

Current and future ISSeP projects on microplastics

Audrey Joris

*Workshop Microplastics
Maastricht, 28th November 2023*



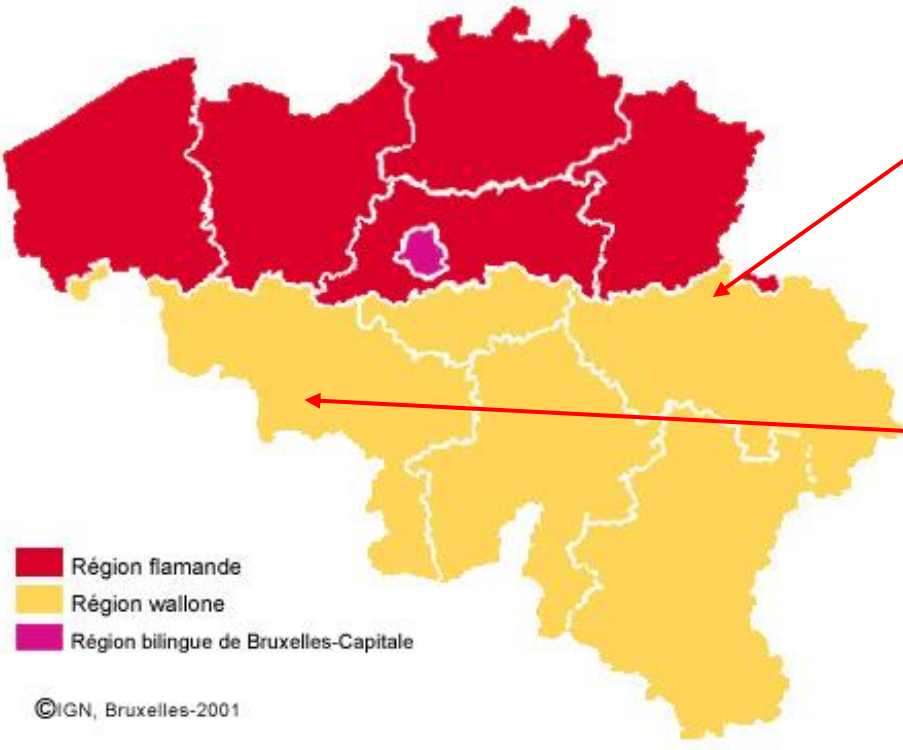


- **General presentation**
- **ISSeP Activities**
- **Microplastics projects**
 - **Finished projects**
 - **Projects in progress**
 - **Future project**



General Presentation

ISSeP : Scientific Institute of Public Service for Walloon Region



Head Office: Liège



Colfontaine site



300 staff members



ISSeP Activities

Technical and scientific support for the
Walloon Administration
Walloon Ministry of the environment

Environment monitoring

- Air ambient
- Modelling
- Atmospheric emissions
- Water quality
- Earth observation
- Remote sensing and geodata
- Mapping
- Ecotoxicology
- Contaminated sediment
- Soil quality
- Waste and hazardous sites

Reference laboratory for Wallonia

- Interface between public authorities and private providers
- Technical expertise to approvals granted by Wallonia
- Provide all those involved in the public and private sectors



