

The Systems Approach Framework (SAF) applied to the coastal zone of Barcelona

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Issue:

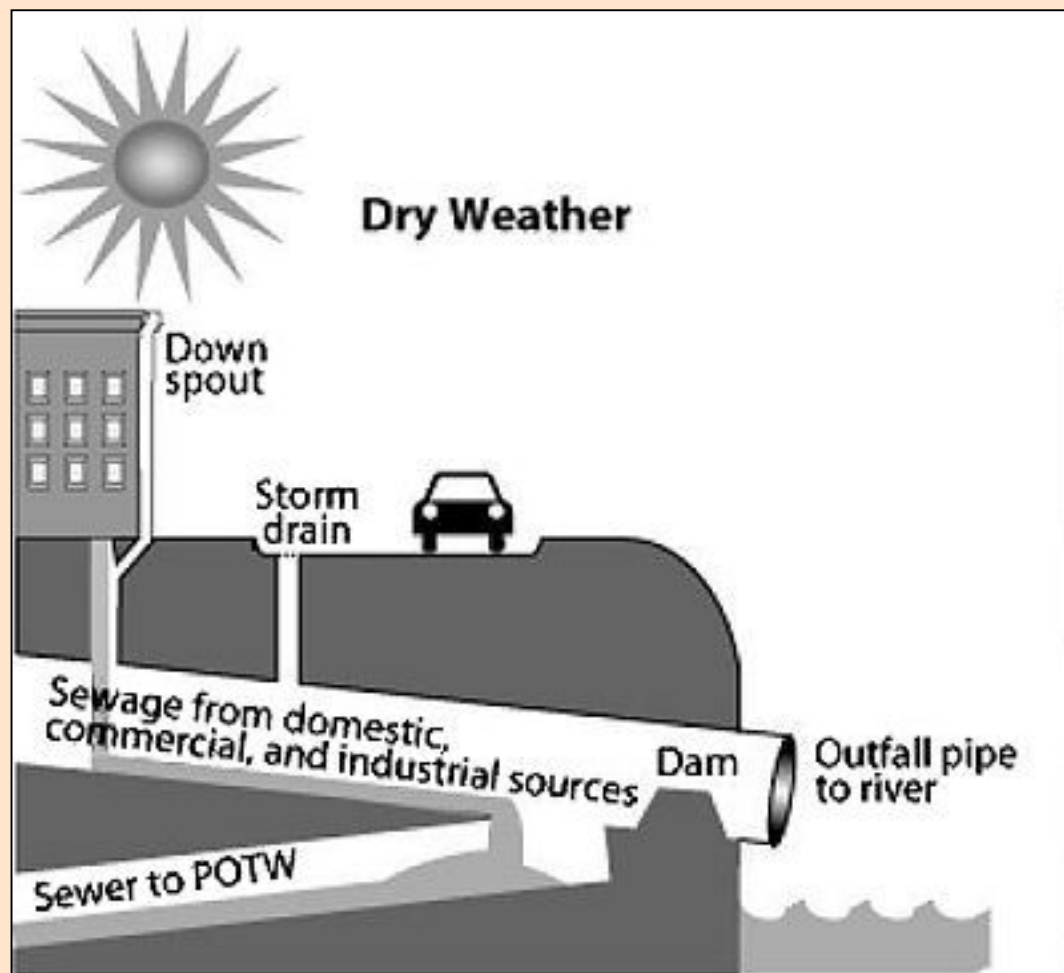
The effect of changes in water quality on the aesthetic and recreational aspects of the Barcelona beaches

Water quality:

water clarity
bacteria (fecal coliform)

Inputs:

combined sewer overflow (storm runoff)
river Besòs
wave resuspension



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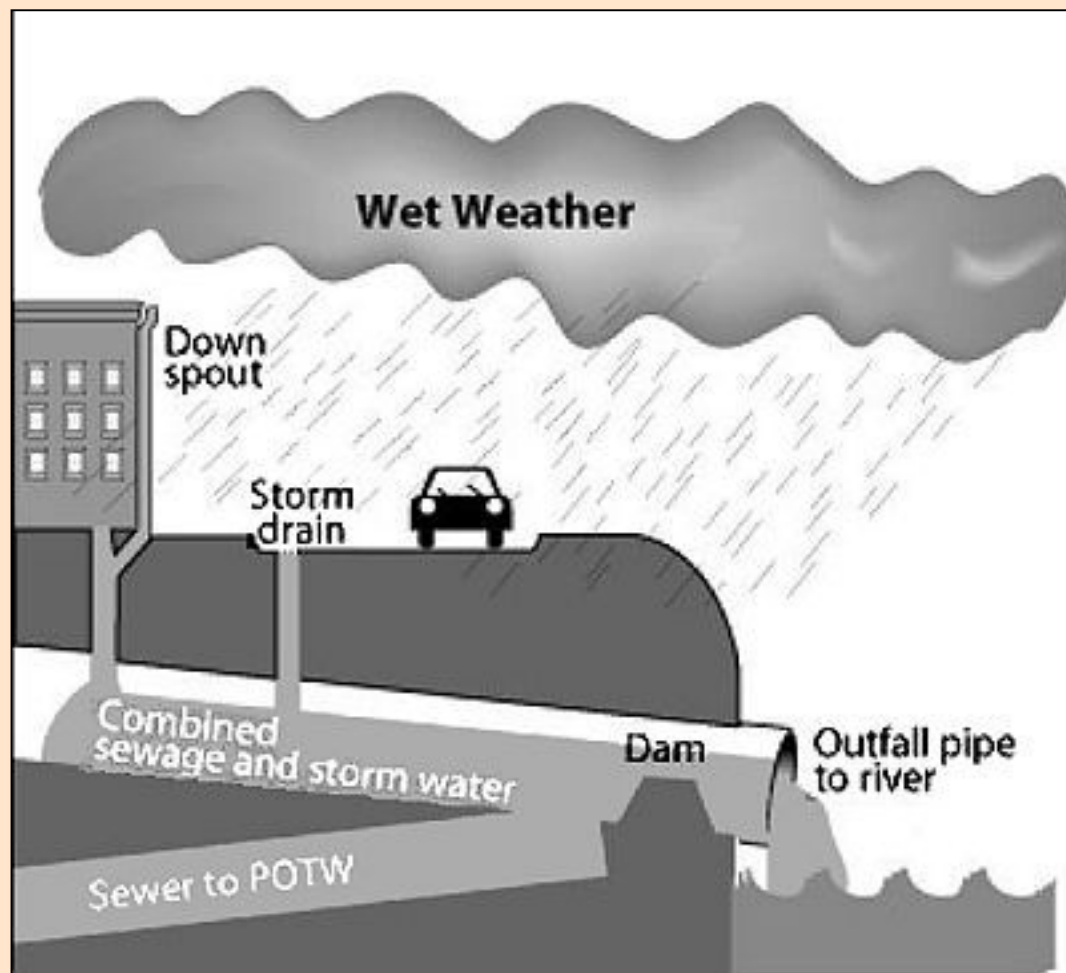
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Multiple zones



Changes to model since System Formulation

Why change?

