UNESCO-IWRA ONLINE CONFERENCE
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3RD IN THE IWRA ONLINE CONFERENCE SERIES

Emerging Pollutants: Protecting Water Quality for the Health of People and the Environment

Marine pollution linked to wastewater discharges at the Soumbédioune wharf: Prospects for the implementation of a marine swimming water standard in Senegal

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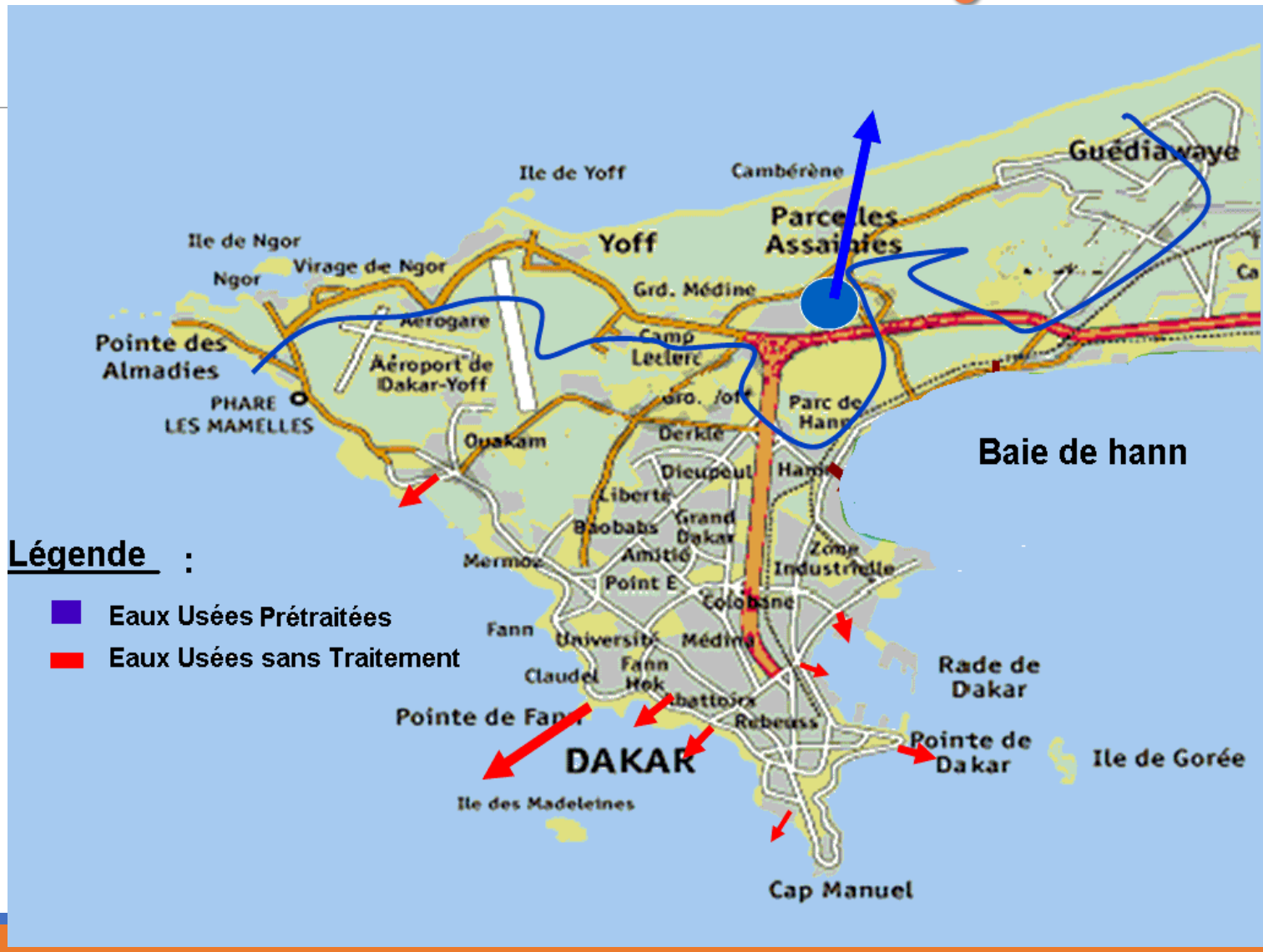
Introduction

- In Dakar most of the wastewater is not treated and is discharged directly into the sea.
- This leads to a deterioration in the quality of marine waters, which poses health risks for swimmers and beach users.
- This study, which addresses this issue, aims to contribute to the establishment of national standards for swimming water quality.