Risks and nuisances prevention

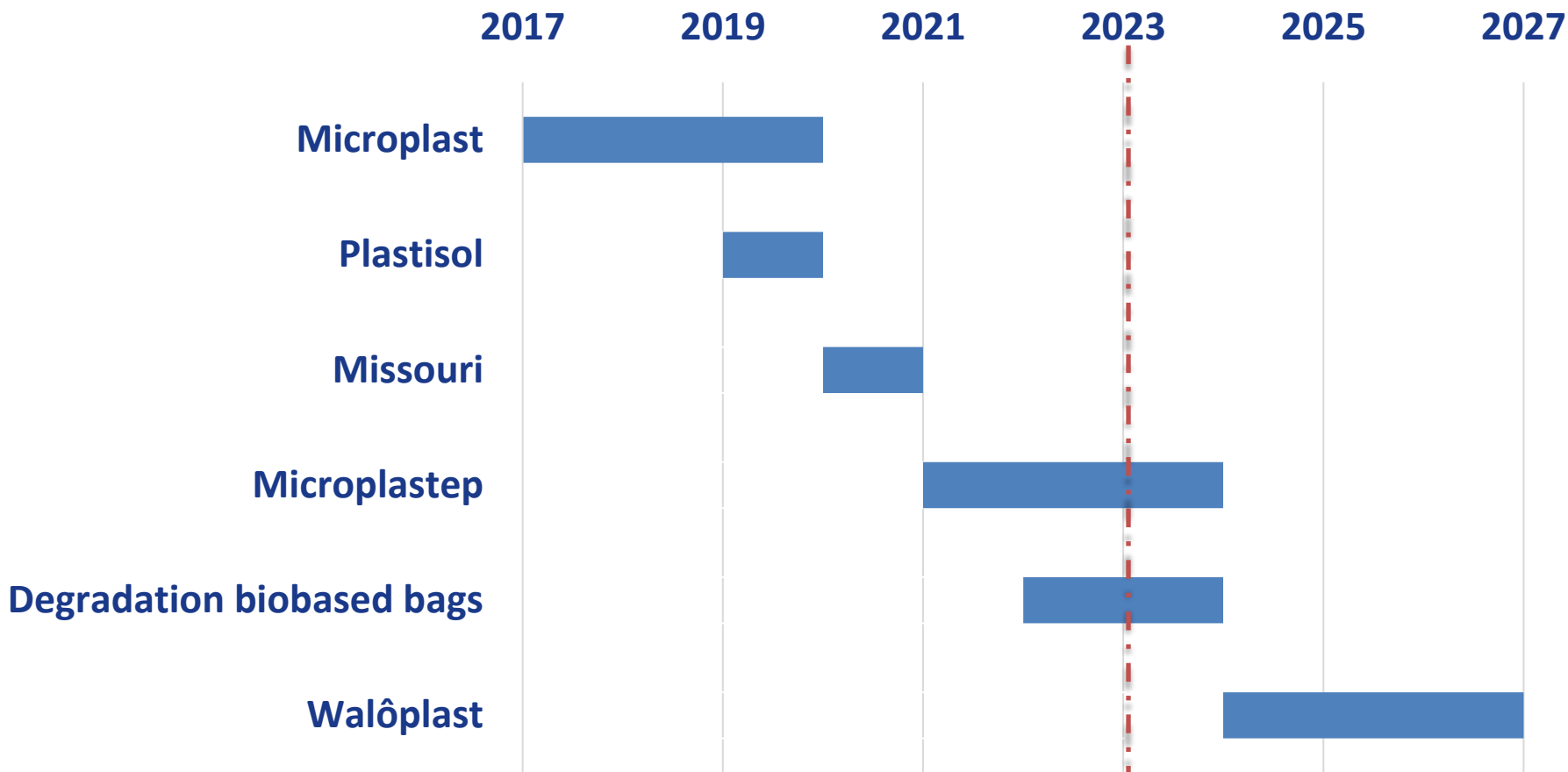
- Chronic risks
- Geological risks
- Accidental risks
- Fire/explosion
- Equipment control
- Nanoparticles
- Ecological risk assesement

Research and development

- Equity based research
- Walloon research programmes
- European programmes
- Interdisciplinarity that enabled to create synergies with numerous partners