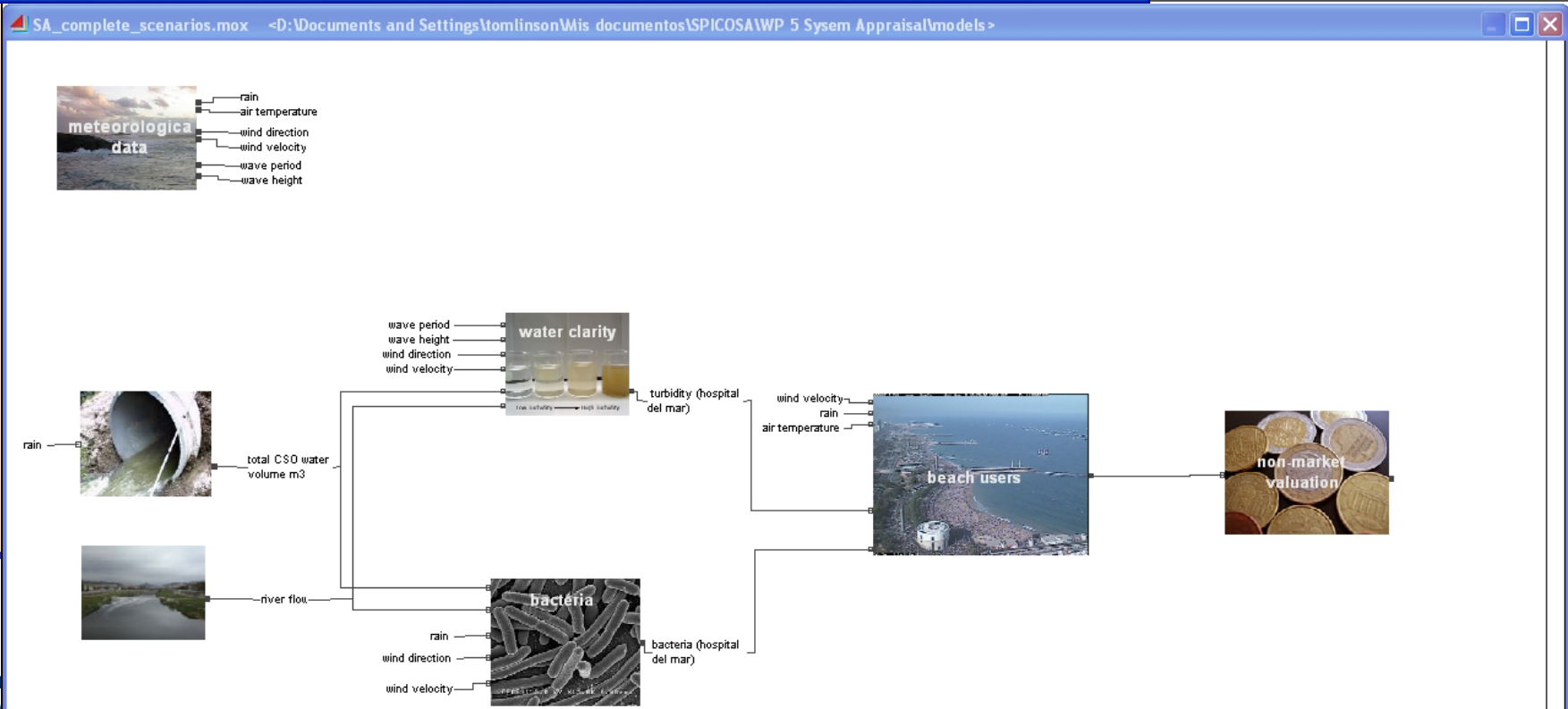
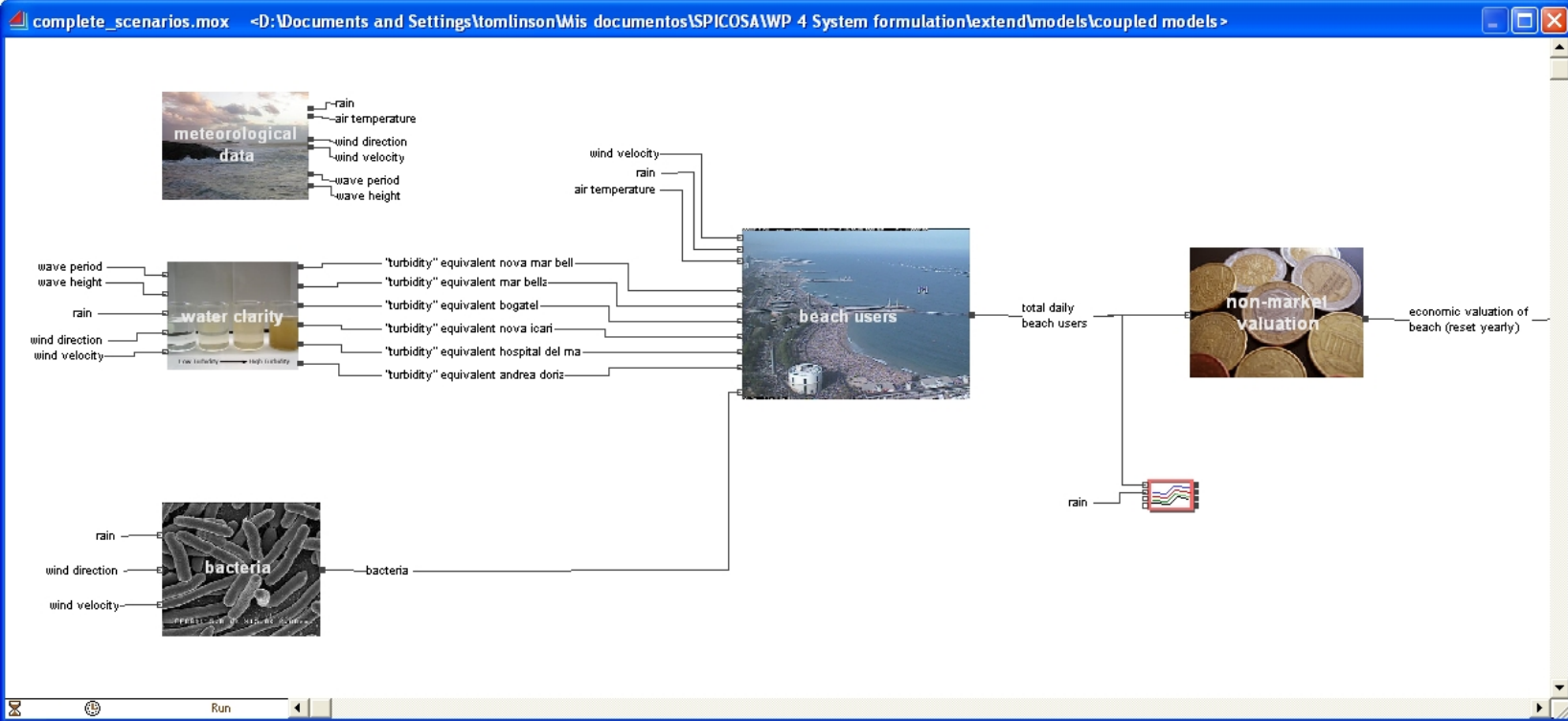
Input from stakeholders

Advice from SSA team and *Spicosians*

What?

Re-structure model

- clearer input of CSO and river as main drivers
- removed “excess” links between sub-models
(using “catch” and “throw” blocks)
- removed some variables from database to improve model speed



Changes to model since System Formulation

Why change?

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What?

Re-structured visual display of model

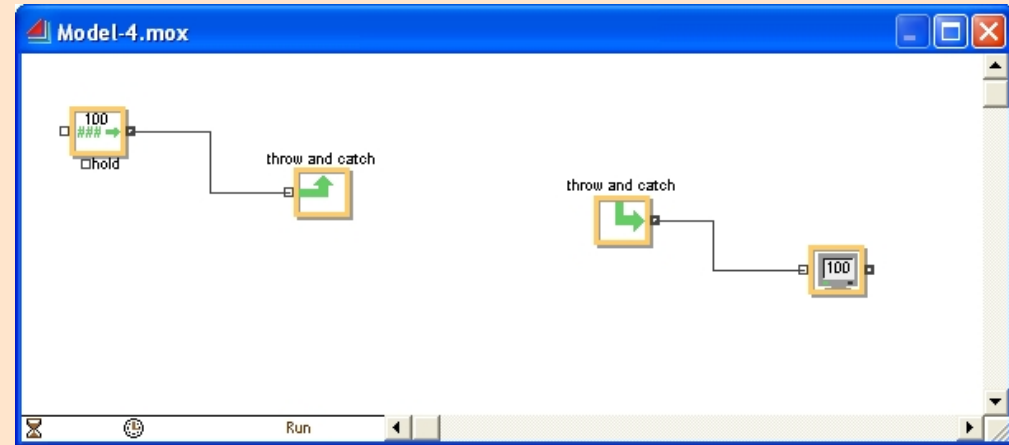
- clearer input of CSO and river as main drivers
- removed “excess” lines between sub-models (using “catch” and “throw” blocks)
- removed some variables from database in order to improve model speed

Re-built water clarity and bacteria sub models to include

- River and uwwt only affect beaches depending on wind direction/velocity
- Onshore wind converges bacteria and suspended matter (increased concentration)

Optimised water clarity sub-model against observed quantitative data (for one beach) and optimised the other beaches against qualitative data

Re-built beach users sub model so that carrying capacity dependent on visitor per m² is included



