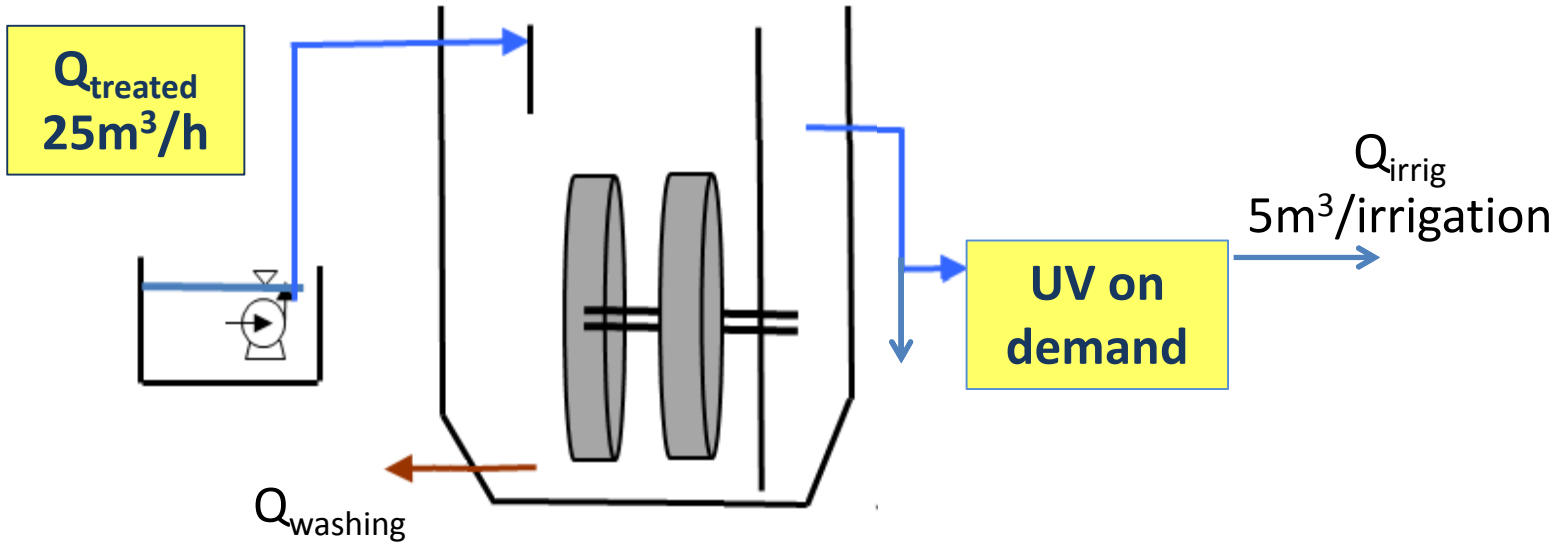
Pilot plant 2 – GDF – solids removal

June 2012-November 2013 → ***CLOTH type #1***
December 2013- May 2014 → ***CLOTH type #2***

Both cloth types are polyester filters with 20 µm mesh, but ***CLOTH type #2*** is thicker than ***CLOTH type #1***



Pilot plant 2 – GDF+UV – Energy requirements



	GDF operation	Feeding pump + FDG	UV
Energy requirements (**kWh/m³$_{trattata}$**)	0,006	+0,07 kWh/m³	1,2kWh/m³
Backwashing water (**m³/m³$_{treated}$**)	0.05-0.15kWh/m³ Hp. Conventional full-scale treatment 1kWh/m³ (only pumping)		0m³/m³

CONCLUSIONS

	IFAS-MBR+UV	GDF+UV
Complying with local standards	Ok	• Depending on influent charact.; • UV needs periodic cleaning
Process cost	Needs evaluation at full scale	Ok, but GDF needs optimization of backwashing
Reliability	Ok, if hydraulic design considered IFAS	Ok, if the secondary treatment works properly

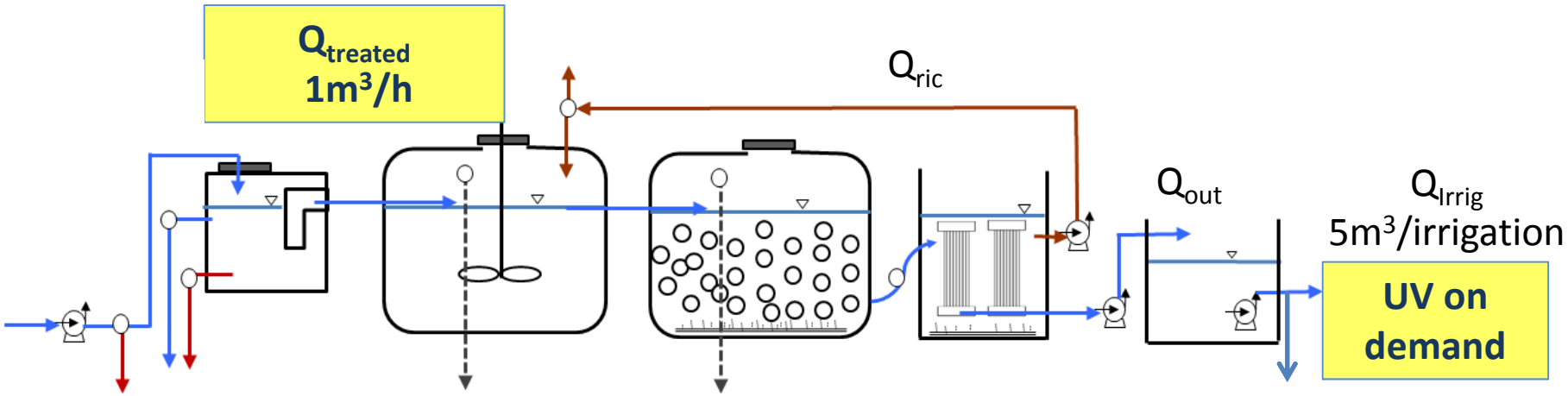
Thanks for your attention

Acknowledgements:
MIUR (Ministero dell'Istruzione dell'Università e della Ricerca)
European Commission

www.pon-interra.it Italian National project

www.water4crops.org Euro-India collaborative projects

Pilot plant 1 – IFAS-MBR+UV – Energy requirements



IFAS-MBR

5kWh/m³

UV

0,2kWh/m³