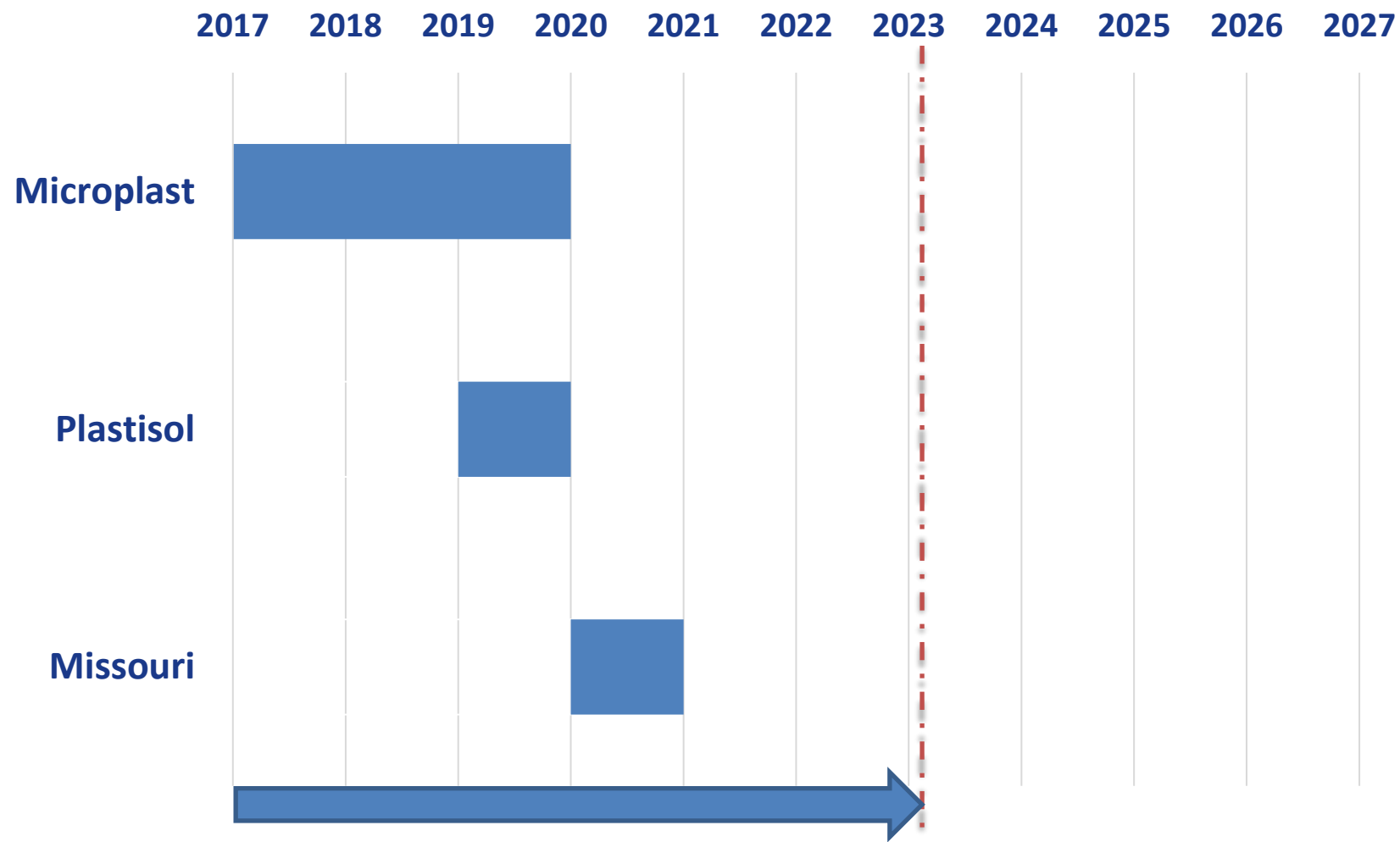


ISSeP Microplastics projects





Finished projects



Microplast (2017-2020)

- Highlight the presence and occurrence of microplastics in the biota of Walloon rivers;
- Dose compounds such as bisphenol A and phthalates, released by plastics, in the fish collected.
- Assessing the impact of microplastics on freshwater invertebrates (*Gammarus pulex*).



Gammarids exposed to polystyrene microbeads



Squalius cephalus



Project leader : ISSeP D.Leroy
Partners : ULiège, UNamur
Own funds

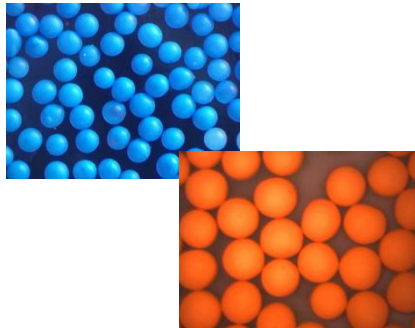
Microplast (2017-2020)

- A method for visualizing microplastics ingested by freshwater fish was selected : digestion of organic matter (KOH) + staining of the filtered sample (Nile Red). 26 fragments were analyzed by Pyrolysis GC-MS (Flemish reference laboratory for environmental monitoring, K. Tirez) → 5 fragments potentially related to plastics were identified.
- Nine phthalate congeners and bisphenol A were tested in fish muscle pools from 23 sampling sites. For all samples analyzed, BPA concentrations ranged from <1 µg/kg fresh weight to 55.8 µg/kg fresh weight. Four of the nine phthalates tested were never detected above the LOQ (DPP, BBP, DCHP and DDcP). Of the remaining 5 congeners, the most frequently detected were DBP and DEHP.
- At the same concentration, *Gammarus pulex* ingested a significantly larger amount of 25 µm diameter beads compared to 45 or 90 µm diameter beads. Moreover, the concentration of microbeads in the medium had an influence on the amount of ingested beads.

