

WP5 Task 5.3

Bathing water quality and tourism

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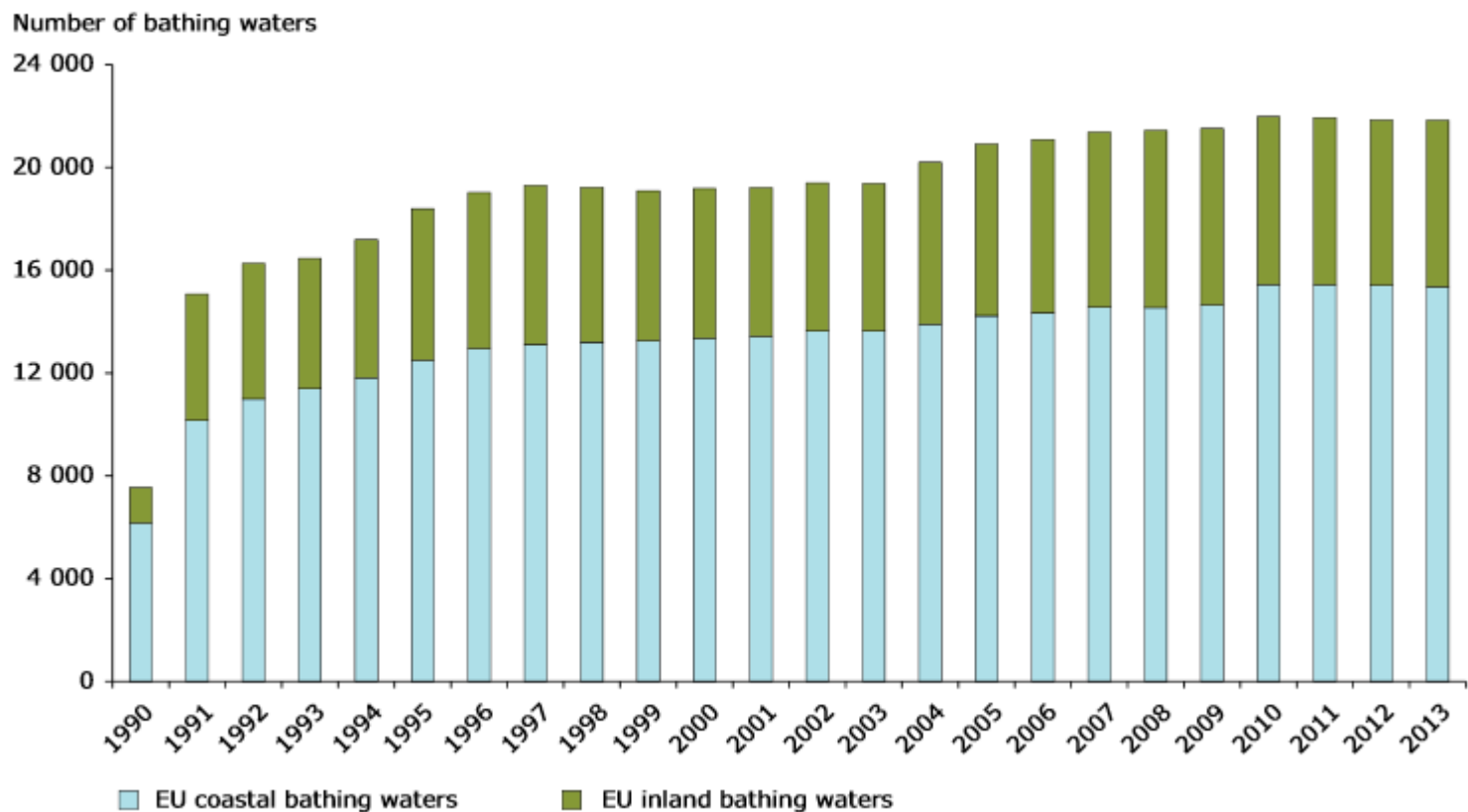


