

System Appraisal

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

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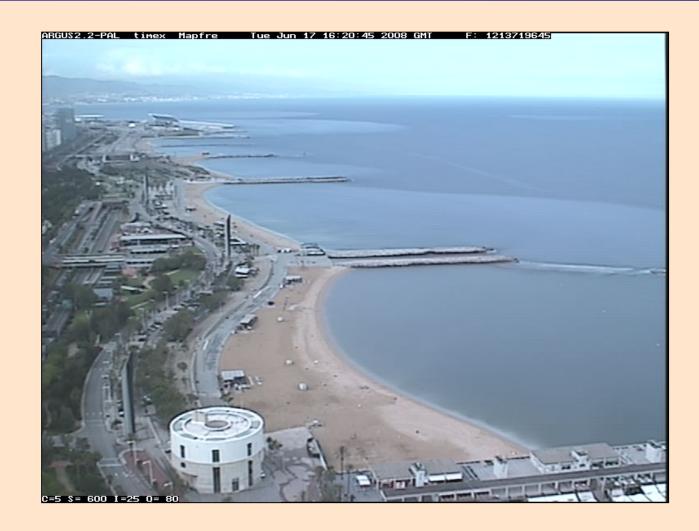






Contents

- 1 Issue
- 2 Changes to model
- 3 Scenarios
- 4 Current state of play
- 5 Needs for system output







ssue resolution

Issue:

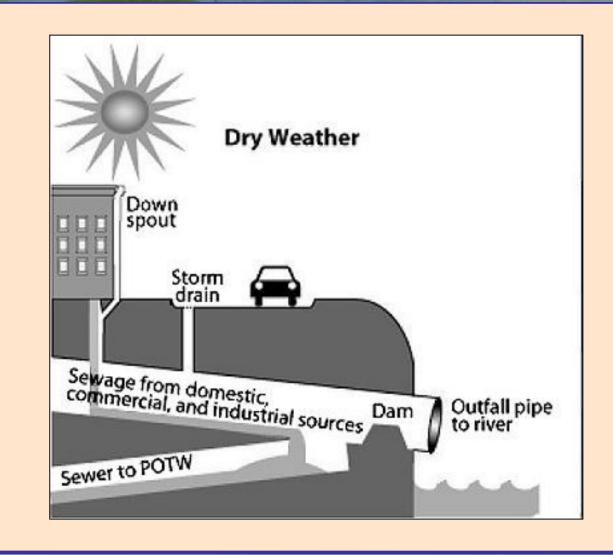
The effect of changes in water quality on the aesthetic and recreational aspects of the Barcelona beaches

Water quality:

water clarity bacteria (fecal coliform)

Inputs:

combined sewer overflow (storm runoff) river Besòs wave resuspension









ssue resolution

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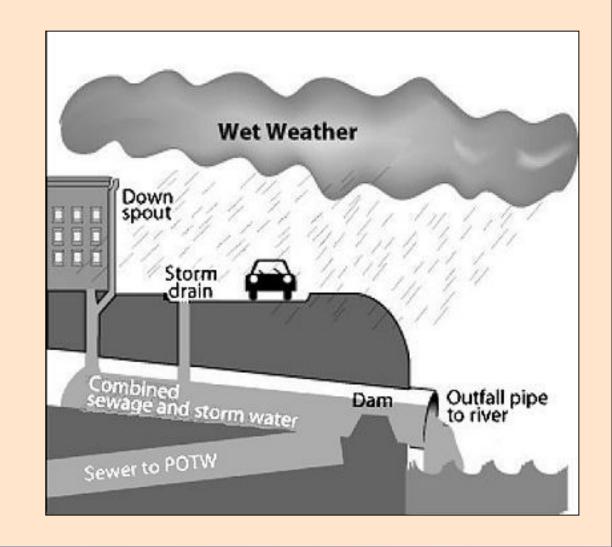
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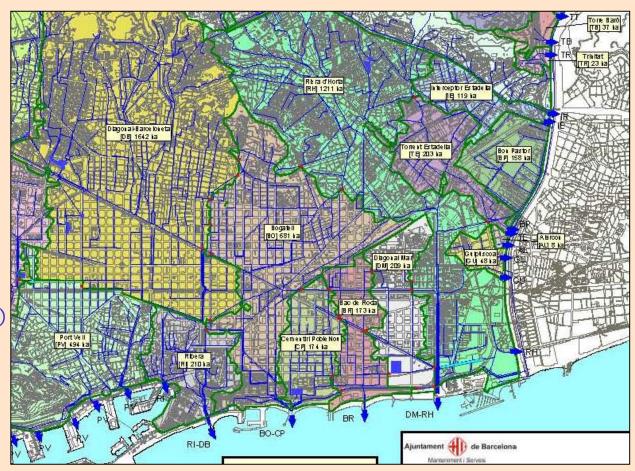
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Conceptual model