Introduction

- **Objectives of the study**

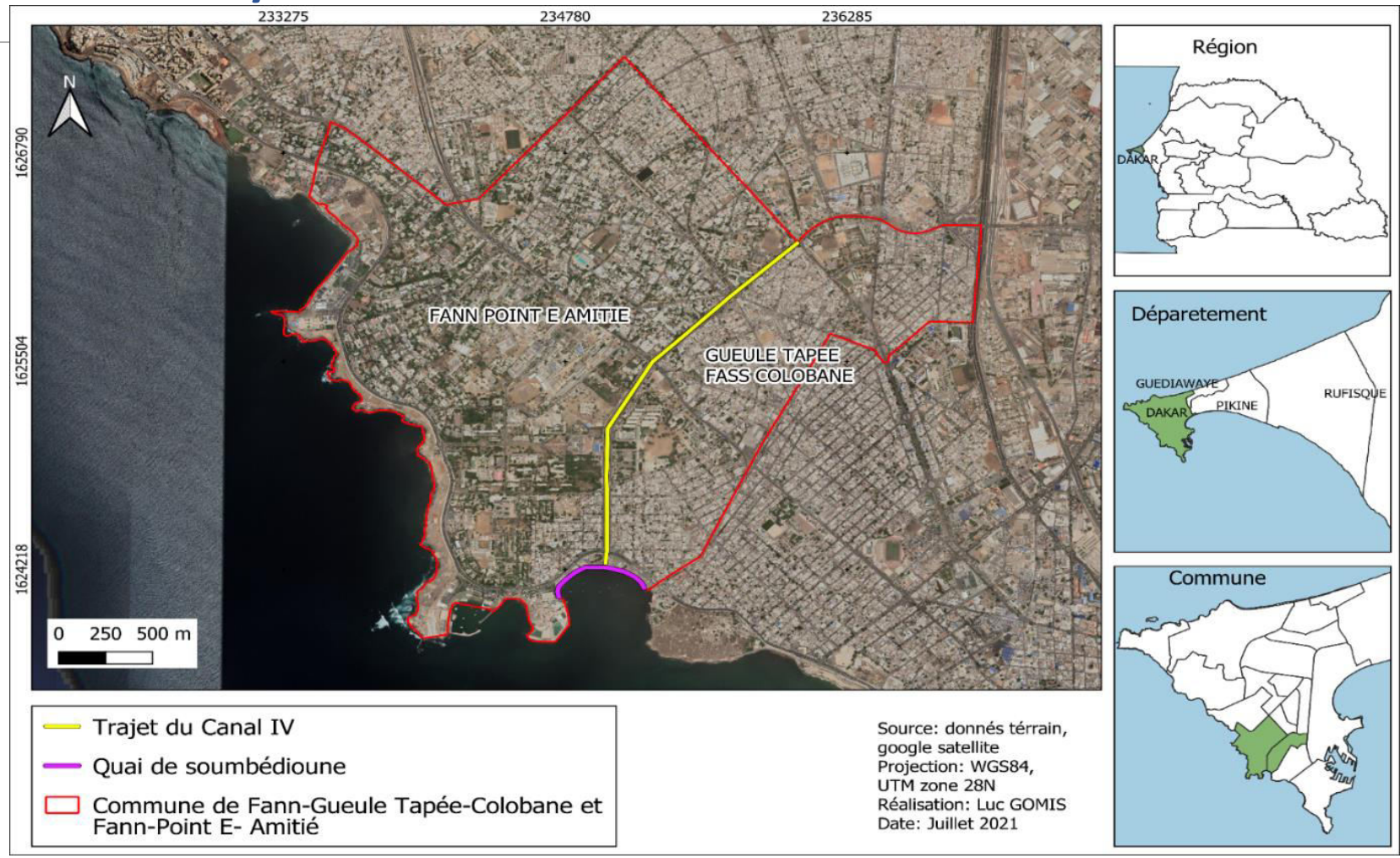
The general objective is to evaluate the marine pollution related to the liquid effluent discharges from the stormwater drainage canals.