PlastiSOLS (2019)

Microplastics in solids : Development of simple separation techniques in sludge water treatment

Spiking polyethylene and polypropylene microbeads



Step by step



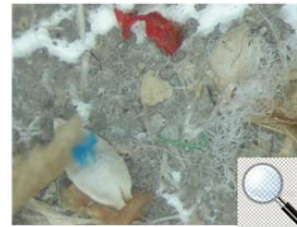
Remove organic matter



Decantation



Filtration



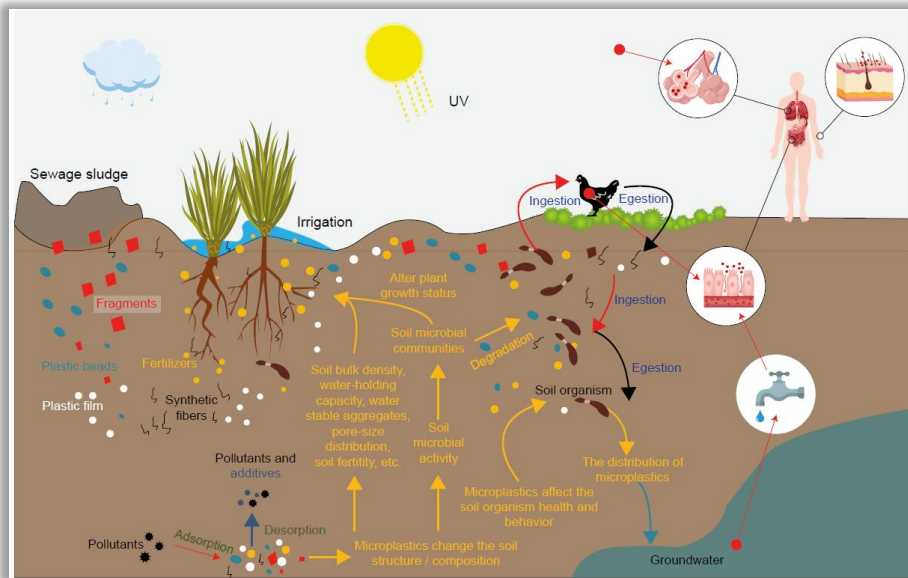
> 90% recovery of polyethylene and polypropylene microbeads in sizes from 300 to 700 μm

Project leader : ISSeP A.Joris
Own funds

MISSOURI (2020-2021)

Microplastics in soil and groundwater : sources, transfer, metrology and impacts

State of art and survey



Project leader : INERIS K.Perronet
Partners : ISSeP A.Joris & VU P. Leonards
Funds : SoilVer (European Project)

➔ **Perez C., Carré F., Hoarau-Belkhiri A., Joris A., Leonards P., Lamoree M. (2022)**
Innovations in analytical methods to assess the occurrence of microplastics in soil
[Journal of Environmental Chemical Engineering](#)

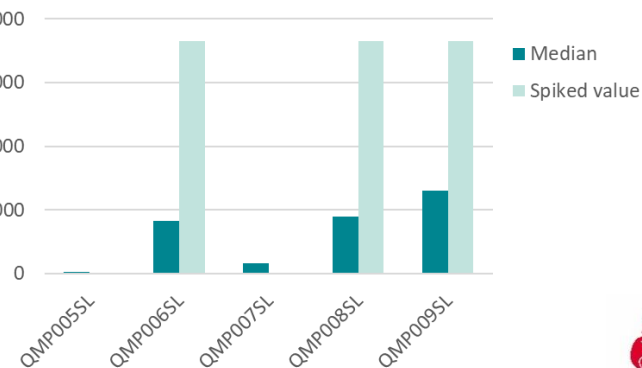
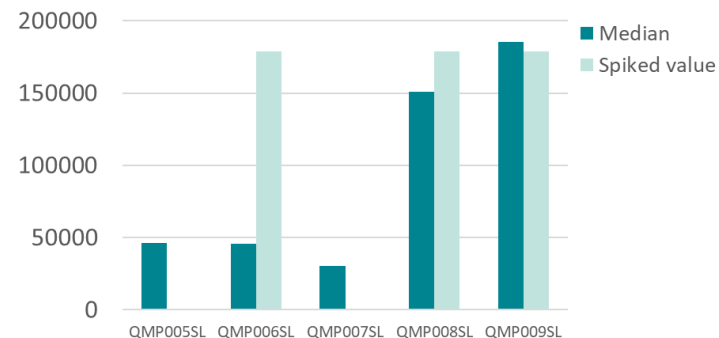
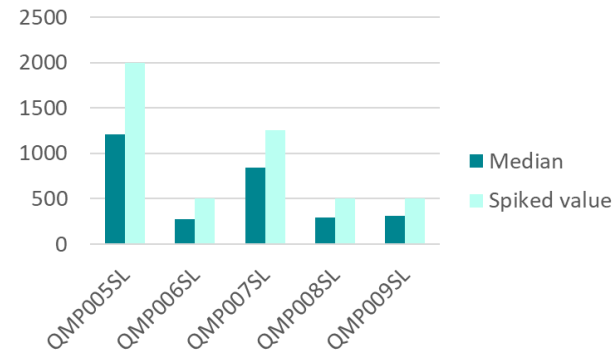
MISSOURI (2020-2021)