Example Scenarios

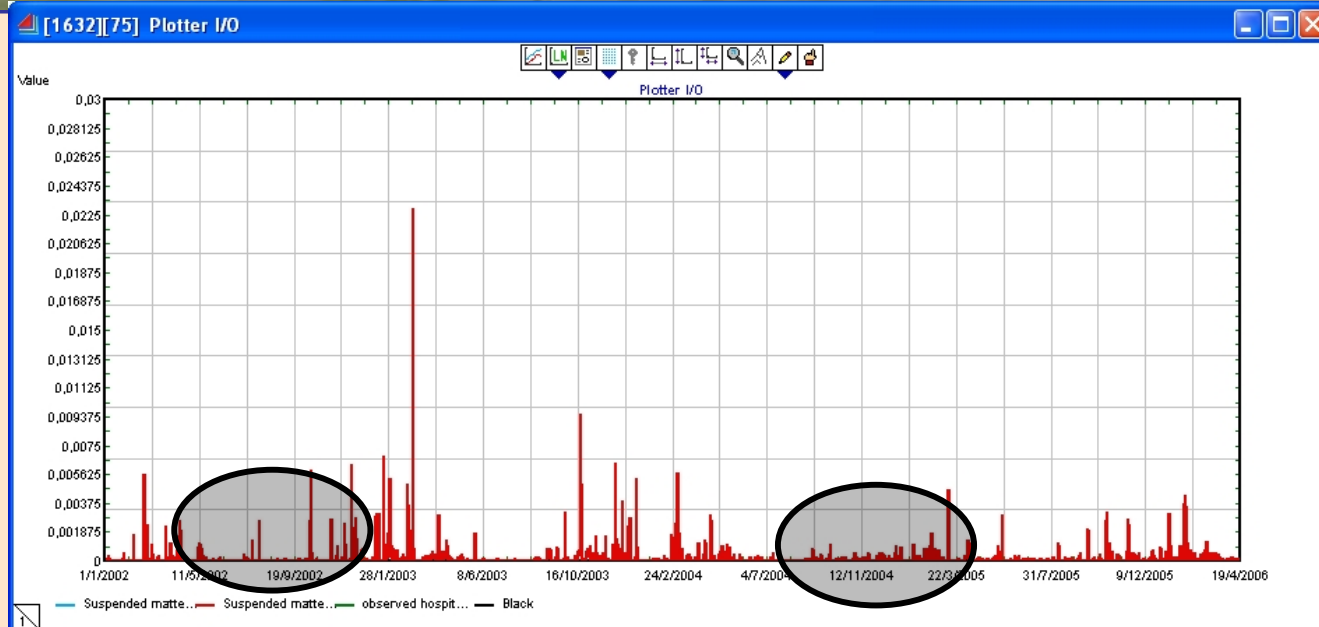
Increase capacity of storm water collectors on:

1) Water clarity

Actual:

50% CSO released directly

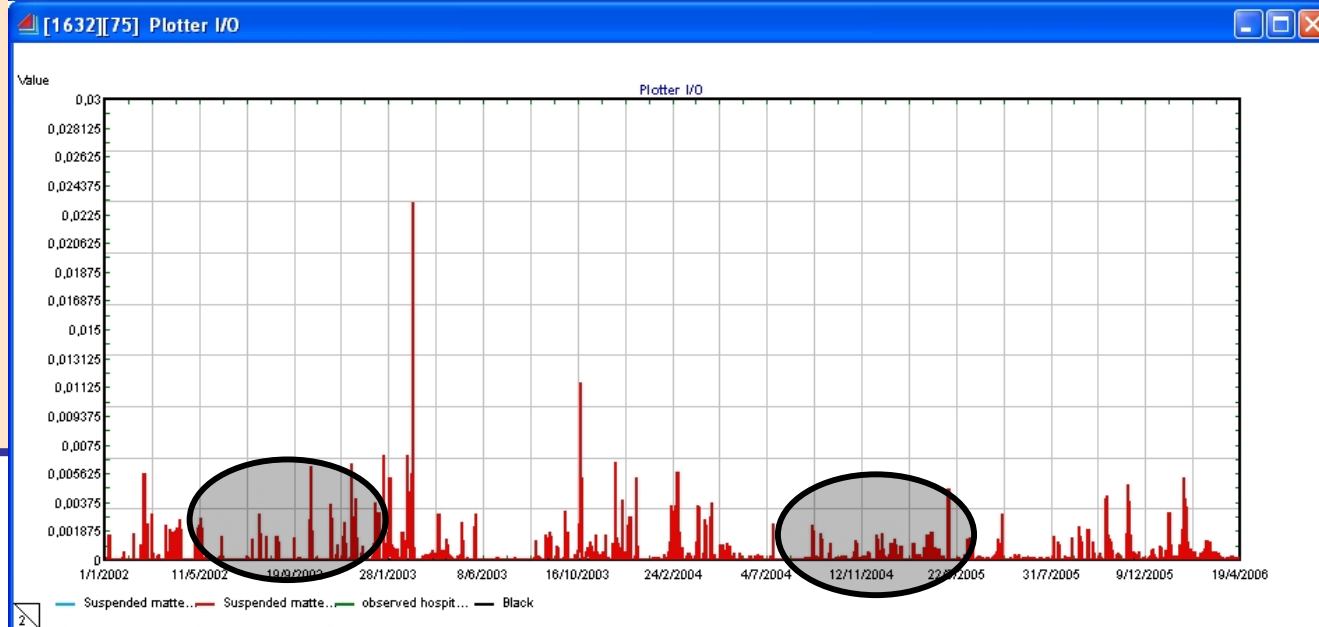
Capacity: 0.52 GL



Planned:

0% CSO released directly

Capacity: 1.5 GL



Example Scenarios

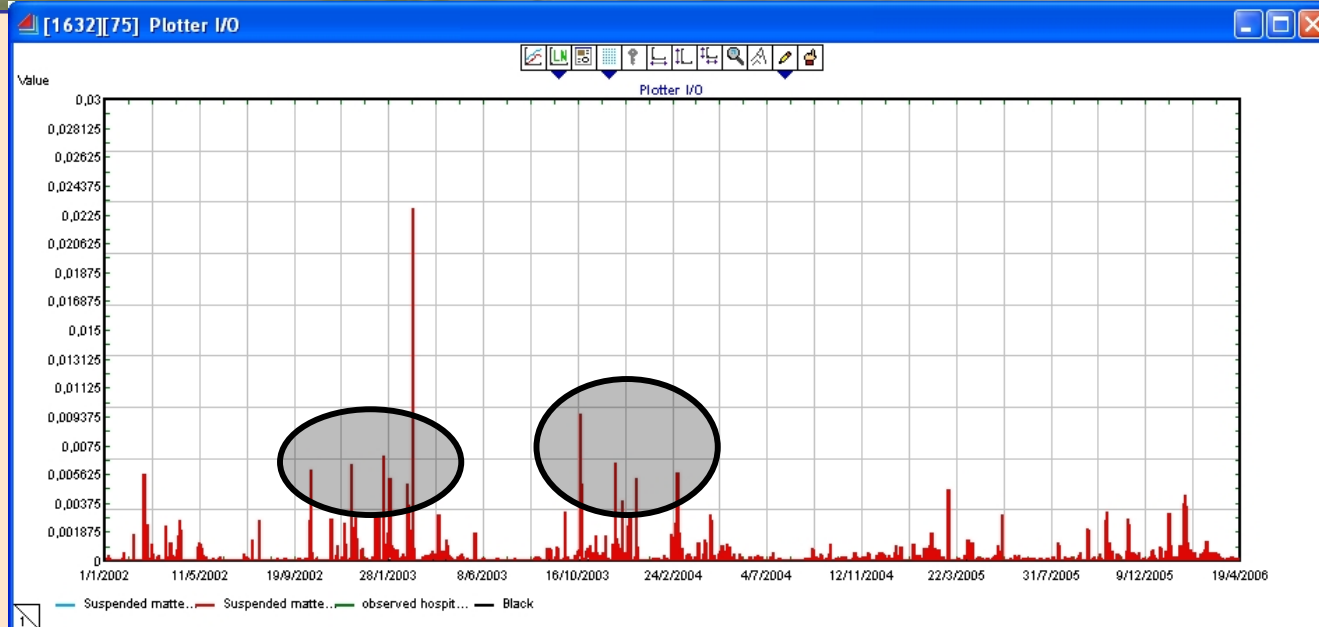
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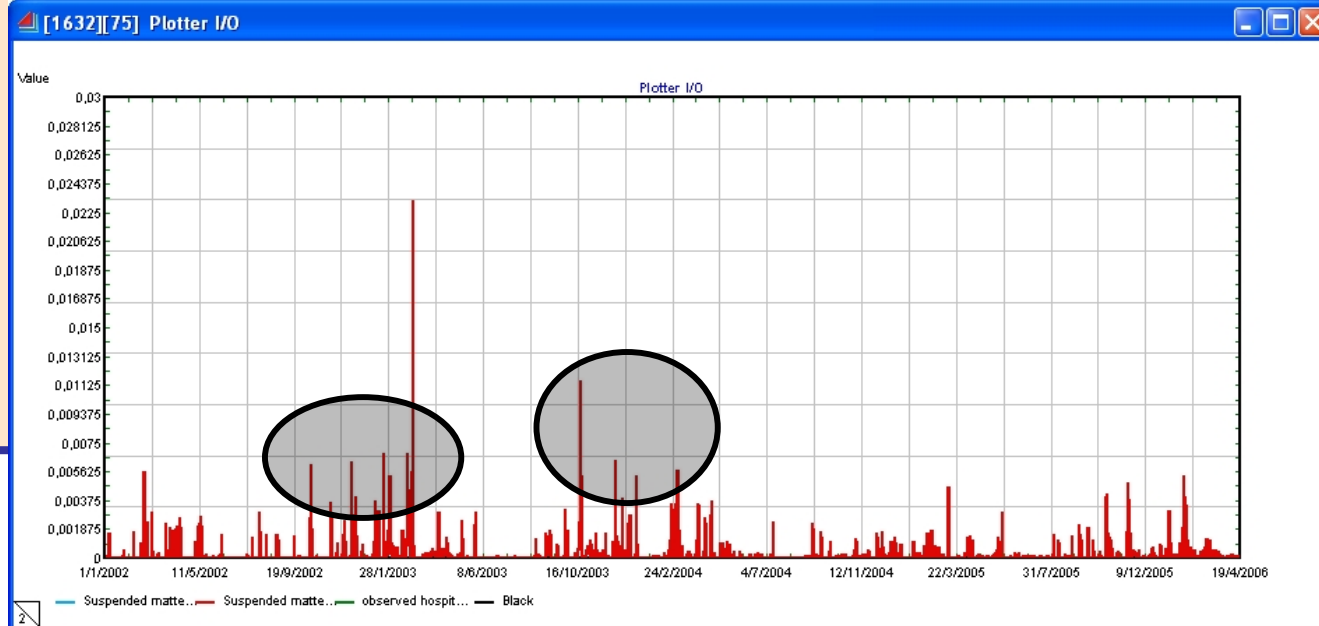
Capacity: 0.52 GL