**A Systems Approach Framework
for Coastal Research and Management
in the Baltic**



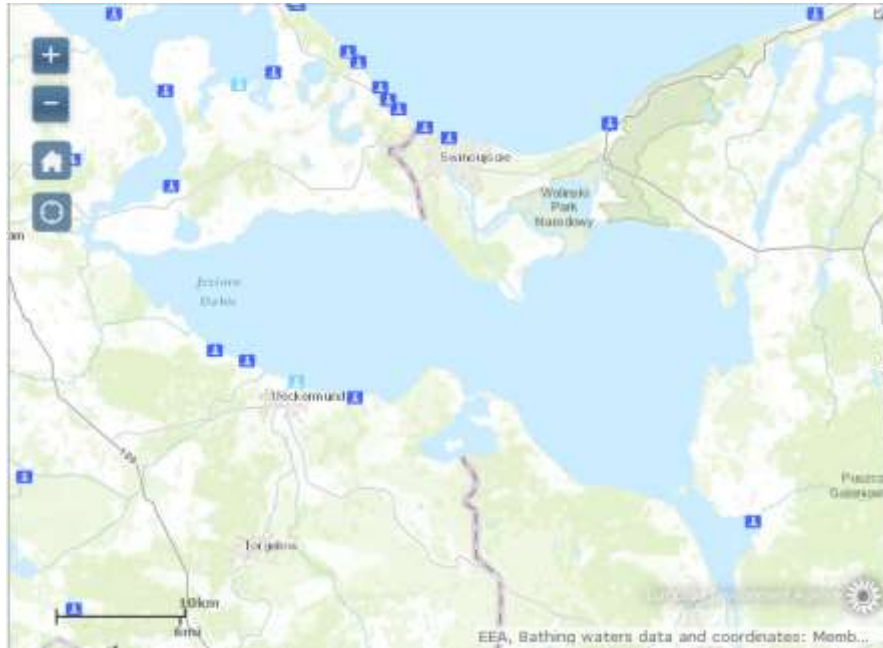
Bathing waters in EU

Figure 2.1 Total number of bathing waters reported in the European Union since 1990





Increasing tourism



Oder lagoon



Curonian lagoon

In the past, especially in Baltic inner coastal waters, several beaches had to be closed because of insufficient bathing water quality. Today, increasing tourism causes a strong demand to reopen these beaches again and to establish additional beaches, especially in large lagoons, like the Curonian lagoon and on the Lithuanian coast.



Regulation

- Bathing water Directive (2006)

For coastal waters and transitional waters

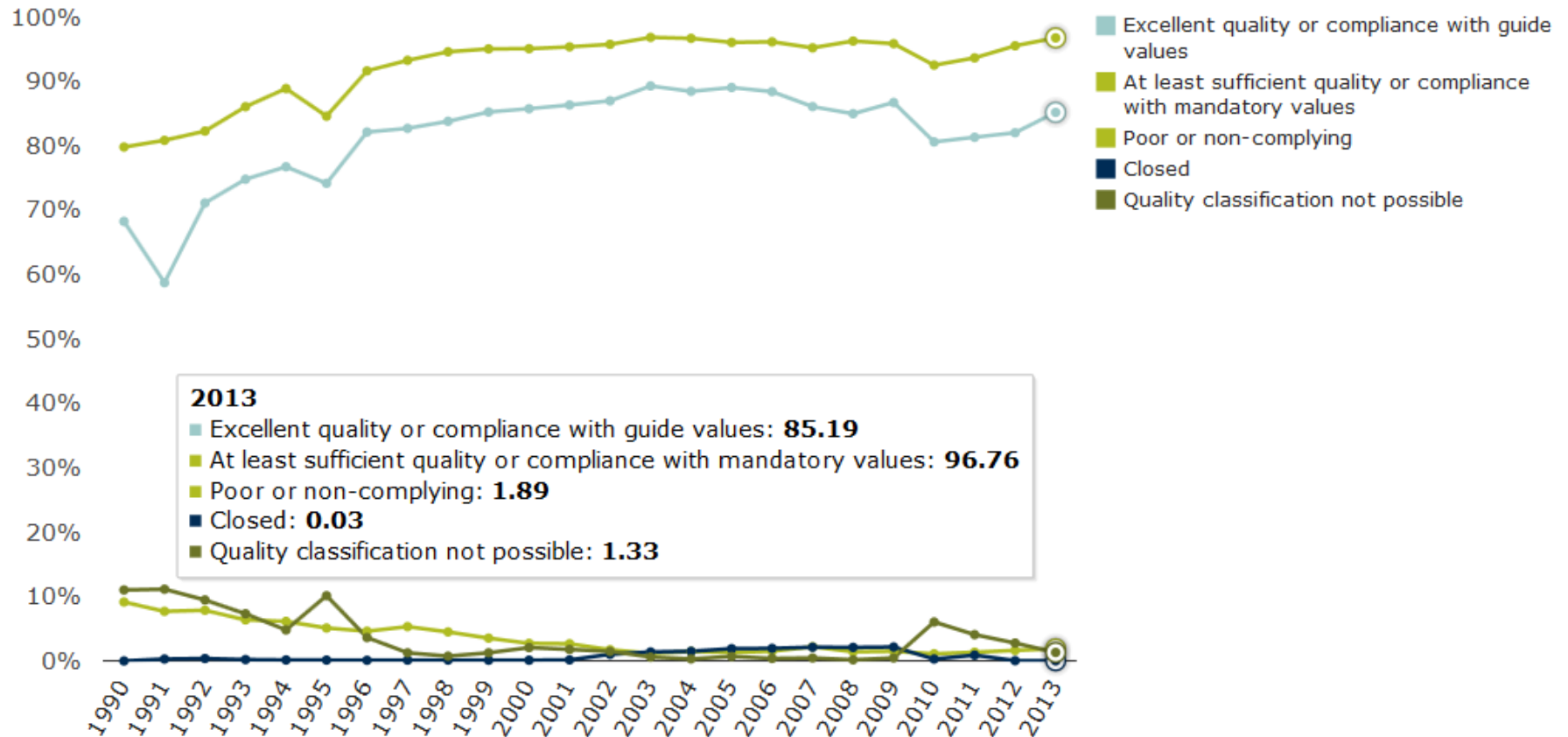
	A
	Parameter
1	Intestinal enterococci (cfu/100 ml)
2	Escherichia coli (cfu/100 ml)