Interlaboratory study

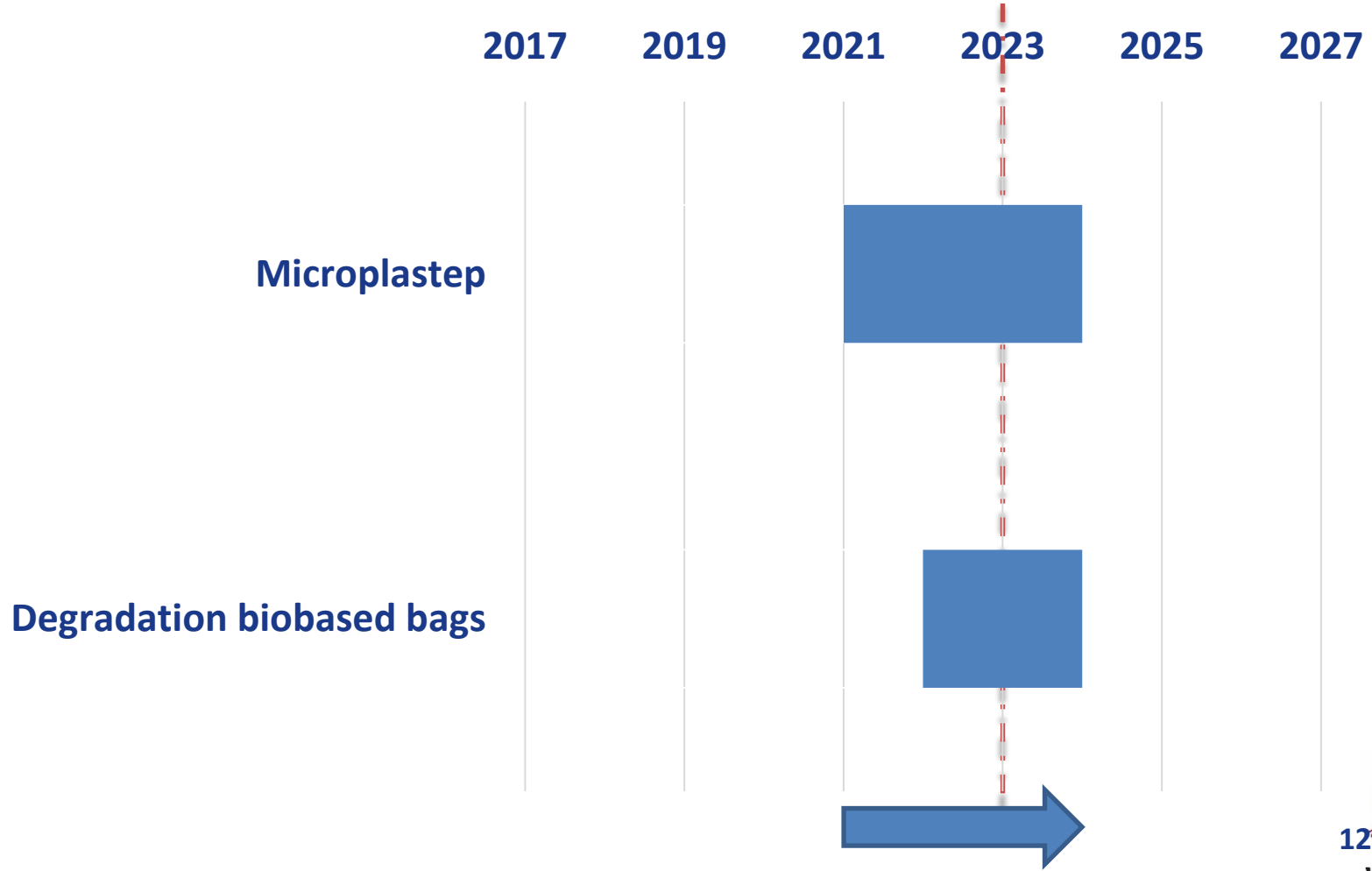
Batch number	Batch name	Matrix	Quantity of matrix in each bottle	MP	Quantity of MP in each bottle
1	QMP005SL	Sand	20 g	PE	40 mg
2	QMP006SL	Sand	20 g	PE	10 mg
				PMMA	15 mg
				PS	1.5 mg
3	QMP007SL	Real sandy soil 250 µm	20 g	PE	25 mg
4	QMP008SL	Real sandy soil 250 µm	20 g	PE	10 mg
				PMMA	15 mg
				PS	1.5 mg
5	QMP009SL	Real sandy soil (25% 250 µm + 75% 2 mm)	20 g	PE	10 mg
				PMMA	15 mg
				PS	1.5 mg