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0% CSO released directly

Capacity: 1.5 GL



Increase capacity of storm water collectors on:

- 1) Water clarity
- 2) Bacteria

Actual:

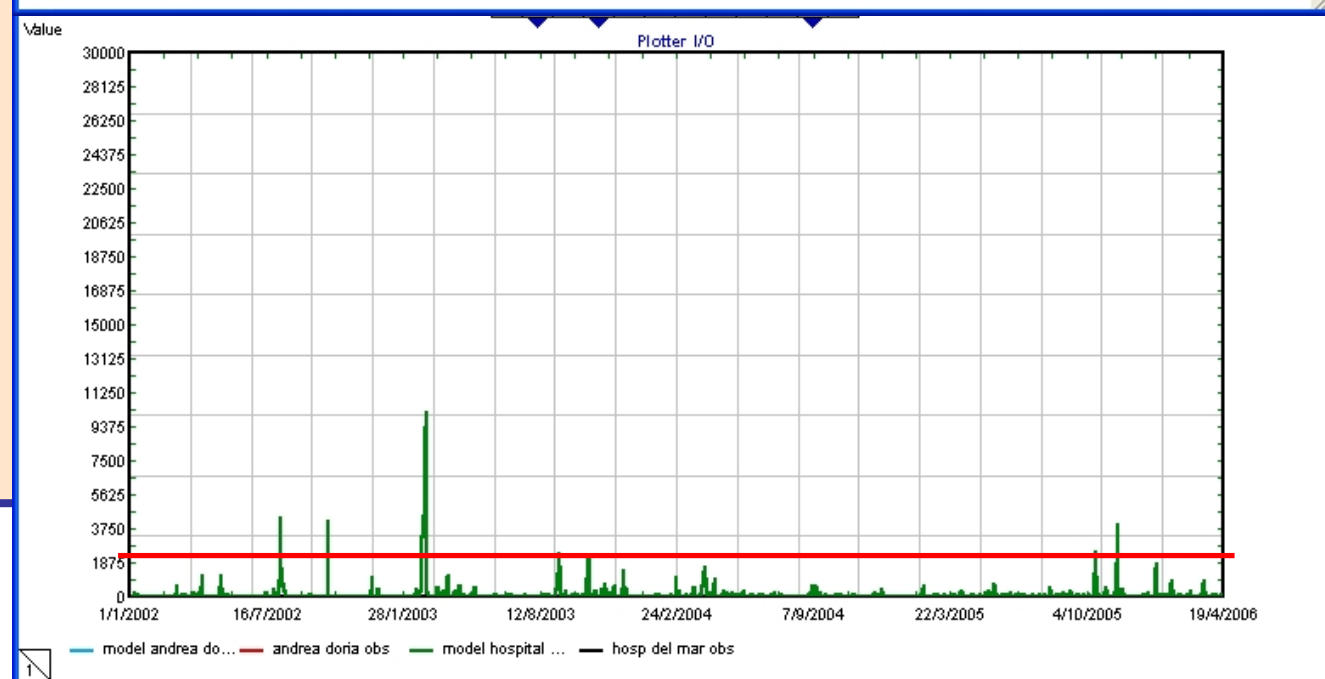
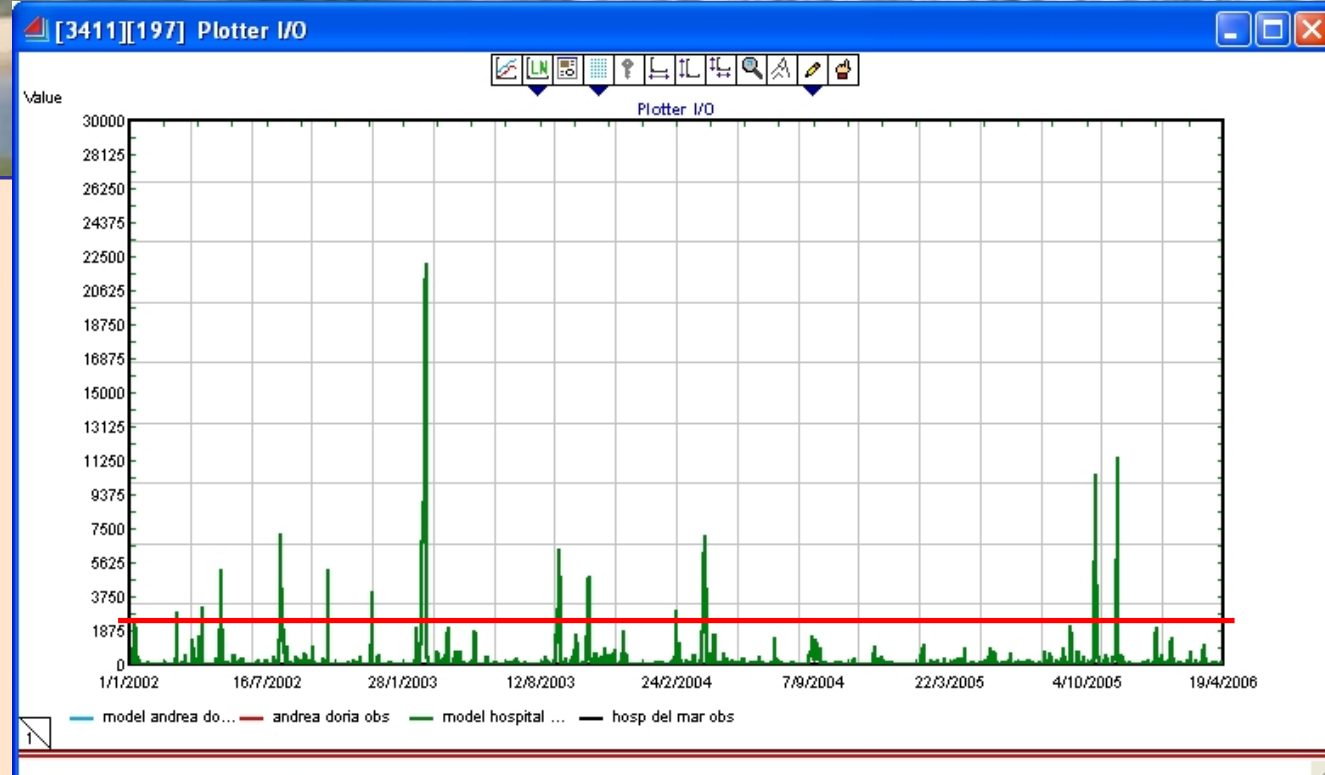