- Water Framework Directive - bathing waters are one of the Protected Areas



Coastal bathing waters in EU

Chart — Percentage of coastal bathing waters in the European Union per compliance category



Kuršių marių ties Kintais maudyklos vanduo neatitiko higienos normų

Sveikatos mokymo ir ligų prevencijos centras, įvertinęs gautus rugpjūčio mėnesio antros pusės maudyklų vandens kokybės tyrimų rezultatus, informuoja, kad Kuršių marių ties Kintais maudykloje vandens kokybė neatitiko Lietuvos higienos normos reikalavimų, todėl maudytis joje nėra saugu.



In august 2013 the amount of fecal coliform (*E. coli*) exceed 1.9 times the allowed threshold



State of bathing waters

Bathing water quality by location

Bathing water quality

- Excellent water quality or Compliant with the guide values (CG)
- Good water quality
- Sufficient water quality or Compliant with the mandatory values but not guide values (CI)
- Poor water quality or Not compliant with the mandatory values (NC)
- Closed or Banned (B)
- Quality classification not possible: new bathing waters/ bathing waters with changes/ not enough samples



Pollution sources

- from point sources – municipal sewage wastes; wastewater treatment outfalls, discharge from large-animal feeding operations.
- From nonpoint sources – agriculture runoff, sanitary sewer overflows, leaky sewers, failing septic systems, storm sewer drainage, domesticated animals (on this side – none) and wildlife fecal materials
- *E. coli* surveillance outside its natural habitat is observed from **30 to 120 days**;
- *E. coli* can grow in secondary habitats: soil, sediments, aquatic vegetation





BaltCoast task

In close cooperation with municipalities and authorities to develop scenarios for opening new beaches and assess the pollution risk of exiting beaches considering effects of *climate change* (pollution due to extreme runoff), *harbour development* and improved *sewage treatment*.



Thresholds, sources and sinks

- Threshold evaluation

For coastal waters and transitional waters

	A	B	C	D
	Parameter	Excellent quality	Good quality	Sufficient
1	Intestinal enterococci (cfu/100 ml)	100 ⁽³⁾	200 ⁽³⁾	185 ⁽⁴⁾
2	Escherichia coli (cfu/100 ml)	250 ⁽³⁾	500 ⁽³⁾	500 ⁽⁴⁾

- What are the sources and sinks?



