Assessment of pollution generated by macro-waste from sanitation networks, an experiment within Lyon Metropole

Évaluation de la pollution générée par les macro-déchets des réseaux d'assainissement, une expérience au sein de la Métropole de Lyon

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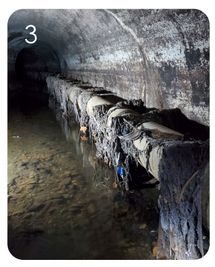
GENERAL ISSUE

A shared observation

Sewer workers *:* "*Phenomenal quantities of debris, especially wipes, sanitary textiles and other waste, which pose technical, health, and safety problems*".



1,2,3 : Waste in a sewerage system

Road workers, cleaning teams, and waste collection associations: "In addition to frequent dumpings along rivers, waste - especially wipes - *is released through sewage systems*".

4,6: Agglomerated waste in the bed of the Ravin stream (dry), Lyon Metropole

5: Cleaning of blockages of waterways caused by vegetation and waste by Brigades Nature

However, the quantities of macro-waste transported through the sewerage systems into streams and rivers are poorly understood.

OBJECTIVES

Establish a diagnosis and adapt the measures to be implemented

To quantify and characterize macro-waste:
1) transported in combined sanitation networks (wastewater and rainwater) during dry weather
2) discharged into rivers through storm overflows during rainy weather

Wild macro-waste is defined here as **waste > 5 mm, of terrestrial origin, resulting from accidental losses or incivilities, transported by the wind, runoff or sanitation networks from where it escapes through storm overflows.**

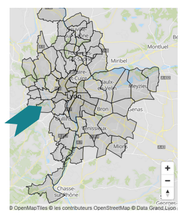
A PARTICIPATORY ACTION RESEARCH

Workshops for the selection of comparable sites (equivalent inhabitants, land use), making and installing nets to capture waste within a unitary network ((1) Taffignon) and in storm outlets of networks equipped with flow and water height sensors ((2) (a) Rillieux-la-Pape and (b) Sathonay-Camp)

6. workshop with sewer workers, road workers, modelers, observers, engineers....

(1) WITHIN THE SEWERAGE SYSTEMS
- During dry weather-

Sector : Taffignon



Yzeron River, Francheville city
Wastewater Treatment Plant: Pierre-Bénite
Watershed: 2,185 ha - 64,861 pop. equiv.
~11 annual discharges (19,467 m3)

Method

- 2 superposed nets (3 x 3 cm² and 1.5 x 1.5 cm² mesh) on a grating
- Height and flow sensors
- 6 tests of 25 min at ≠ times of the day (low usage and peak hours) from 13 to 26/03/24
- OSPAR characterizations

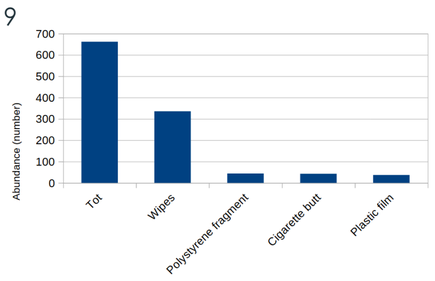
7. depositing the net on the grid

Results

662 waste items collected

8. waste captured in 25 min

Average of 114.8 waste items during peak hours (N=5) compared to 88 during off-peak hours (N=1)

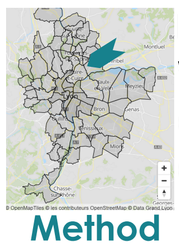


9. Wipes is the major debris. Other waste in "Tot" includes a wide variety of plastic, rubber, metal and cardboard items (fragments, string, sanitary napkins and tampons, packagings, cotton buds...).

336 wipes (50,7%) ➡ 51,3/1000 pop eq./day

(2) DISCHARGED BY STORM OVERFLOWS
- During rainy weather-

Sectors : (a) Rillieux-La-Pape and (b) Sathonay-Camp



Ravin stream, tributary of the Saône river
Wastewater Treatment Plant: Fontaines-sur-Saône
(a) 70 ha - 2350 pop. equiv. ; (b) 357 ha - 24,122 pop. equiv.
(a) 32 annual discharges (28,467 m3) ; (b) 48 (63,671 m3)

Method

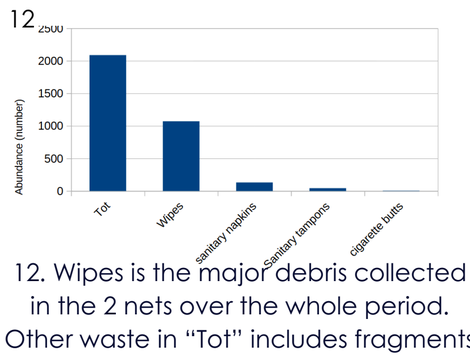
- Outlet nets (2.5 x 2.5 cm - Pollustock)
- Installation 03/28/24 - Emptying #1: 05/03/24, Emptying #2 with removal: 07/05/24
- Characterizations of items by service provider

10. Storm overflow outlet net

Results

2,089 items waste collected

11. Waste captured by a net (b) in 2 months



12. Wipes is the major debris collected in the 2 nets over the whole period. Other waste in "Tot" includes fragments of soft or hard plastic (polystyrene, foam, but also bottles, food and medicine packaging), as well as metal (mainly cans).

13. Water rise during the night rain, with overflow above the net

Part of the waste may have been spilled.

1,071 wipes (51%) ➡ 0,4/1000 pop eq./day
~ 35 wipes / discharge

WHICH PREVENTIVE AND CURATIVE MEASURES?

Sewerage systems drain phenomenal amounts of macro-waste originating from toilets and rainwaters, a significant portion of which ends up in streams during rainy weather. The main waste item, wipe, made of plastic and soaked in chemicals, can cause considerable environmental damage.

Wastewater treatment plants, screens, cleanups and nets can capture some of the macro-waste, but the logistical and health constraints are costly for communities. Awareness-raising actions to avoid flushing down the toilet or into the environment, and support for the use of reusable products, are undoubtedly more sustainable.

Extrapolated to the Lyon metropolitan area (1.4 million inhab.), **> 26 million wipes** could pass through the sewerage systems for a year, and **> 200,000** could reach the environment.

References
Hadley et al. 2023 BioResources
Allison et al., 2025. Water Research
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Pictures: G. Darmon, O. Leblanc, Pollustock