An integrated health perspective on the Social-Ecological System of the Butroe River Transition and Plentzia Bay

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The case study brings together diverse natural, social, and economic dynamics, making it an ideal **real-world setting for testing integrated health approaches**.

The objective is to understand the **Health in this Social-Ecological System**, identifying critical yet unexplored pressures and assess their contribution to the **risk of coastal pathogen** infections in the Bay of Plentzia and surroundings.

This characterisation aims to establish a reference point to guide monitoring strategies and support adaptation efforts within the **One Health Living Lab**.

Methodology

The characterisation of the area combines different sources of information:

- **Literature review** including secondary information from grey literature given the limited peer-reviewed journal articles.
- **Geospatial analysis** using GIS databases from government institutions.
- **Primary information** from interviews with stakeholders and fuzzy cognitive maps exercise.
- **Environmental survey** from the marine station PiE-UPV/EHU.

Biophysical context

Our case study is influenced by the **Cantabrian Sea** and the **Butroe River** (45 km).

In a region characterized by rocky cliffs, the Bay is home to one of the largest and most sheltered **sandy beaches**. Other characteristic aquatic ecosystems include the **estuary** and the Txipio **marsh**.

Water quality monitoring in 2023:

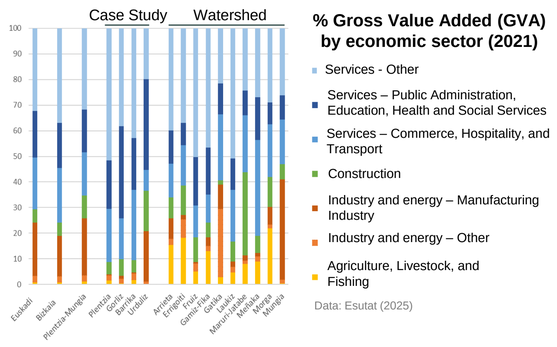
	Ecological	Chemical	Hydromorphological
River	Deficient	Good	Deficient
Estuary	Good	Good	Moderate



Aerial view of Plentzia Bay with the Gorliz Hospital

Upstream activities

The Butroe river catchment area (**172,2 km²**) features a mosaic of **urban** and **agropastoral land uses**, interspersed with patches of **natural cover**.



Low-lying areas are dominated by **meadows and grasslands** for grazing or forage (reflected in high agricultural GVA%).

Pine and eucalyptus **plantations** cover high elevations, occupying 40% of the catchment.

Industrial activity is concentrated in Mungia and Gatika, with a high industrial GVA%.

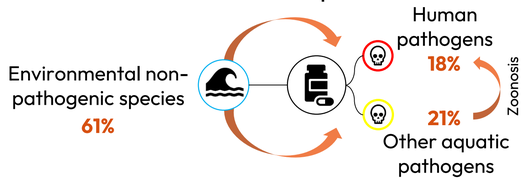
Coastal pathogens

In 2023, faecal contamination (***E. coli*** and **enterococci**) increased due to wastewater overflows from heavy rainfall, leading to **11 swimming bans** mostly after summer storms.

