

# Environmental Engineering and Management for EXPO 98

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# EXPO 98

- Last World Fair of the XX Century
  - Major environmental reclamation project
  - Development of a new town for 60.000



# EXPO 98

Aerial view (1993)



# EXPO 98

Aerial view (1998)



# EXPO 98

- Environmental problems and solutions
  - Reclamation projects
  - Urban development projects
- Environmental management tools
  - Actual practice
  - Research
- Lessons learned

# Reclamation Projects

- Sanitary Landfill
- Soil decontamination
- Demolitions
- Transplanting trees
- Wastewater treatment plant upgrade
- Cleaning-up of Trancau River

# Reclamation Projects

- Lisbon's sanitary landfill was converted in a 50 acres park
  - Major contractor: Geosyntec (USA)



# Reclamation Projects

- Decontamination of soils at oil refinery sites, slaughterhouse and dock
  - Major contractor: Heidmeij (Netherlands)



# Reclamation Projects

- Demolitions: 810.000 tons of concrete, 190.000 tons of stone, 60.000 tons of road pavement and 5.000 tons of steel
  - Recycled for use in development of new town



# Reclamation Projects

- 500 trees were transplanted, 30.000 trees were planted



# Reclamation Projects

- Major Lisbon wastewater treatment upgrade
  - Tertiary treatment was introduced
  - Major contractor: Degremont (France)



# Reclamation Projects

- Cleaning-up Trancao River
  - Mini-dams and wastewater treatment plants were built upstream
  - River banks were cleaned before EXPO 98

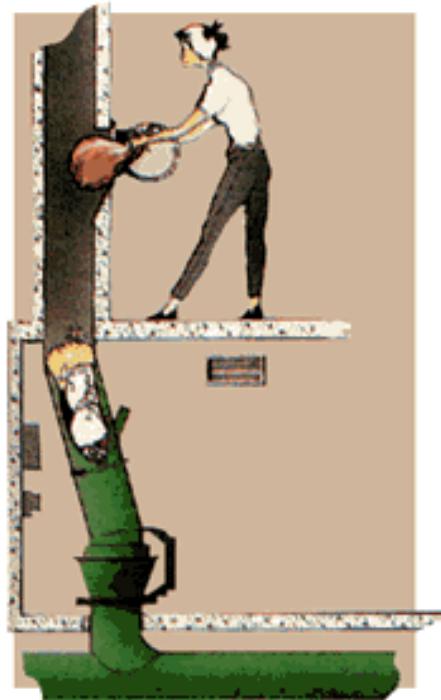


# Urban Development Projects

- Solid waste removal
- Technical gallery
- Energy management
- Environmental impact statement
- Monitoring

# Urban Development Projects

- Automatic solid waste removal



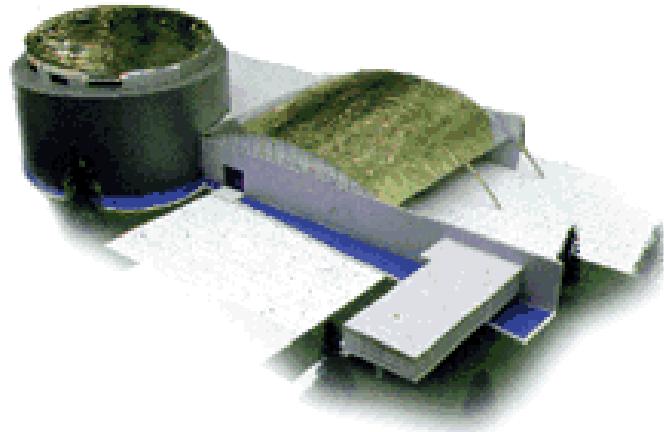
# Urban Development Projects

- Technical gallery was designed to facilitate maintenance



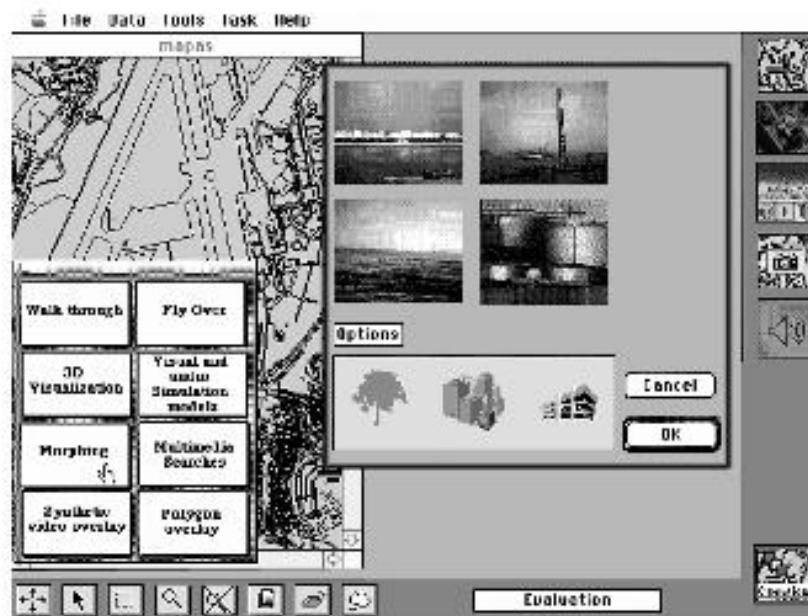
# Urban Development Projects

- Energy management
  - Central facility for air conditioning
  - Buildings were designed to minimize energy consumption