- Spiked sand was as difficult as spiked real soil samples
- Similar relative standard deviation for spiked single or mixtures of microplastics
- Quantification on mass basis had lower relative standard deviation than on particle basis
- Indications that methyl polymethacrylate particles behave differently than polyethylene and polystyrene in glass bottles



Projects in progress

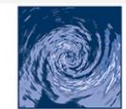


MicroPlaSTEP (2021-2024)

Diagnosis of the effectiveness of WWTPs for treating microplastics in wastewater



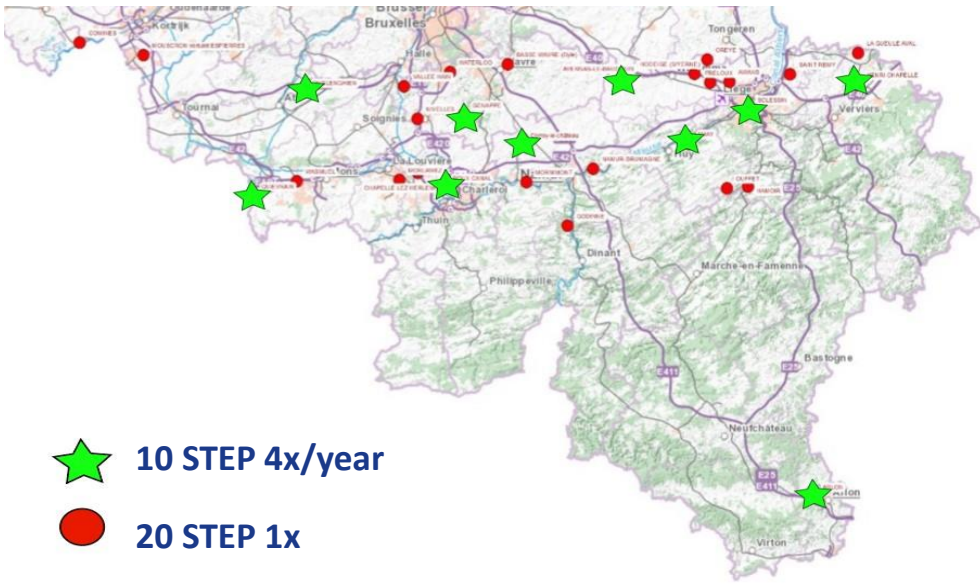
CEBEDEAU



SPGE

Société Publique de Gestion de l'Eau

*Project leader : ISSeP A.Joris
Partners : Cebedeau, SPGE
Own funds*



SAMPLING



Wastewater (inlet)



Sludge



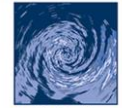
Effluent (after treatment)

MicroPlaSTEP (2021-2024)

Diagnosis of the effectiveness of WWTPs for treating microplastics in wastewater



CEBEDEAU



Société Publique de Gestion de l'Eau

Oxydation



Decantation



Filtration



PREPARATION

MicroPlaSTEP (2021-2024)