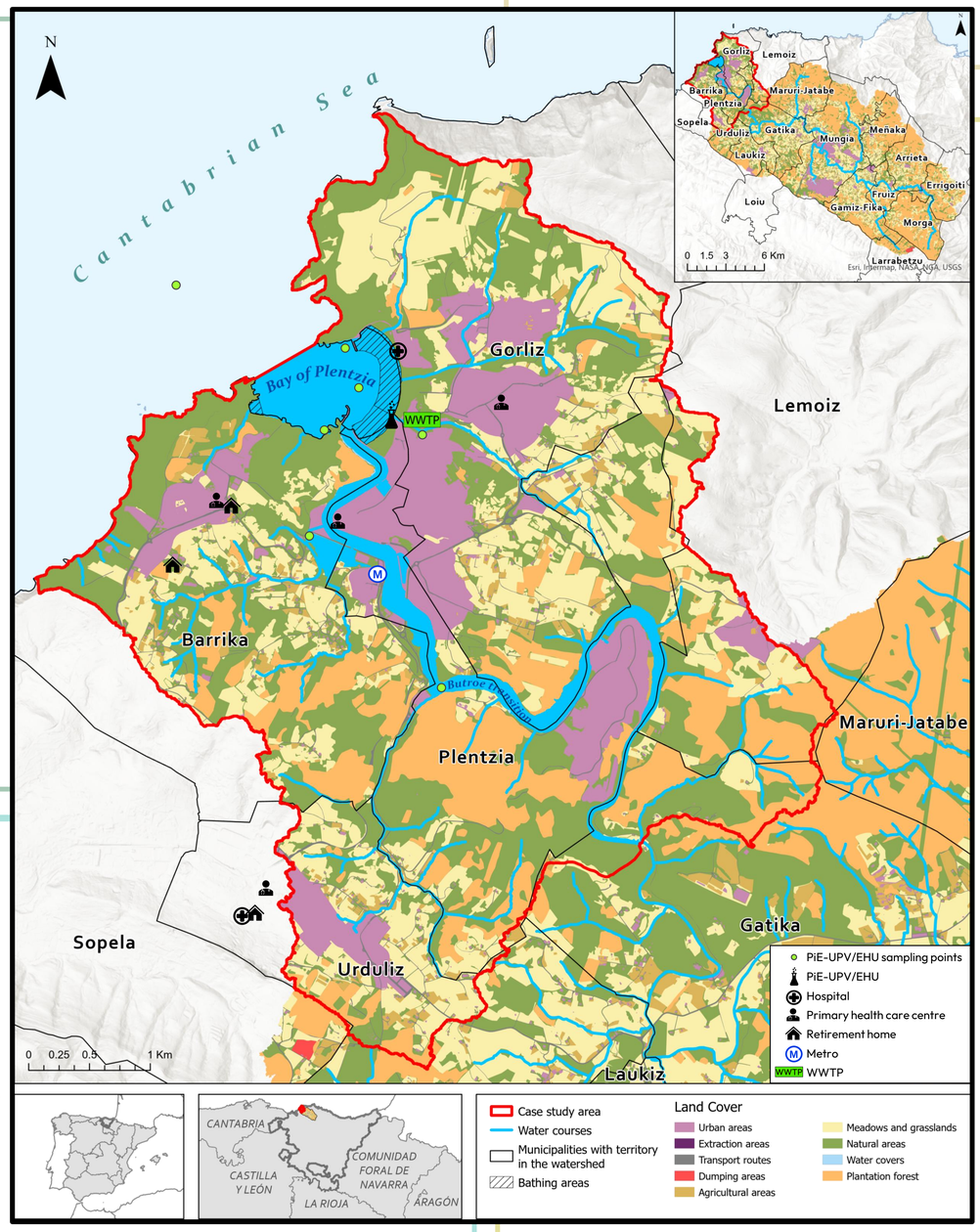


2023 → 2024

39% of sampled species in the Bay were **potentially pathogenic**, posing a risk if antibiotic resistance develops.

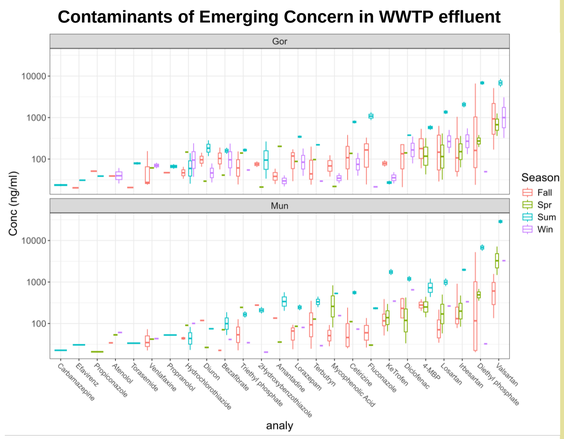


Climate change and pollution may create conditions that favour the arrival of **exotic pathogenic *Vibrio* species**, posing a potential health risk in the area. Continued monitoring is essential.

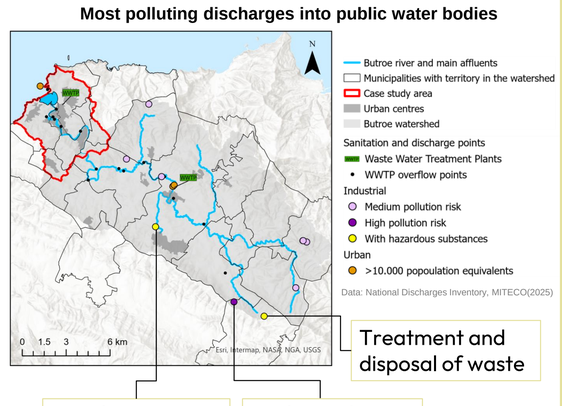


Pollution

The main pollution sources include the **discharges of the WWTP of Gorliz and Mungia**, sewer overflows, the Plentzia marina and secondary streams.