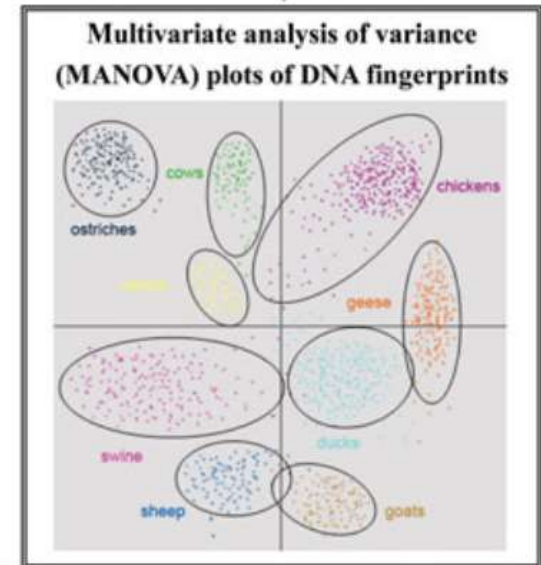
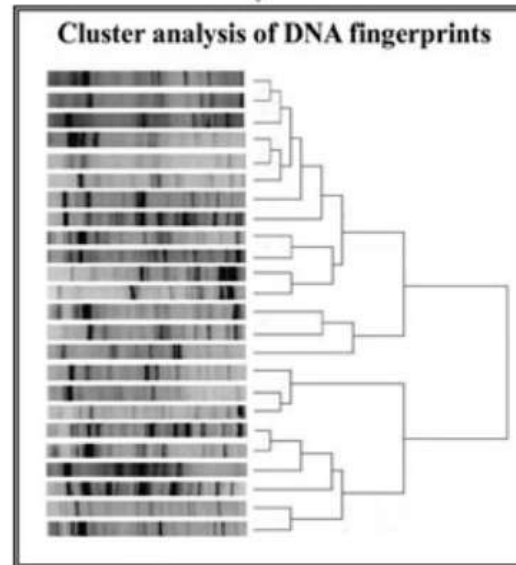
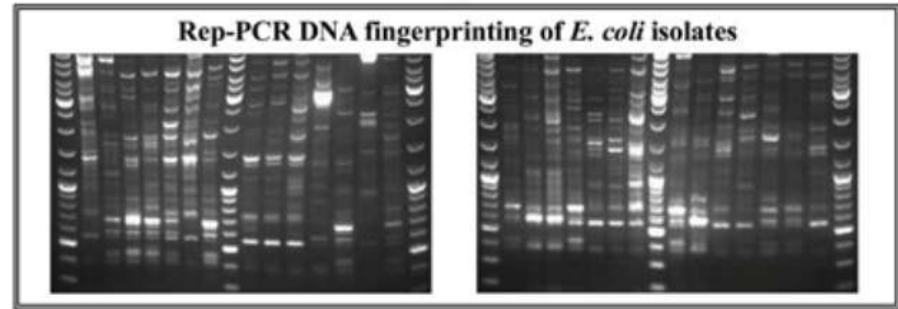
Methodology

- Traditional monitoring methods
- Strain - specific genetic fingerprint methods (e.g. ERIC, REP, BOX)
- 3D-hydrodynamic transport models