- **Research hypothesis**
- The hypothesis that we want to verify is that the canal water pollutes the marine water at the wharf and makes it dangerous for swimming.
- **Key issues addressed are:**
  - The origins of the pollution in the stormwater drainage channels
  - The quality of the water in the stormwater drainage channels
  - The impact of stormwater drainage in marine water quality

Methodology

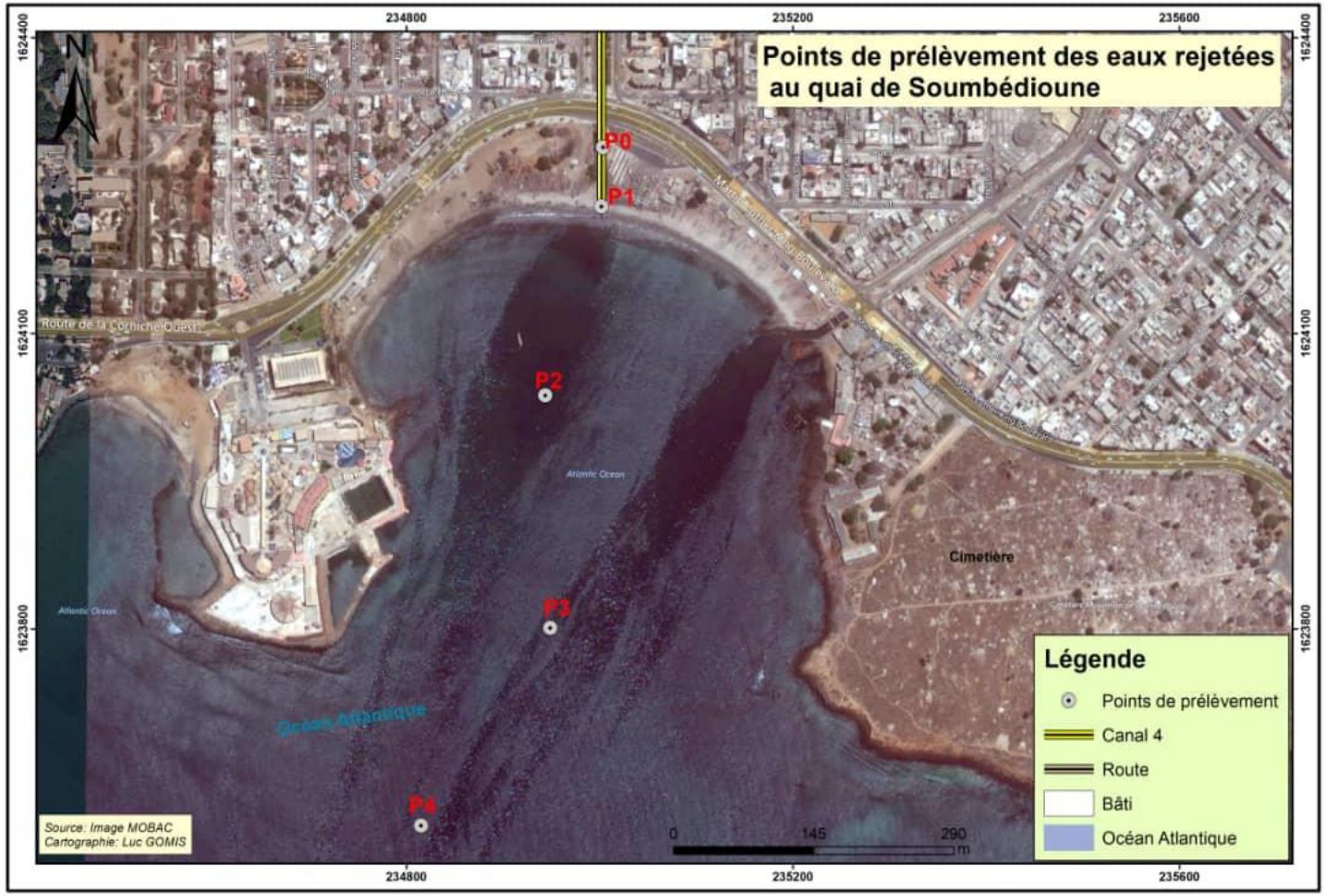
Presentation of the study area

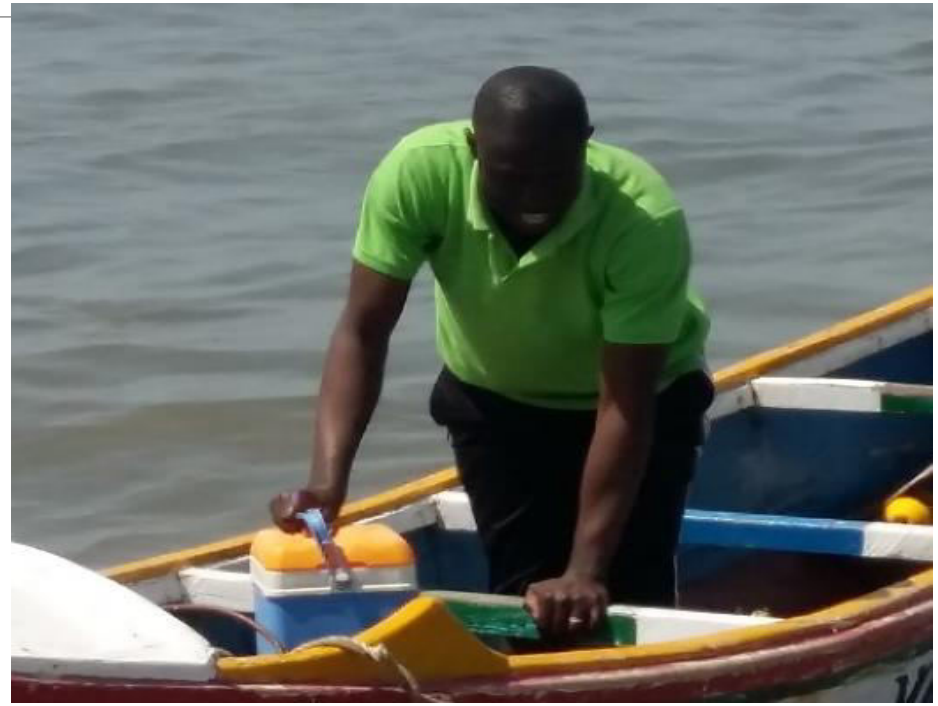
- Built in 1952, Canal IV was intended, on the one hand, to drain rainwater from watersheds going from Sicap Liberté to Soumbédioune via Grand Dakar; and on the other hand, from Sacré Coeur to Fass via Sicap, Amitié, Point E.