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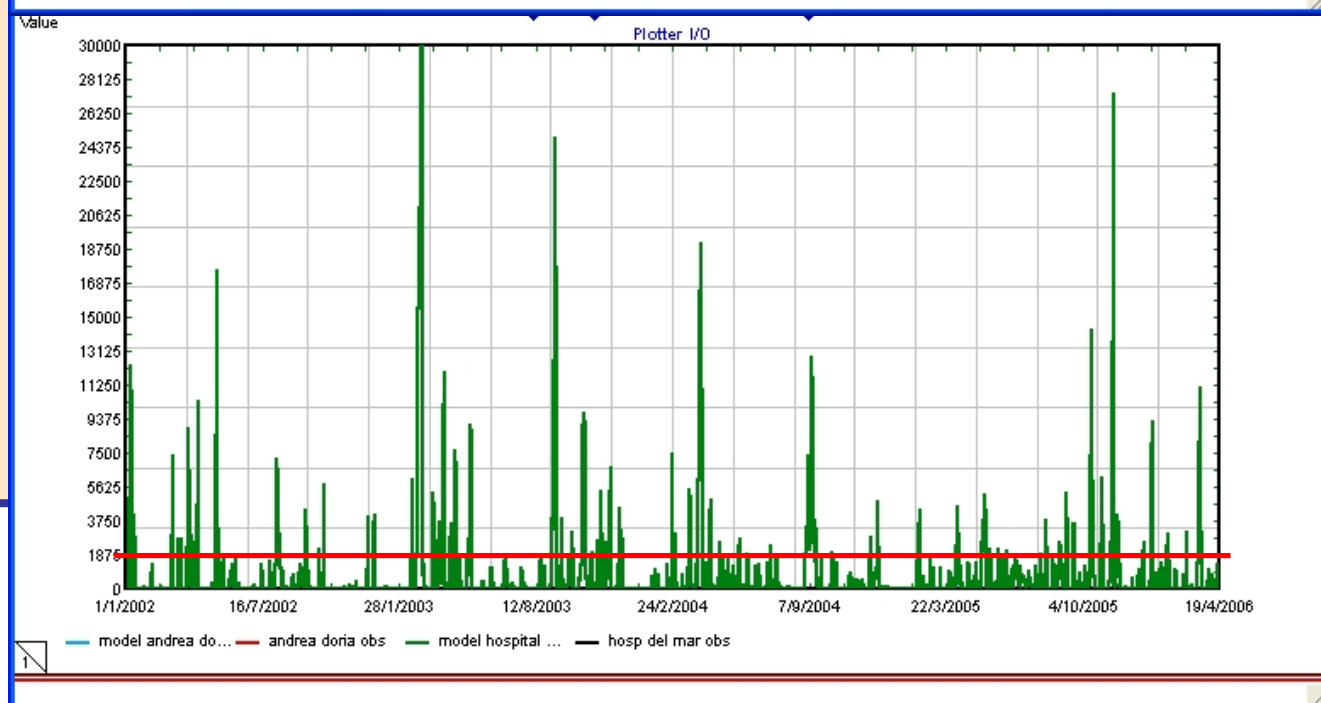
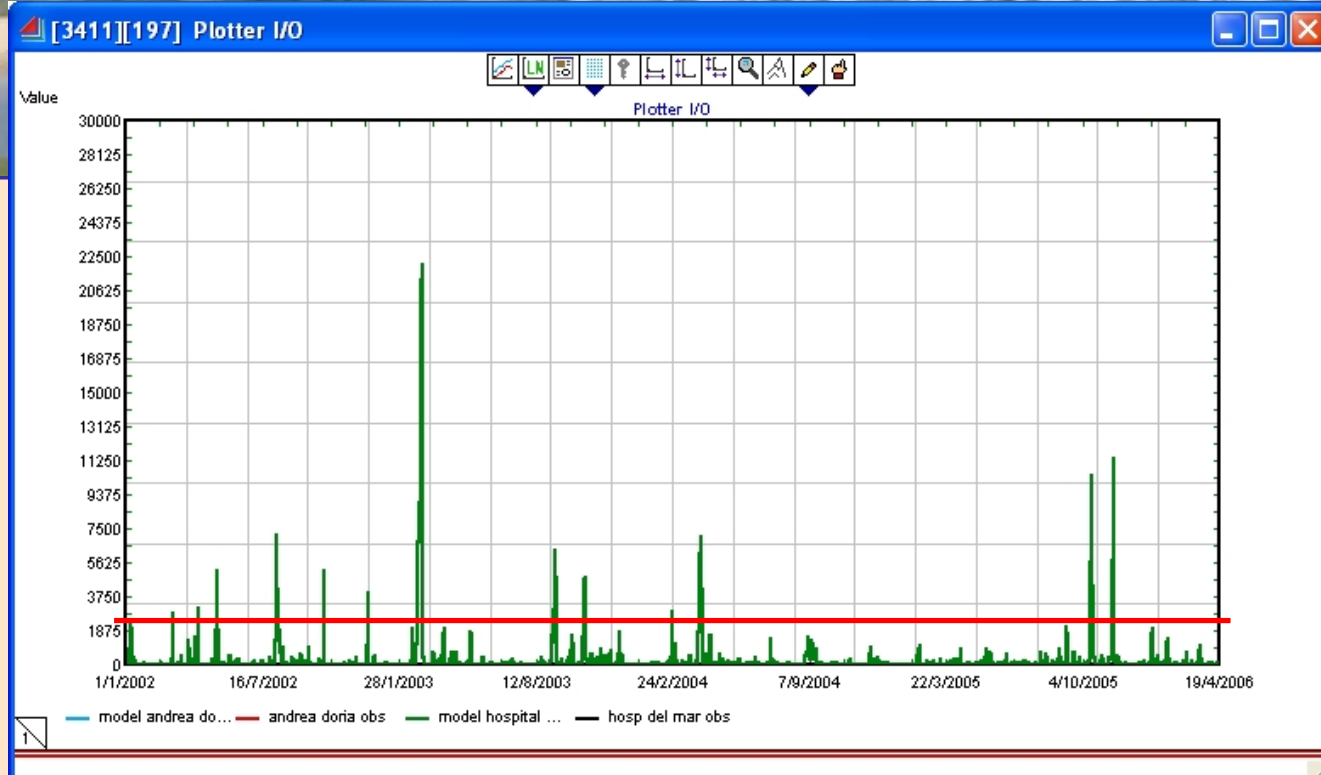


Disaster scenario:

- 1) Wastewater treatment plant releases TREATED effluent directly into beach

Actual:

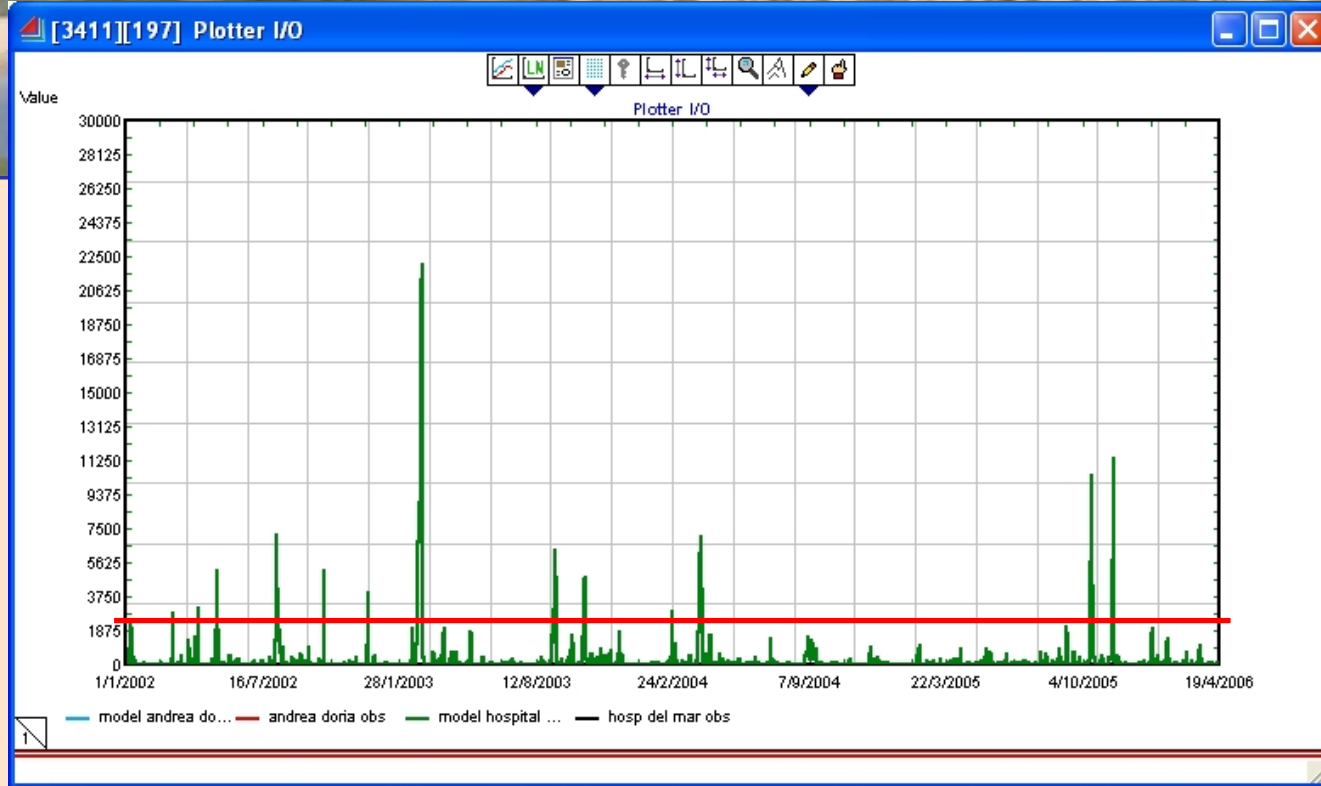
TREATED effluent accident:



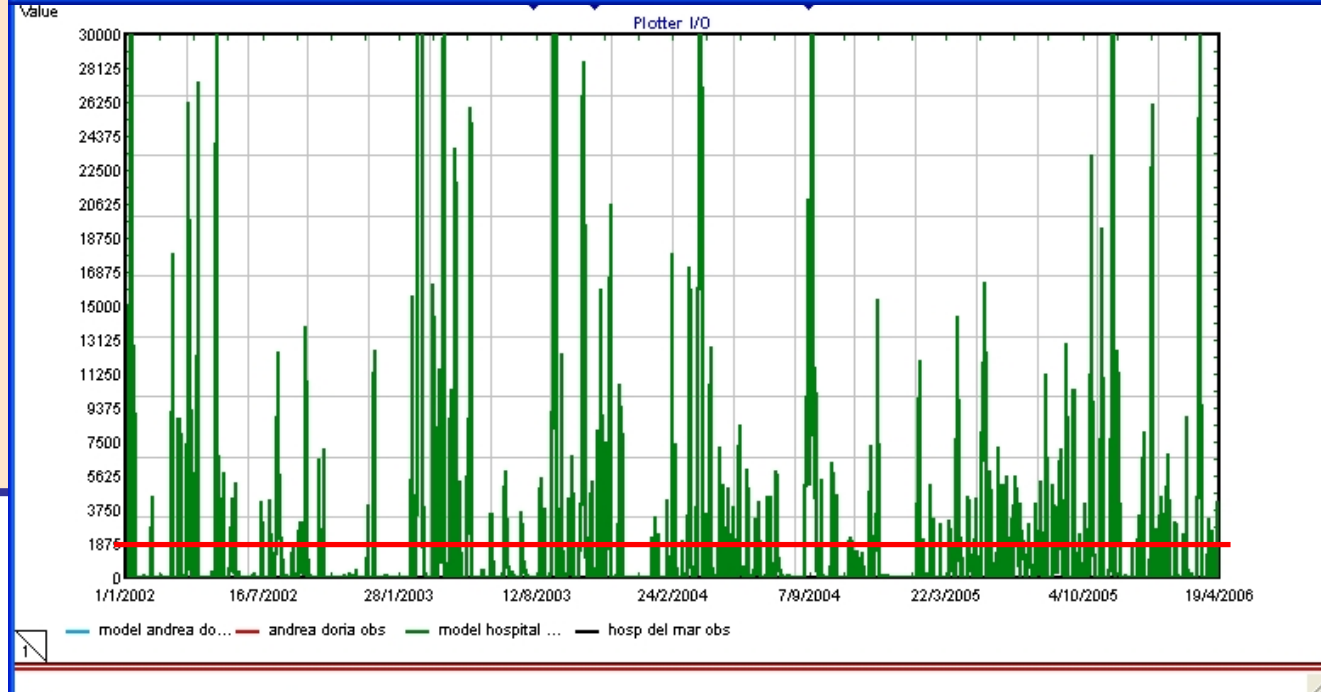
Disaster scenario:

2) Wastewater treatment plant releases UNTREATED effluent directly into beach

Actual:



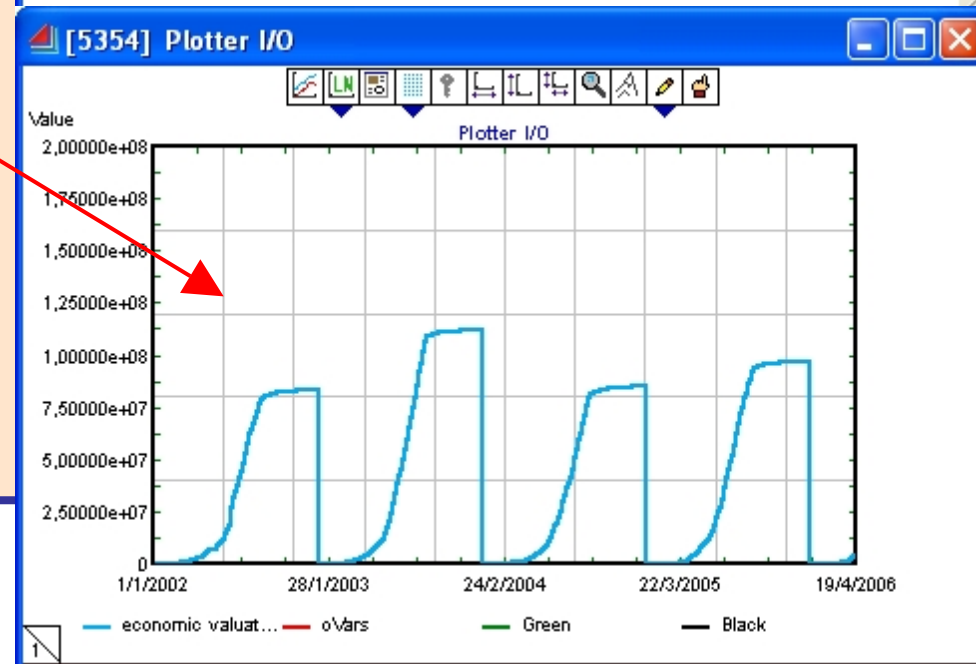
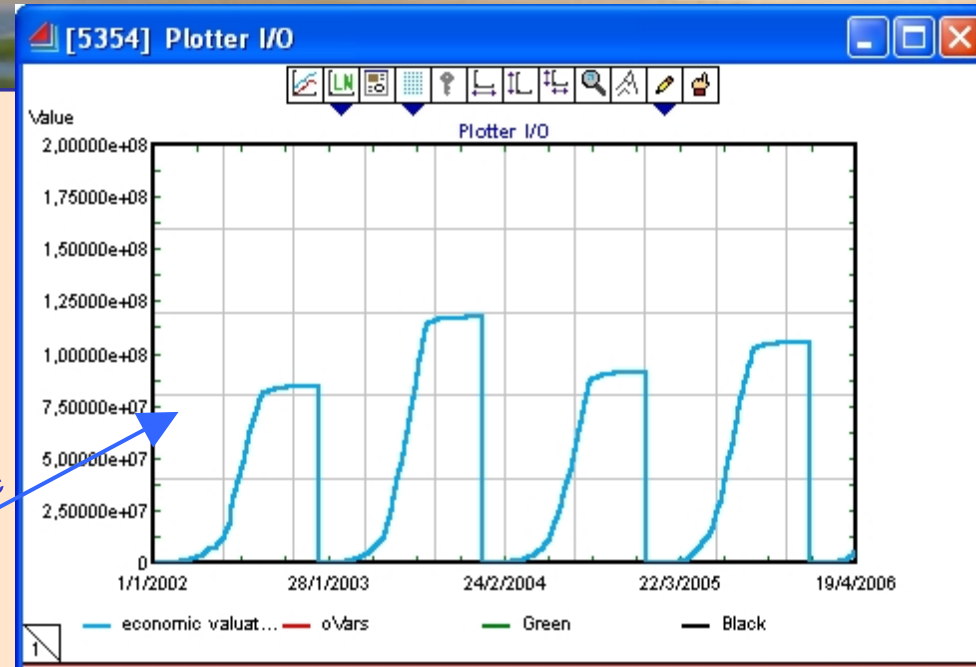
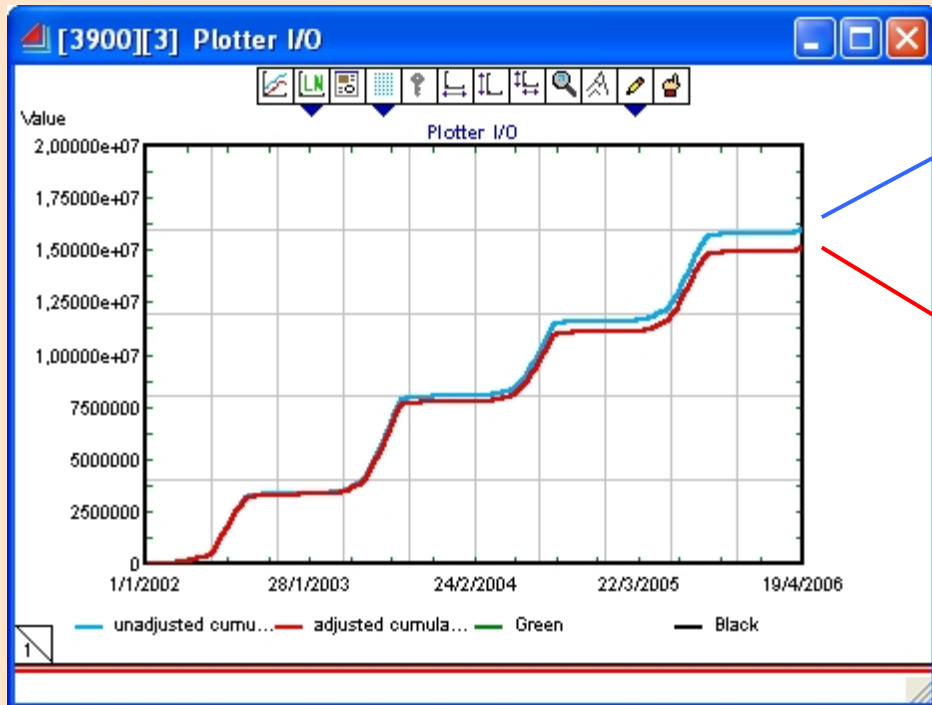
UNTREATED effluent accident:



Example Scenarios

Effect of turbidity on beach user perception
(realised as loss in economic value)

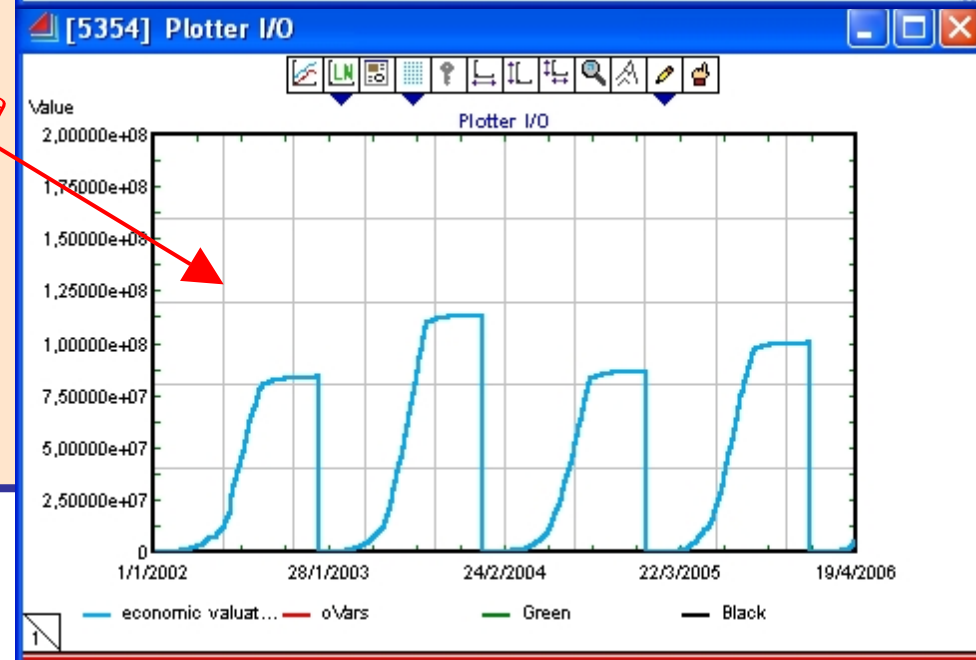
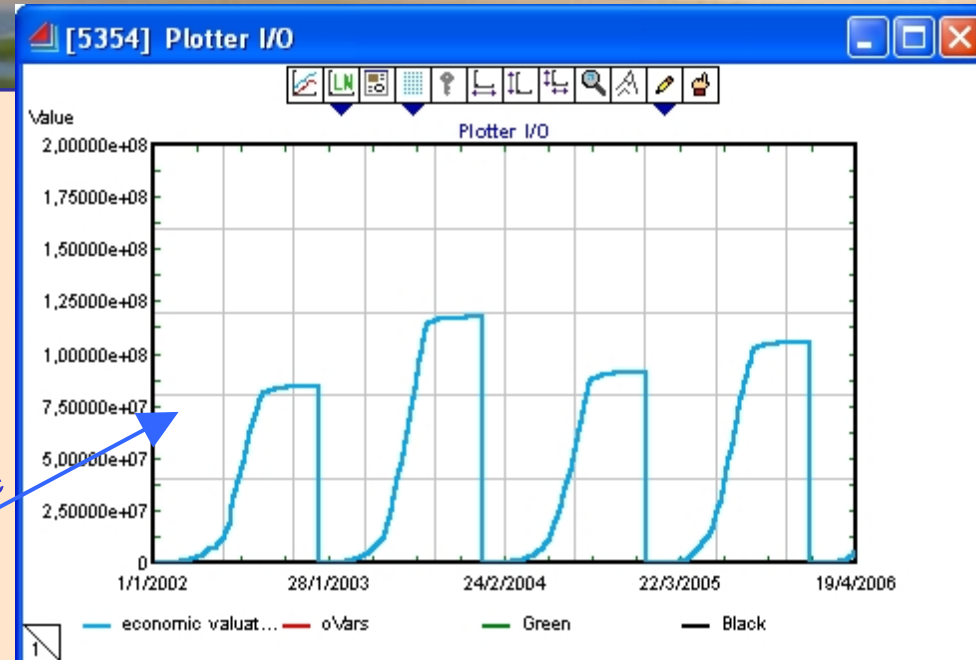
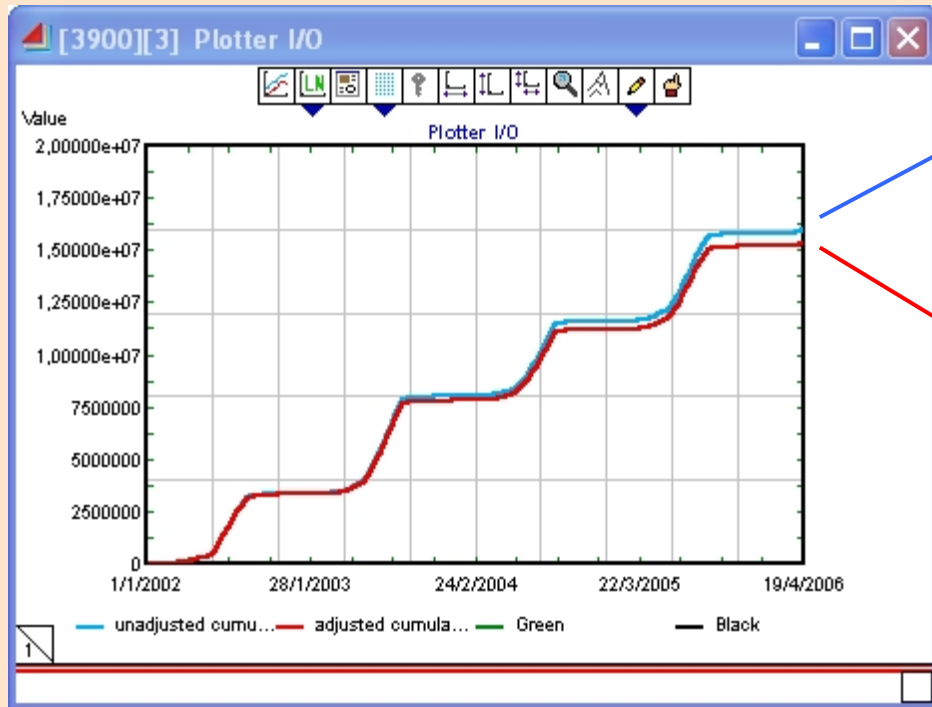
Total beach visitors (cumulative):