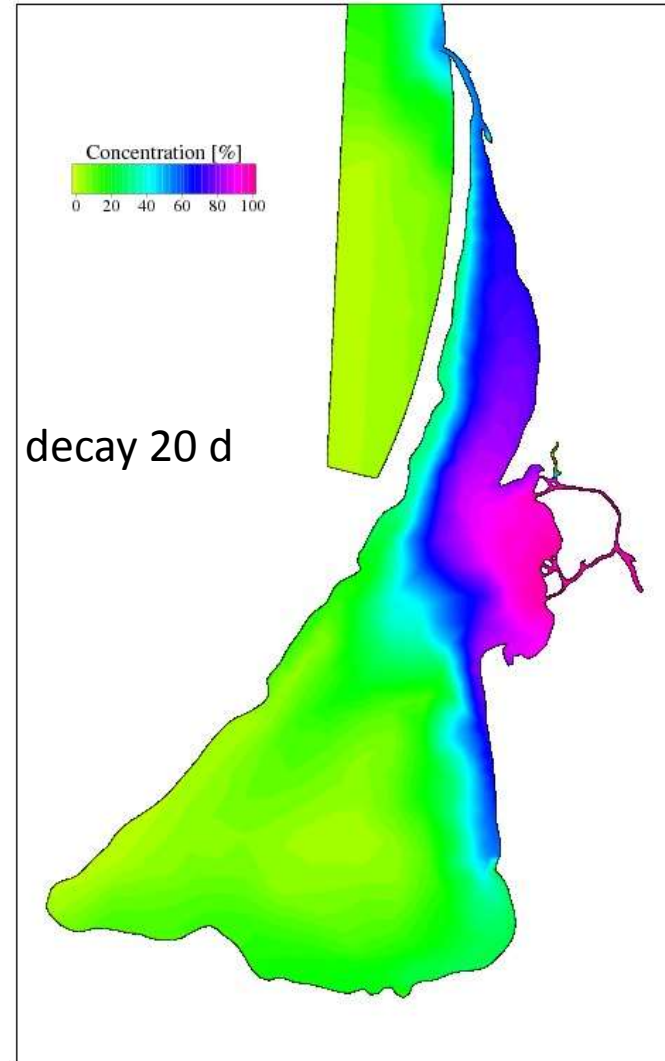
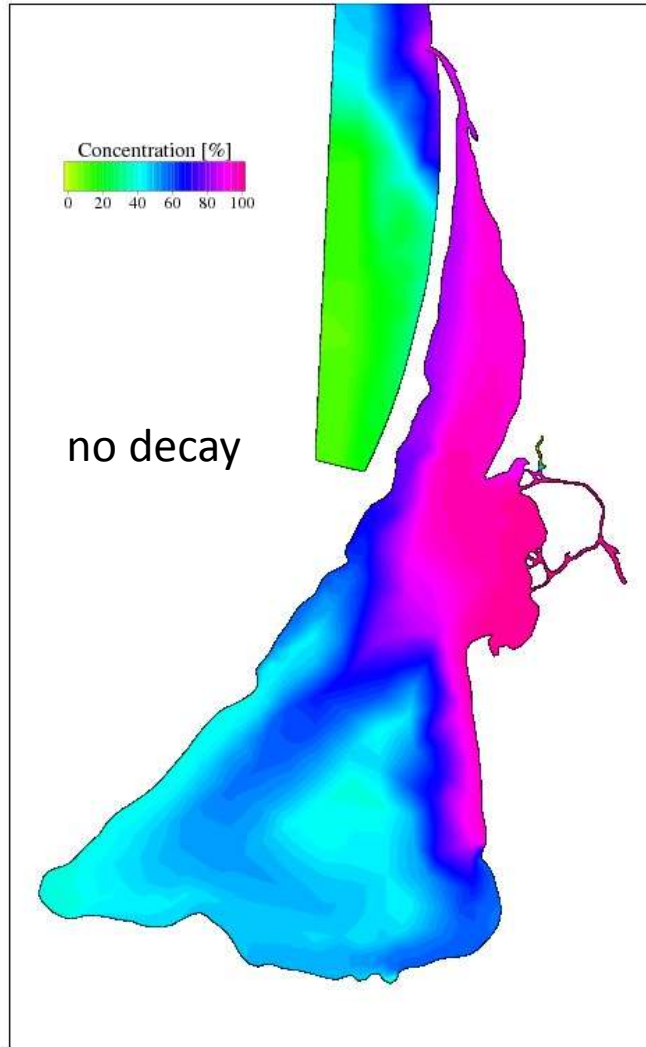
Fingerprinting method

- That phenotypic and genotypic traits of specific strains are associated with a specific animal/human source
- Fingerprinting allows to indicate different strains