- The canal has two independent sections upstream which are Canal IV upstream and Canal IV upstream bis which make a junction at the level of HLM Fass Paillote to form Canal IV downstream



Methodology

Sampling points





- P0 : outlet ; P1 : contact zone ;
- P2 : 250 m from the edge ;
- P3 : 500 m from the edge ;
- P4 750 m from the edge.

Methodology

Determination of pollutant parameters studied

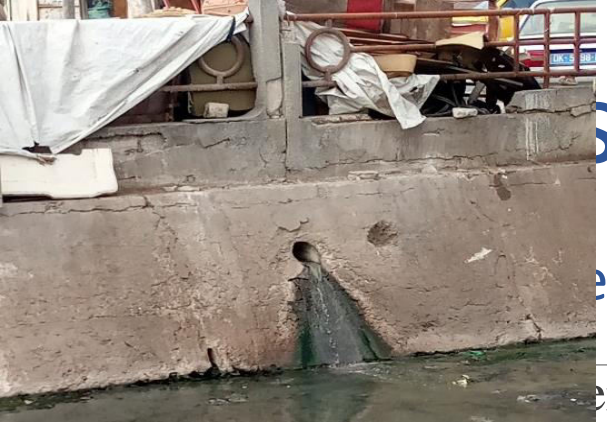
- Salinity, pH, electrical conductivity, and temperature are measured directly using a HANNA brand multi-parameter pH meter.
- TS, TSS, COD, and BOD5 are analyzed in triplicate through conventional methods according to the procedures indicated in the Standard Methods for the Examination of Water and Wastewater (Eaton et al., 2005).
- Fecal coliforms were enumerated on agar culture medium according to NF ISO 4832.