Multiple zones









Changes to model since System

Formulation

Why change?

Input from stakeholders

Advice from SSA team and *Spicosians*

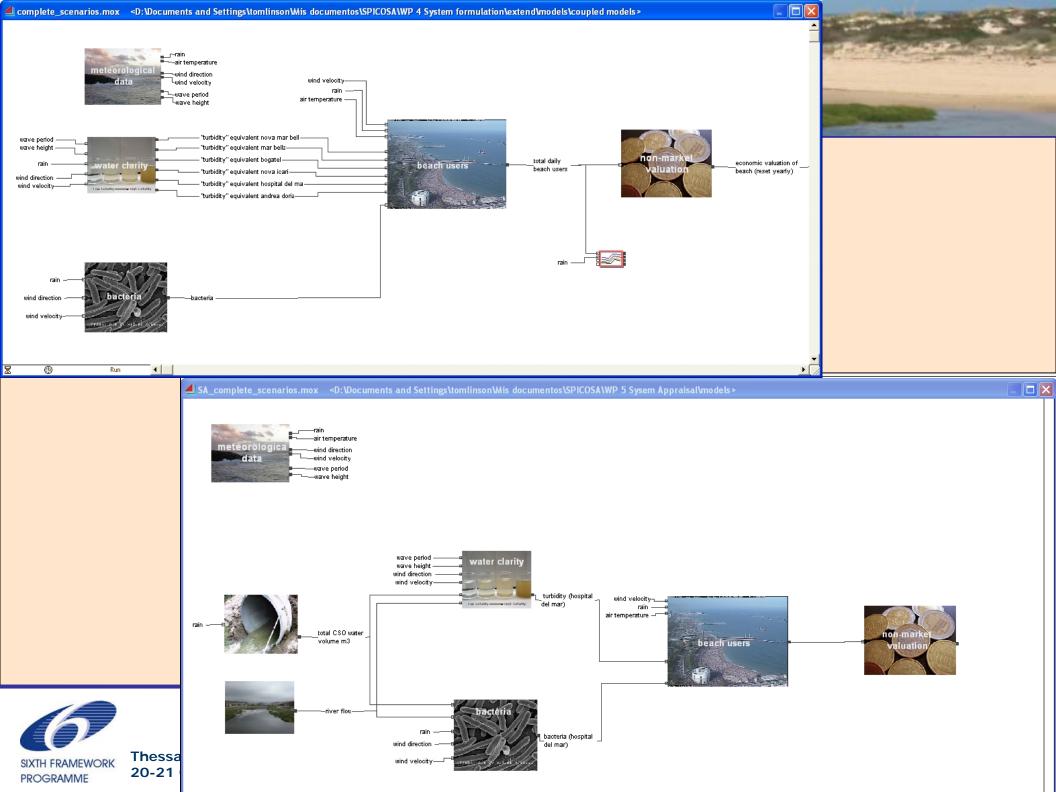
What?

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?