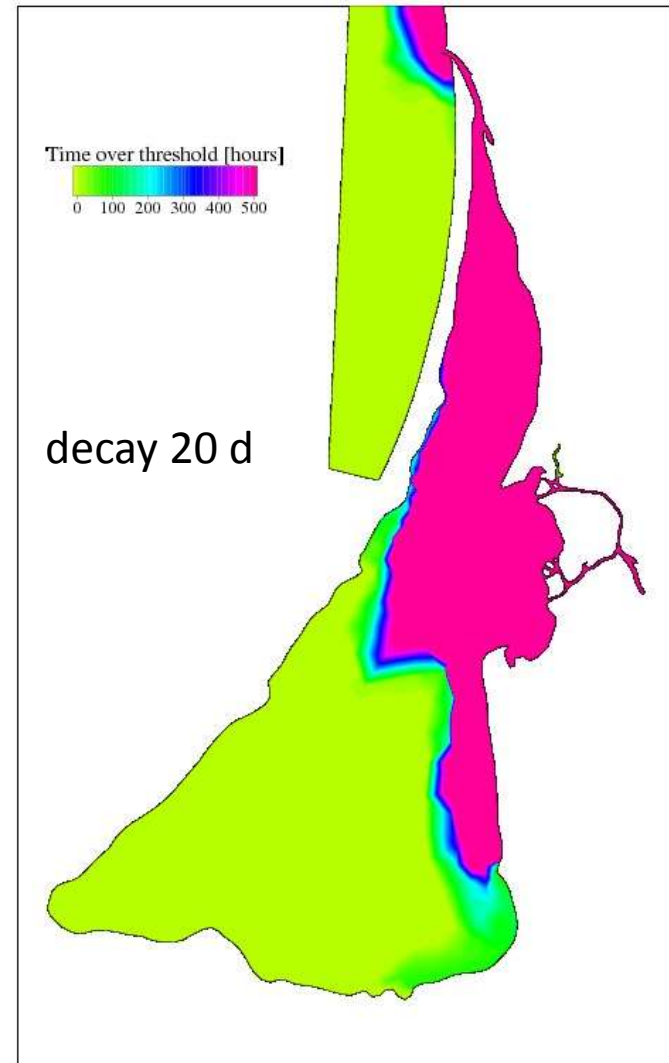
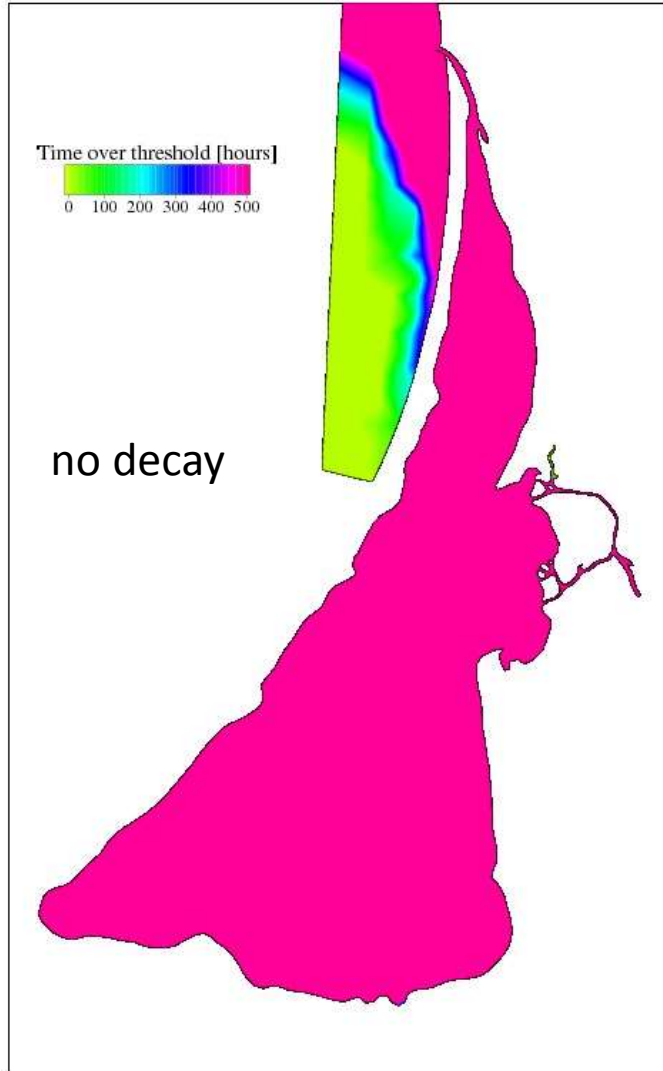