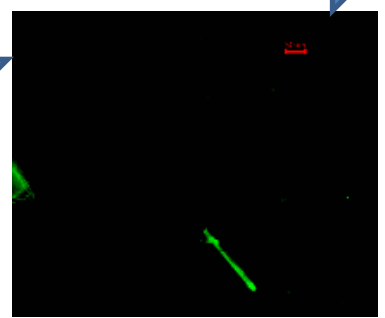
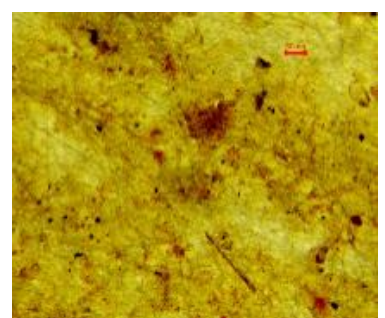
Diagnosis of the effectiveness of WWTPs for treating microplastics in wastewater



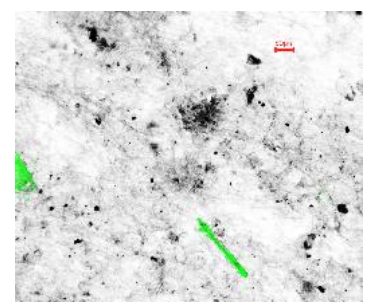
CEBEDEAU



NILE RED STAINING

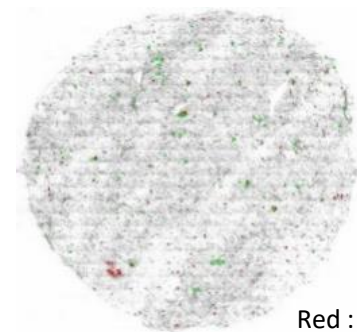


UV + green filter
(excitation/emission :
460/525 nm)



Picture treatment
Zoom 50x

FTIR



Red : PA
Green : PET
Yellow : PP



Ghent University
Nicolet™ iS™ 10 FTIR Spectrometer ThermoFisher

Composition	PET	PA	PP	PS	Unidentified
# Particules	437	875	1	1	1117

PET : ethylene polyphthalate
PA : polyamide
PP : polypropylene
PS : polystyrene

Degradation of biobased bags (2022-2024)

Evaluation of the degradation of plastic bags sold as compostable within the framework of three composting operations as they are carried out in Wallonia



