

Urbanization and environmental pressures in the Yzeron watershed: Does policies match with environment status?

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Introduction

Since the 1950s–60s, the expansion of the Lyon metropolitan area has driven rapid and heterogeneous suburban sprawl in the Yzeron watershed (148 km²), increasing exposure to environmental and hydrological risks. This urban growth has intensified pressures on stream mobility zones and pollutant emissions, within an evolving regulatory context.

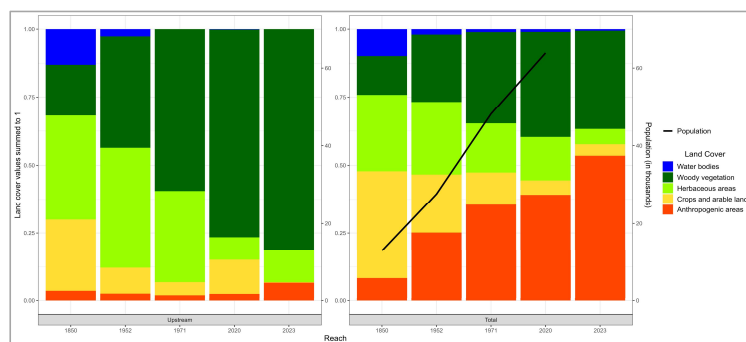
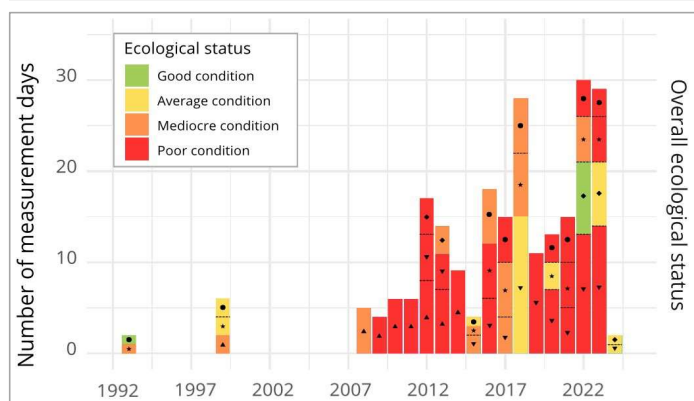
Research Question

How have land-use changes in the Yzeron watershed influenced the environmental and hydrological vulnerability of the area, and how does local and supra-local legislation attempt to mitigate these risks in a watershed facing increasing anthropogenic and climatic pressures?

Land cover changes in Q100 flood exposed area

Land use changes (1825–2023) were assessed across the floodplain and watershed using historical maps, 20th-century orthophotos, Corine Land Cover, and CoSIA 2020 data.

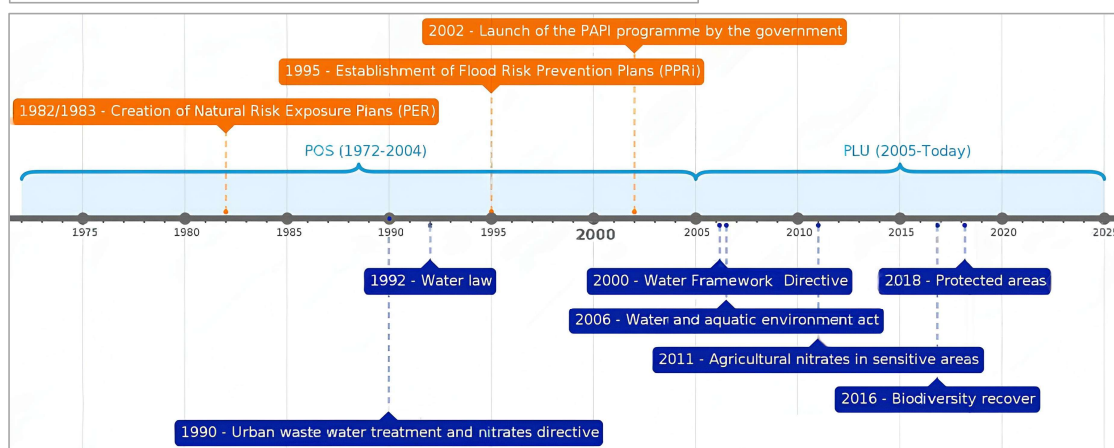
- **Strong urbanization** occurred downstream between the 1950s and 1970s, then stabilized, while expanding into the midstream reach, but not reaching upstream zones.
- **Population increased by 40,000** in the southern part between 1990 and 2018
- **Agricultural land was progressively replaced** by peri-urban residential areas: 60,8% urbanized downstream vs. 25,3% midstream in 1970.
- Recent rise in pervious surfaces reflects efforts to mitigate impermeabilization impacts.



Water quality – Key findings (1993–2024)

Physico-chemical and ecological analyses at five peri-urban monitoring stations have focused on identifying/assessing pollutants from agriculture, industry, and urban sources using SEQ thresholds.

- **Good ecological status was achieved only twice in 31 years.**
- **Assessment results are variable**, reflecting disparities between degradation indicators.
- **Pollution trends have evolved**: from herbicides and organic matter to heavy metals (copper, zinc), to PFOS in recent years
- **Monitoring efforts have increased** in frequency, scope, and station coverage.
- **Physicochemical indicators show strong variability**, while hydrobiological and pollutant indices remain consistently poor despite regulations and restoration actions.



Flood management – Events and policy responses (since 1970)

- **1989**: First major flood event recorded, but without significant damage.
- **1993**: First flood causing major damage.
- **2003**: Most severe flood, both in peak discharge and impact.
- **Before 1989**: Flood impacts primarily affected agricultural areas, according to some urban planning documents.

Regulatory response and management shifts

- (1) Hazard events** (e.g., floods) triggered **local regulatory responses**, such as river contracts that limit new urbanization in risk zones—though existing developments remain unchanged.
- (2) Regulatory focus shifted from water quality only to more integrated watershed-scale policies**, including:
 - Pollutant control,
 - Riparian zone protection,
 - Enhanced monitoring and governance via basin contracts.
- (3) Management approach evolved**:
 - From point-source to diffuse pollution reduction,
 - From infrastructure sanitation responses to ecosystem restoration.

Conclusion – Key findings

- **Urbanization influences risk perception and hazard awareness**, increasing residents' vulnerability.
- **Rapid and ongoing urban expansion** in the Yzeron catchment is likely linked to physico-chemical, ecological, and hydrobiological alterations.
- These impacts are **exacerbated by irregular monitoring** of water quality and ecological parameters.

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