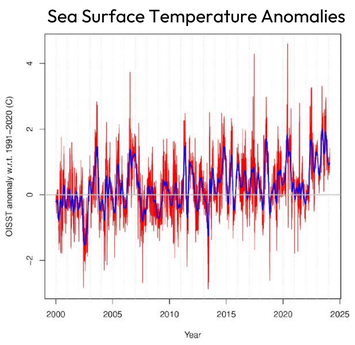


127 registered discharge points, most small-scale and from urban origin.

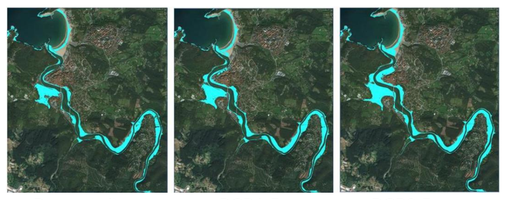


One industrial discharge in Gamiz-Fika poses high pollution risk, and one in Mungia and one in Larrabetzu can have hazardous substances associated.

Climate change



Meteorological data shows a particular **increase in sea surface temperature anomalies in the last 2-3 years.**



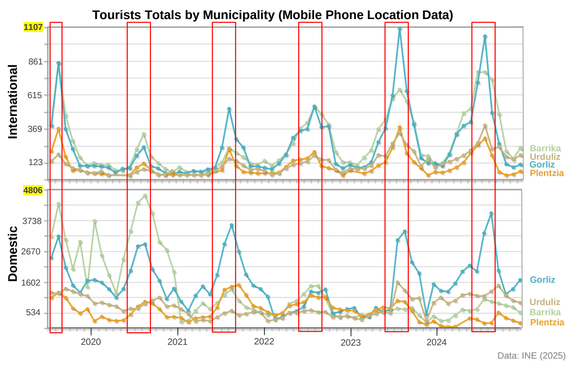
Extreme flood events (T=50 yr) under climate change scenarios may impact local infrastructure.

Social context

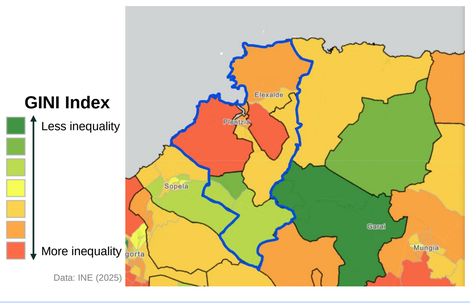
The area is a popular summer destination for the regional population, making tourism a key driver of the local economy.

Gorliz attracts the highest number of visitors, **mainly domestic tourists**.

Tourism shows a strong seasonal trend, peaking during the summer months.



The area is **socio-economically advantaged** compared to other Basque regions, but some areas in Barrika and Gorliz show high **income inequality**, according to the GINI coefficient. Urduliz, on the other hand, has a relatively equal income distribution.



Host health status

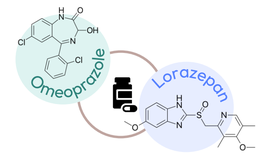


Rehabilitation and Palliative Care Gorliz Hospital

Around the area: 2 hospitals
4 primary health care centres
3 retirement homes

Local health practitioners describe the population as **aging**, **polypathological** and **plurimedicated**.

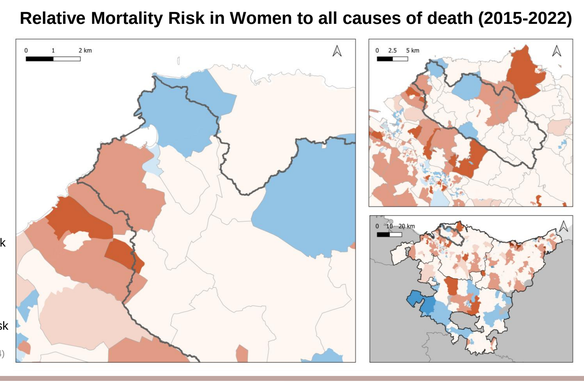
Proton pump inhibitors and anxiolytics are among the most consumed pharmaceuticals.



In 2014 **long-term risky alcohol consumption** and **female smoking rates** were higher than the Basque Country average.

Women show **higher mortality risk** in **Urduliz** (from respiratory diseases, dementia, and lung cancer) and in **Barrika** (from ischaemic heart disease) in respect to the regional average.

In contrast, male mortality in the area is consistently lower and closer to the regional average.



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