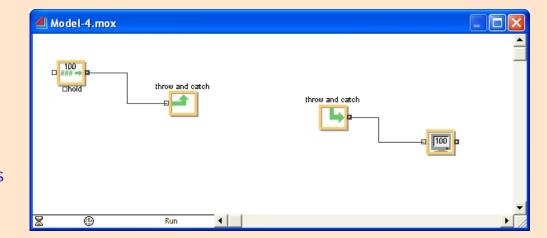
Input from stakeholders

Advice from SSA team and *Spicosians*

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







Increase capacity of storm water collectors on:

1) Water clarity

Actual:

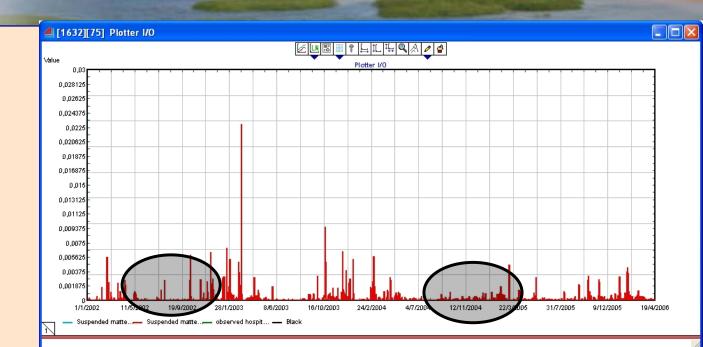
50% CSO released directly

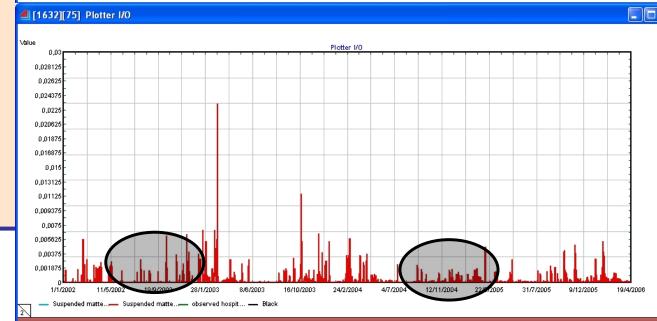
Capacity: 0.52 GL

Planned:

0% CSO released directly Capacity: 1.5 GL









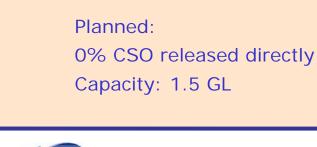
Increase capacity of storm water collectors on:

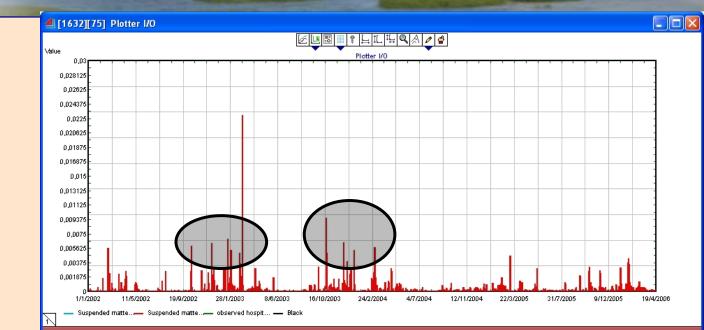
1) Water clarity

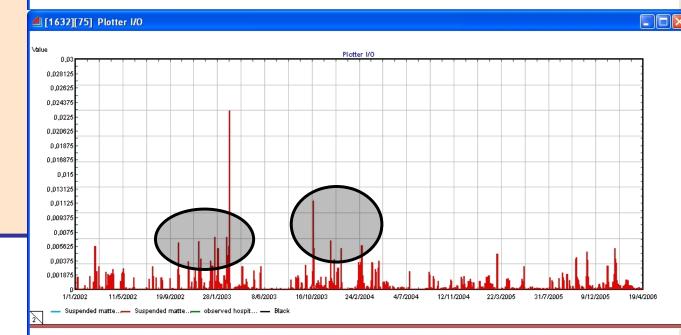
Actual:

50% CSO released directly

Capacity: 0.52 GL











Increase capacity of storm water collectors on:

- 1) Water clarity
- 2) Bacteria

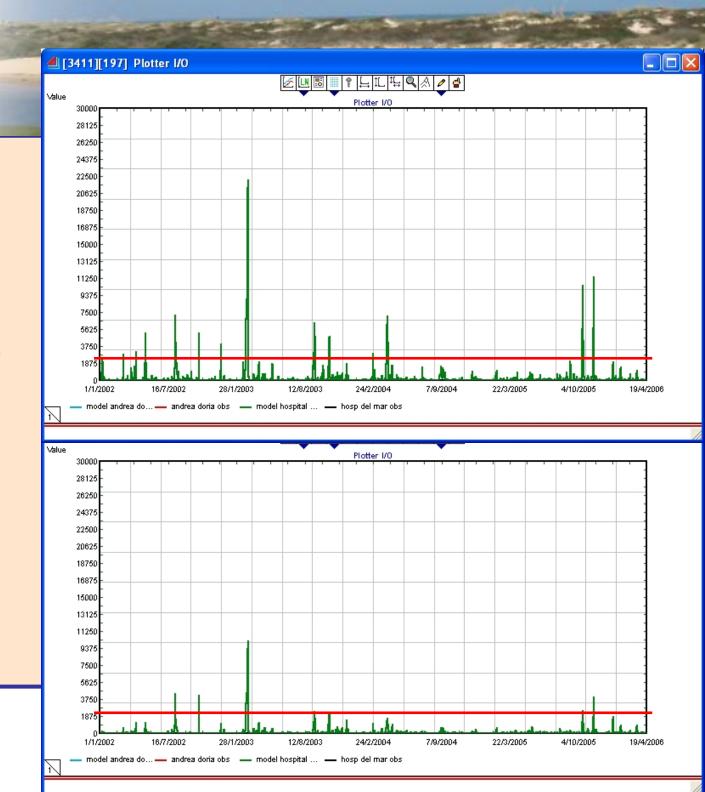
Actual:

50% CSO released directly Capacity: 0.52 GL

Planned: 0% CSO released directly Capacity: 1.5 GL



Thessaloniki, Greece 20-21 October 2009





Disaster scenario:

1) Wastewater treatment plant releases TREATED effluent directly into beach



7500 5625 3750 Actual: 1875 1/1/2002 16/7/2002 28/1/2003 12/8/2003 24/2/2004 7/9/2004 22/3/2005 4/10/2005 19/4/2006 model andrea do... — andrea doria obs — model hospital ... — hosp del mar obs Value Plotter I/O 30000 28125 26250 24375 22500 20625 18750 16875 15000 TREATED effluent accident: 13125 11250 9375 7500 5625 3750 1/1/2002 28/1/2003 12/8/2003 24/2/2004 7/9/2004 22/3/2005 4/10/2005 19/4/2006 model andrea do... — andrea doria obs — model hospital ... — hosp del mar obs

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Value

28125

24375

22500 20625

18750 16875

15000

13125 11250 9375





Disaster scenario:

2) Wastewater treatment plant releases UNTREATED effluent directly into beach

Actual:

4 [3411][197] Plotter I/O

Value

28125

UNTREATED effluent accident:



24375 22500 20625 18750 16875 15000 13125 11250 9375 7500 5625 3750 1875 1/1/2002 16/7/2002 28/1/2003 12/8/2003 24/2/2004 7/9/2004 22/3/2005 4/10/2005 19/4/2006 model andrea do... — andrea doria obs — model hospital ... — hosp del mar obs Value Plotter I/O 30000 28125 26250 24375 22500 20625 18750 16875 15000 13125 11250 9375 7500 5625 1/1/2002 16/7/2002 28/1/2003 12/8/2003 24/2/2004 7/9/2004 22/3/2005 4/10/2005 19/4/2006 model andrea do... — andrea doria obs — model hospital ... — hosp del mar obs

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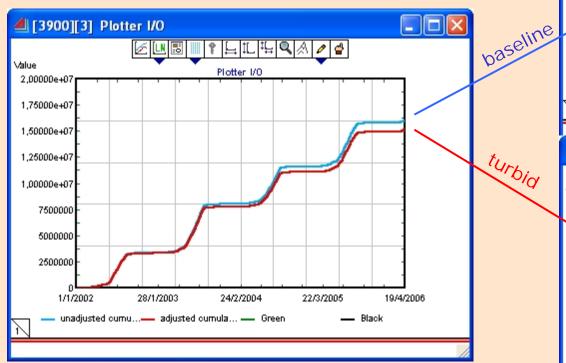
1/1/2002