Example Scenarios

Effect of beach closure due to bacteria limits exceeded on beach user perception (realised as loss in economic value)

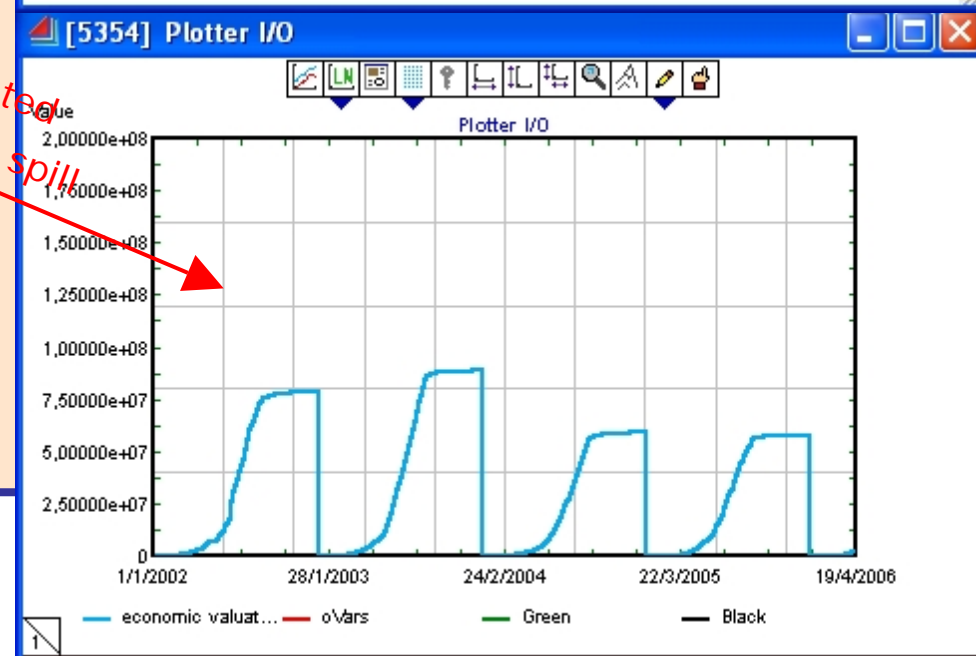
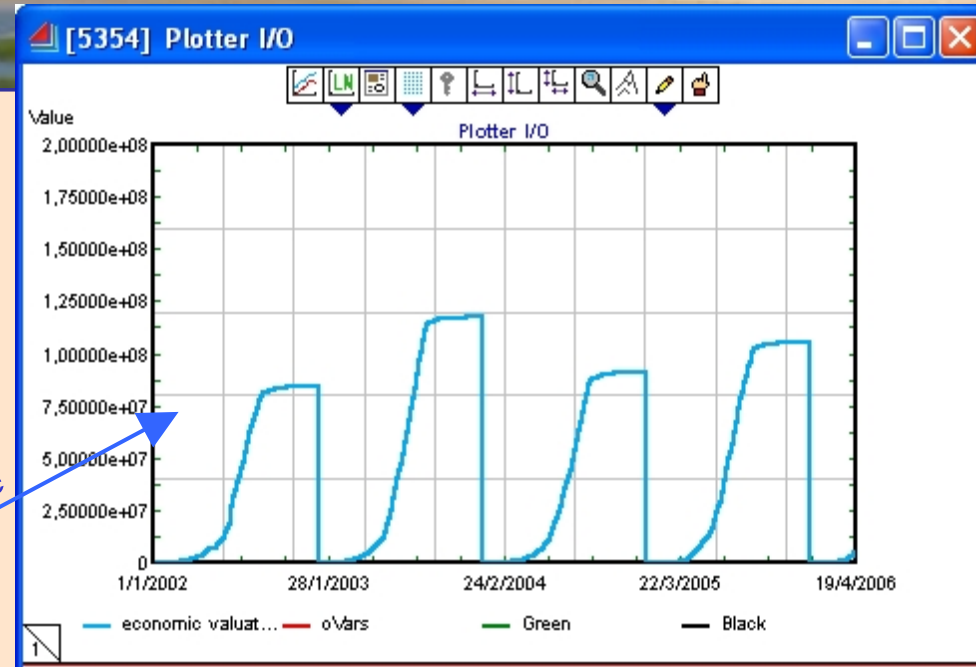
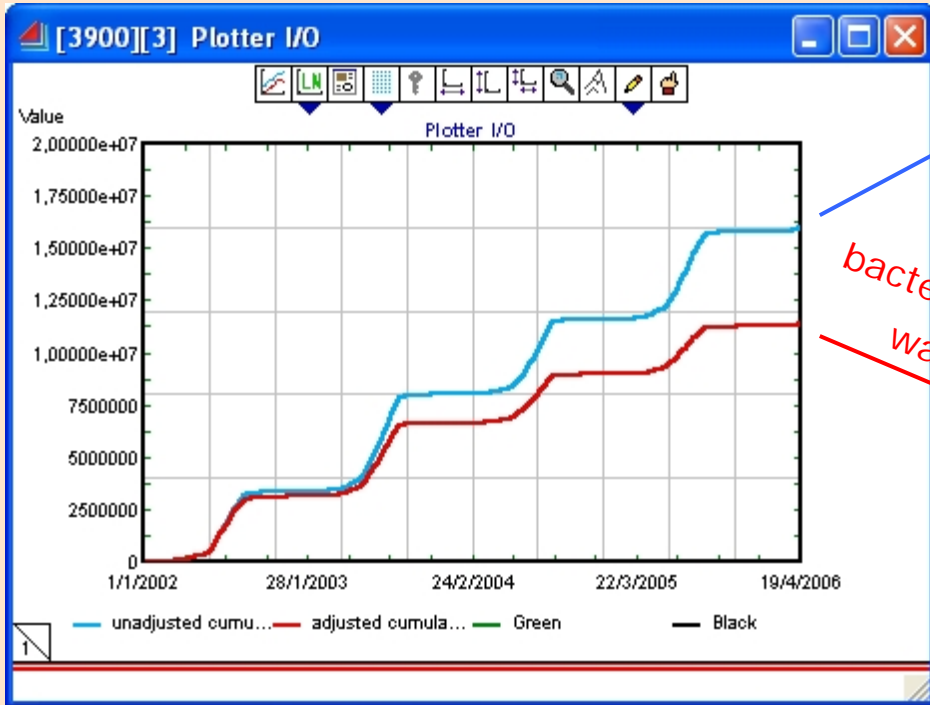
Total beach visitors (cumulative):



Example Scenarios

Effect of beach closure due to bacteria limits exceeded on beach user perception (realised as loss in economic value): disaster scenario

Total beach visitors (cumulative):



System Appraisal:

Difficulties with re-designing model recently discovered

In process of re-documenting and fully testing model again

(Sensitivity analysis towards meteorological drivers not yet complete)

Unsure how to analyse socio-economic component

Preparation for System Output:

Weather generator (in discussions with WP8)