Results and discussions

Quality of the canal water in comparison with the Senegalese standard NS 05 061 for discharge into the natural environment (NE) or into a WWTP

Parameters	pH	ORP	T	Salinity	TSS	TS	BOD5	COD	FC
Units	-	mS/cm	°C	mg/L	mg/L	g/L	mg/L	mg/L	n/100 mL
	7.8	1537	22.8	0.6	552	1 076	309.28	1 267	$34*10^3$
NS 05061-NE	6.5-9.5	-	< 30	_	< 50	-	< 50/80	< 200	< 2.000
NS 05061-WWTP	6-9	-	< 30	_	≤ 600	-	≤ 800	≤ 2.000	-

- The water from Canal IV does not meet the conditions for discharge into the natural environment
- The high concentration of faecal coliforms in Canal IV water shows that it is contaminated by domestic wastewater
- Indeed, according to Krepsky et al. (2021), fecal coliform concentrations of the order of 10^5 are evidence of contamination by untreated domestic wastewater



s and discussions

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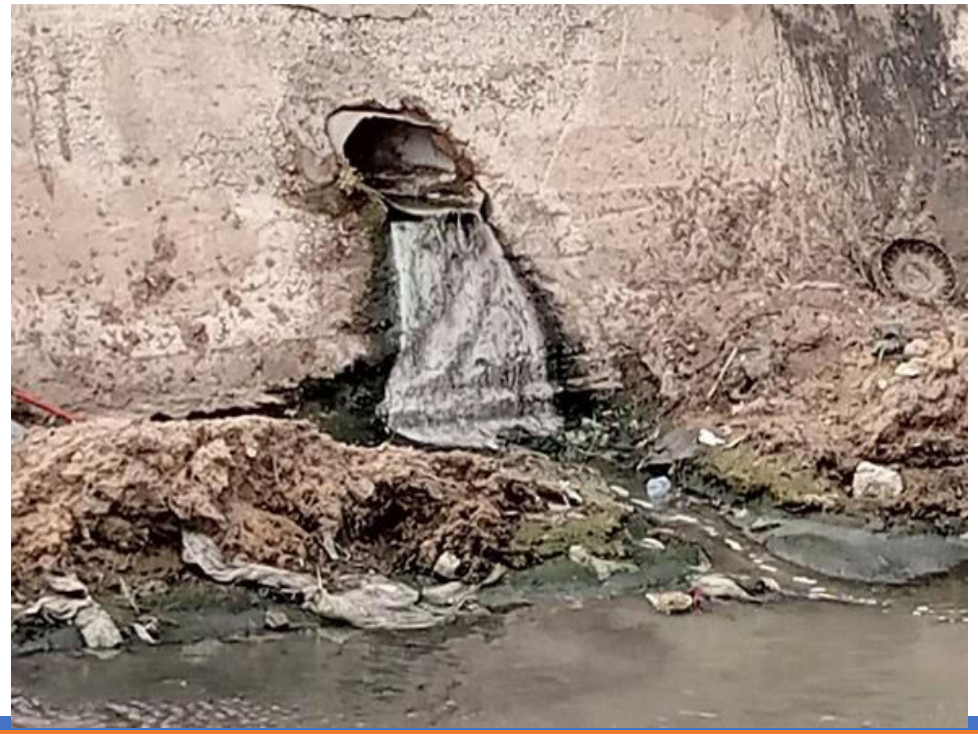
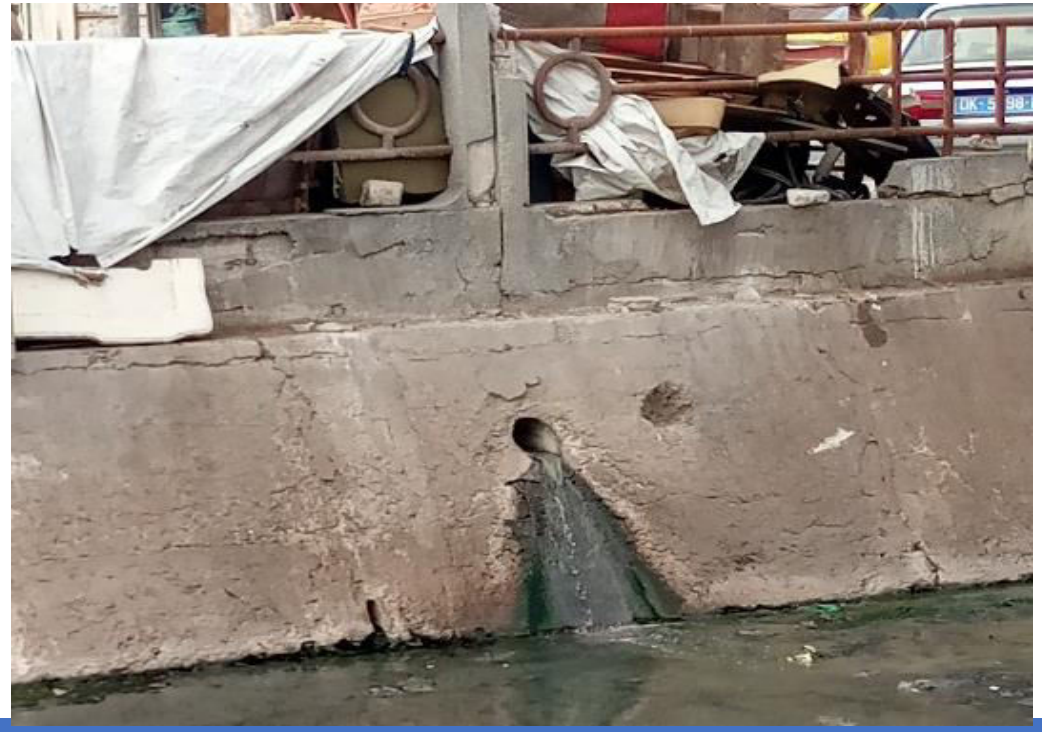
e of domestic wastewater into canal IV