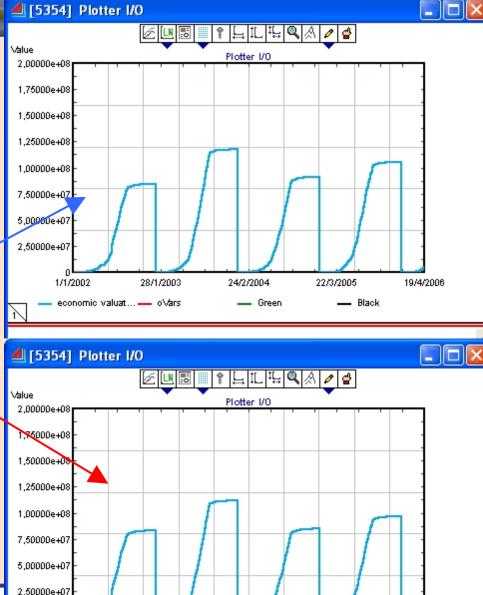
28/1/2003

economic valuat... — oVars

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

Total beach visitors (cumulative):





24/2/2004

Green

22/3/2005

Black

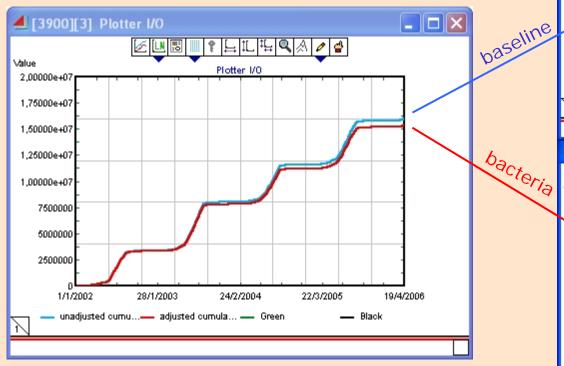
19/4/2006





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

Total beach visitors (cumulative):





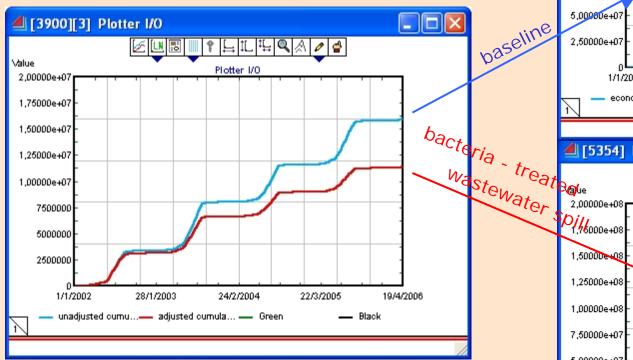
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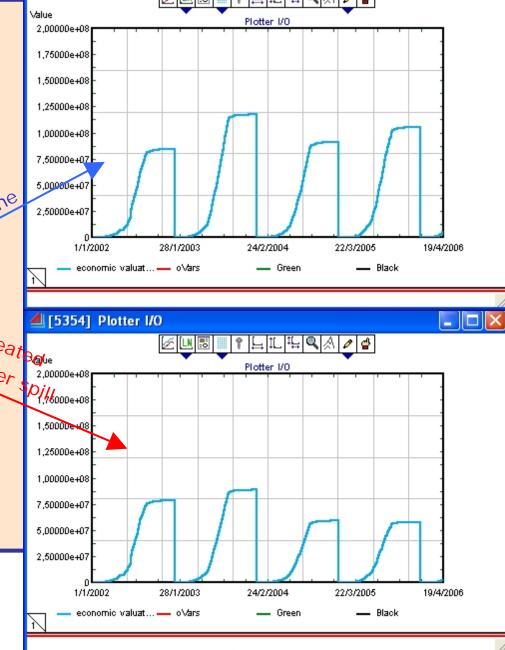


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Effect of beach closure due to bacteria limits exceeded on beach user perception (realised as loss in economic value): disaster scenario

Total beach visitors (cumulative):









Current state

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 analise socio-economic component

Preparation for System Output:

Weather generator (in discussions with WP8)