Home composting



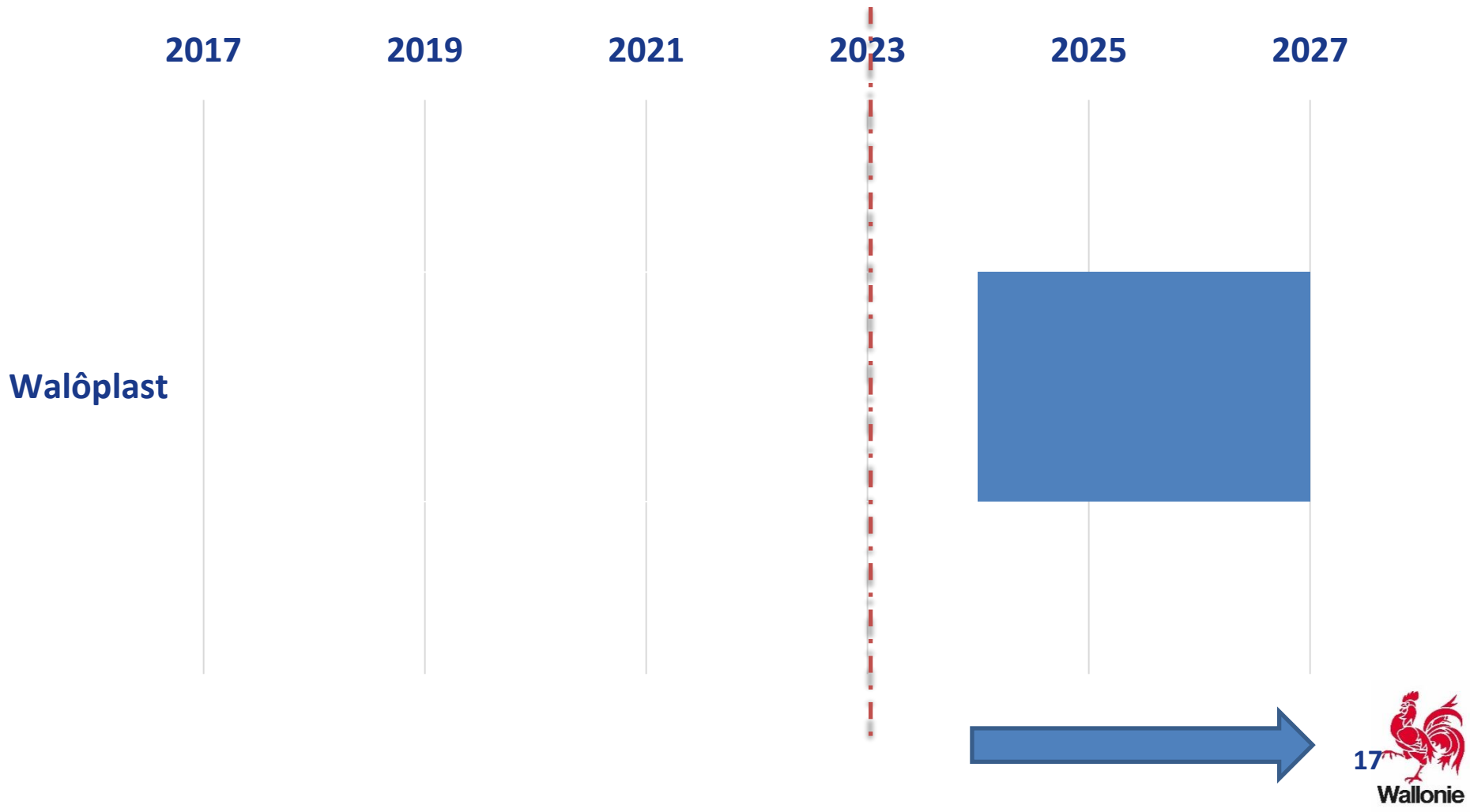
Community composting



Industrial composting



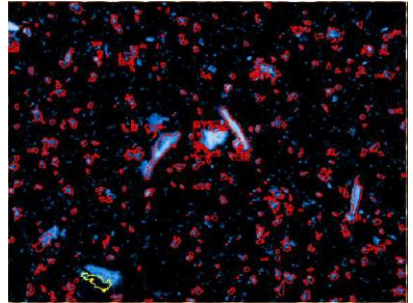
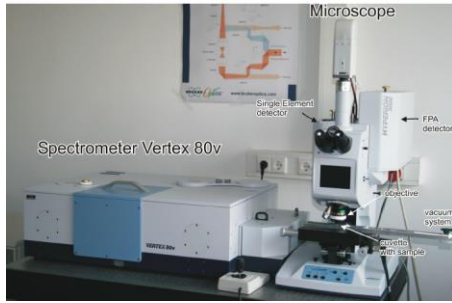
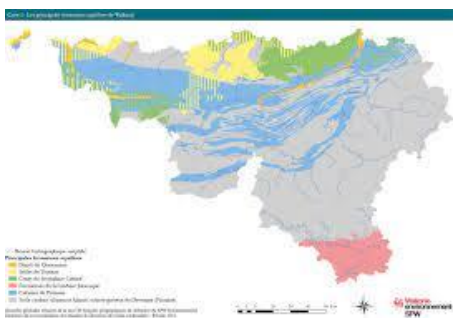
Future project



Walôplast (2024-2027)



Distribution and occurrence of microplastics in the Walloon environment: development of sampling and analysis methods, characterisation of Walloon environmental matrices.



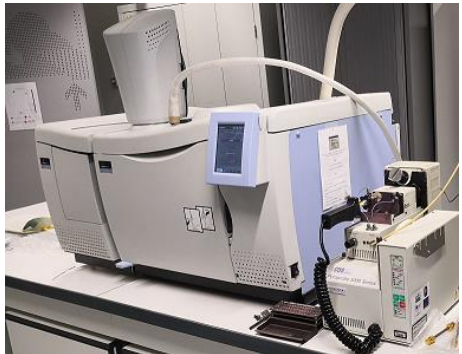
SAMPLING



ANALYSIS

FTIR

Overview image of waste water with μ FTIR Agilent LDIR 8700 system



Pyrolysis GC MS

Project leader : ISSeP A.Joris
Partners : Lasire (ULille)
Own funds



Thanks for your attention

www.issep.be

Contact : a.joris@issep.be