Modeling maximum concentration



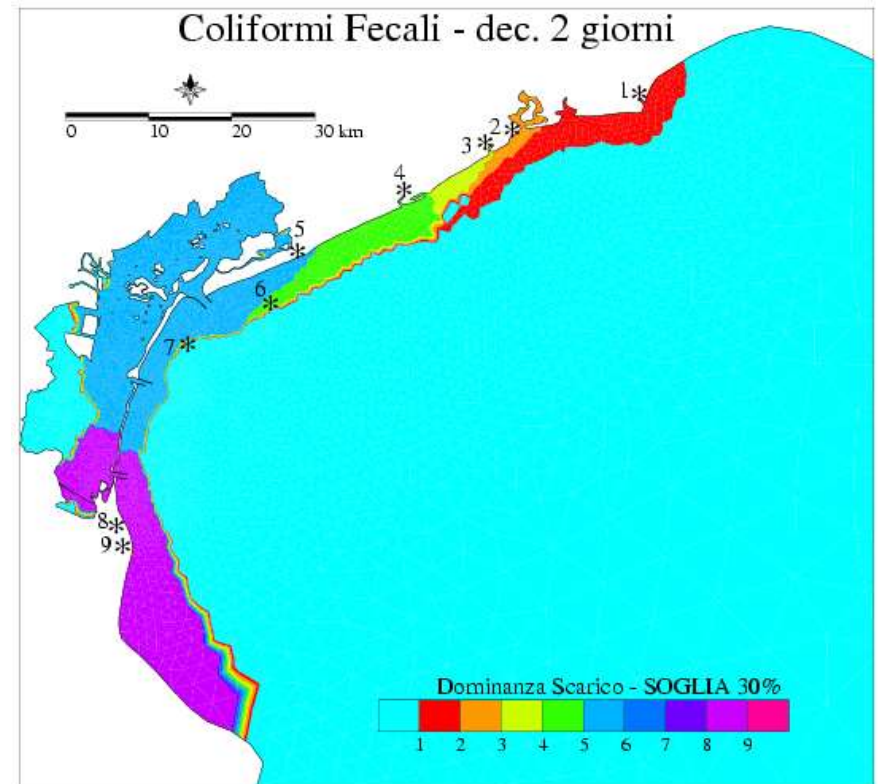
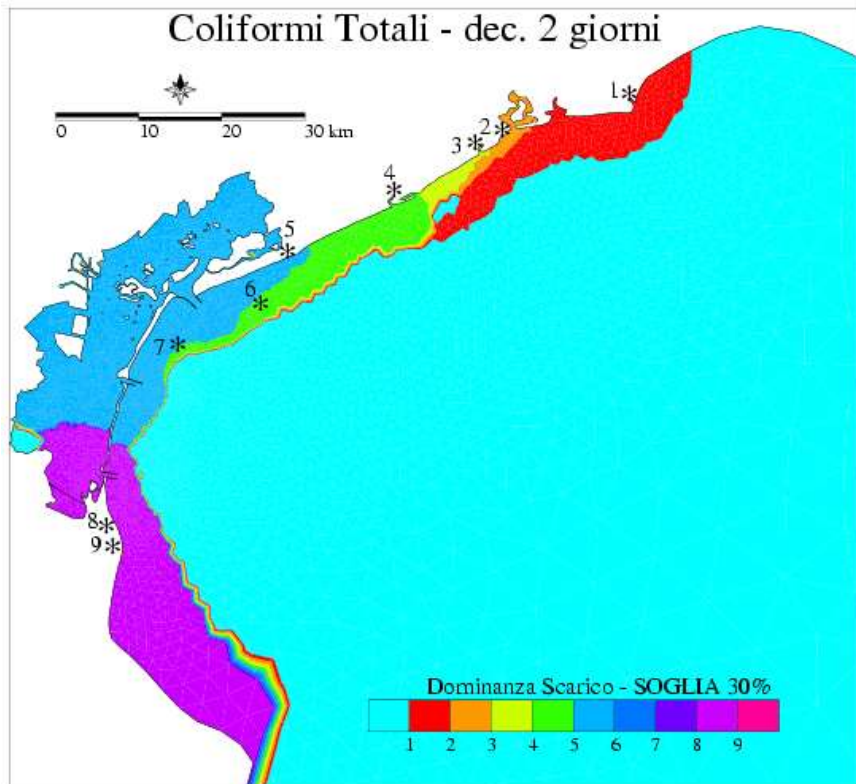


Modeling hours over threshold





Modeling area of influence





Examples: Eulerian and Lagrangian simulations

- [Eulerian simulation, 20 days decay](#)
- [Lagrangian simulation, no decay](#)