er is discharged via clandestine connections, and opportunistic discharges

- **Result**: permanent presence of liquid discharges in the Canal IV designed for the evacuation of stormwater only.





Results and discussions

Sea water quality at the wharf compared to the new European bathing water standard 2006/7/EC

Parameters	pH	ORP	T	Salinity	TSS	TS	BOD5	COD	FC
Units	-	mS/cm	°C	mg/L	mg/L	g/L	mg/L	mg/L	n/100 mL
P1	7.7	27.6	21.3	16.9	366	18 684	103.1	320	$11.3*10^3$
P2	7.3	52.3	19.3	34.1	94.8	37.38	24	640	324
P3	6.7	52.7	20.2	34.5	33.6	37.90	8	160	32
P4	6.3	52.8	20.1	34.5	32	39.92	0	420	14
2006/7/CE	-	-	-	-	-	-	-	-	200-400

- Up to 500 m from the shore, the marine waters are not suitable for swimming at the quay
- Because according to Wu et al. (2011) the presence of fecal contamination indicators is often correlated with that of pathogenic organisms.
- Swimming is only possible from 500 m (from P3)

Results and discussions

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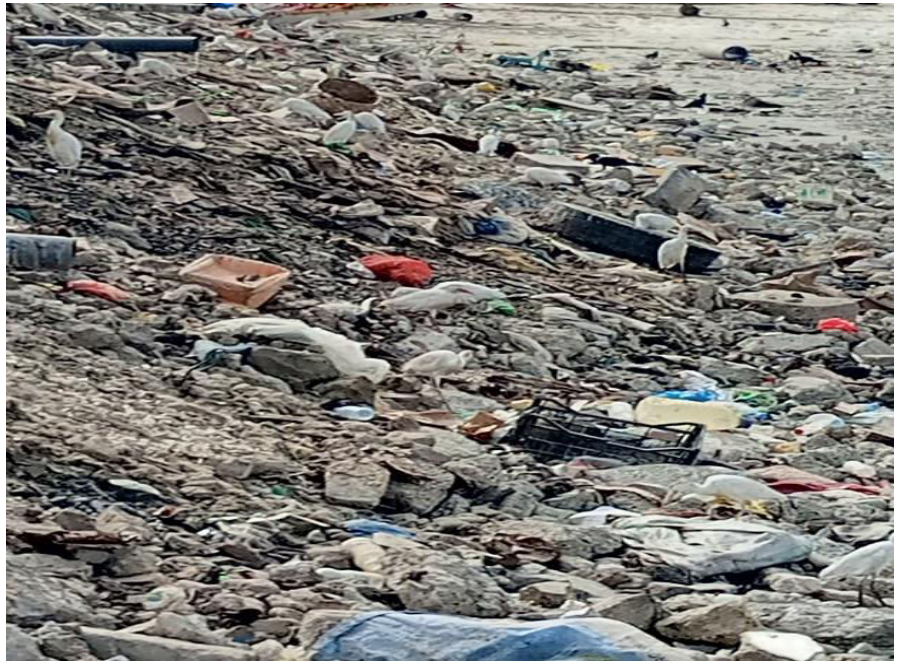
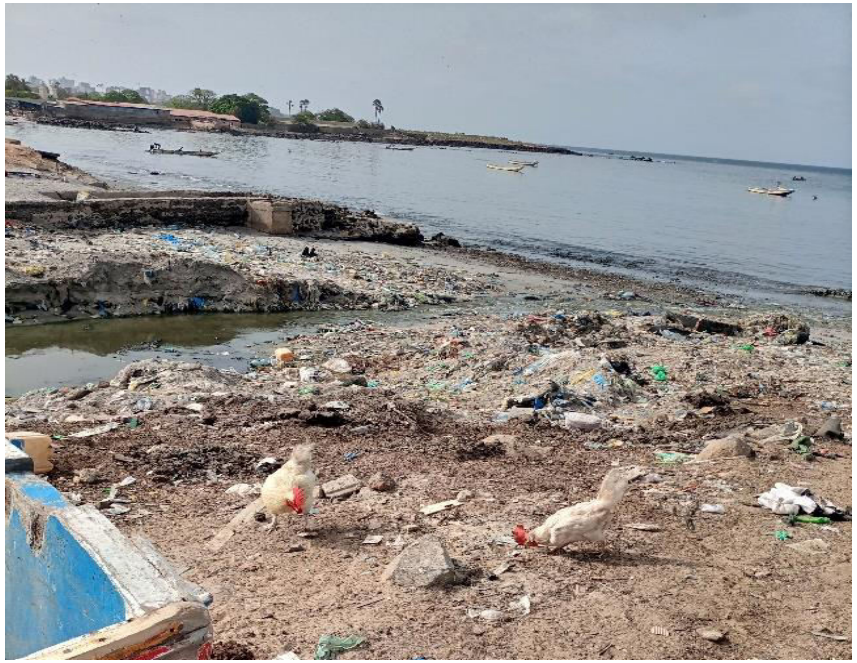
Visual/aesthetic pollution by solid waste





- In addition to sewage, Canal IV drains a lot of solid waste.
- The mismanagement of solid waste also leads to high levels of plastic waste pollution (Lestari and Trihadiningrum, 2019)
- The discharge of waste into the canal can lead, beyond the environmental and health consequences, to aesthetic degradation.
- Aesthetic issues play a large role in people's perception of recreational water spaces (Oldridge, 1992).

Conclusion

- Wastewater from Canal IV has a high concentration of fecal coliforms, which shows contamination by domestic wastewater.
- Canal IV evacuates a lot of solid waste and create high pollution of marine waters making swimming impossible up to 500 m from the shore.
- Canal IV is responsible for the aesthetic degradation incompatible with the various activities carried out at the level of the warf of Soumbédioune.
- Poor swimming water quality highlights the need for a standard in Senegal
- Within this framework, a number of parameters seem essential to monitor:
  - Fecal coliforms, which are correlated with health risks
  - Microplastics resulting from the degradation of coarse plastic that can be incorporated into the food chain
  - Heavy metals as everything is discharged into the sewer system, even batteries for which there is no safe collection and disposal strategy