# Urban Development Projects

- Environmental impact statement
  - Media and investors oriented



# Urban Development Projects

- Monitoring
  - Ground water quality



# Urban Development Projects

- Monitoring
  - Air quality



# Urban Development Projects

- Monitoring
  - Noise



# Urban Development Projects

- Monitoring
  - Meteorological station



# Management Tools

- Project management
- Environmental information system
- Exploratory system
- Virtual Tejo

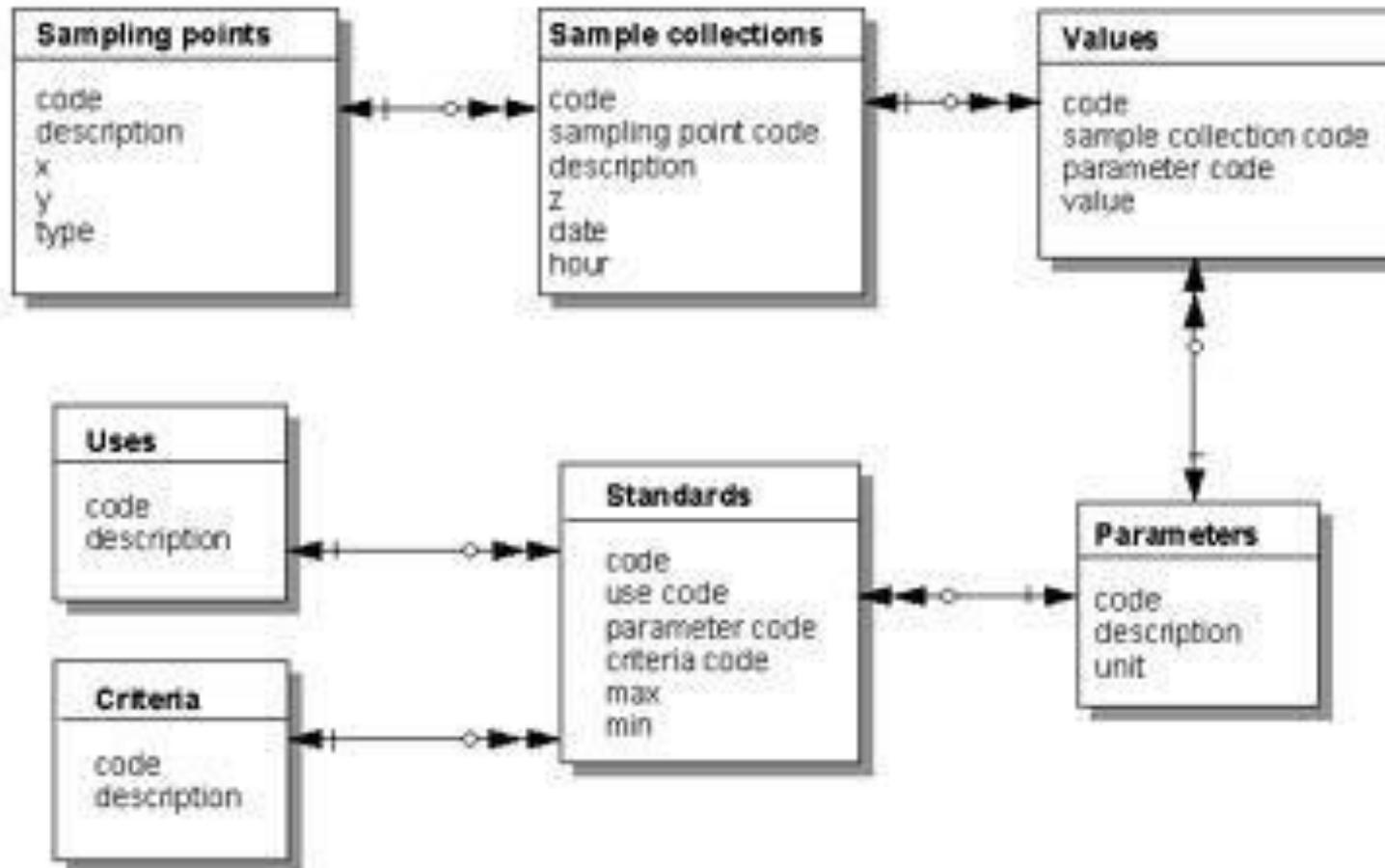
# Project Management

- PERT/CPMs were developed in 1993. They were revised every quarter until 1997
- Planning in 1997 and 1998 (until the opening in May) used the day unit
- Web based working sites with planned activities, weekly status reports, project documents, and providing access to conferencing were tested successfully in 1997-98

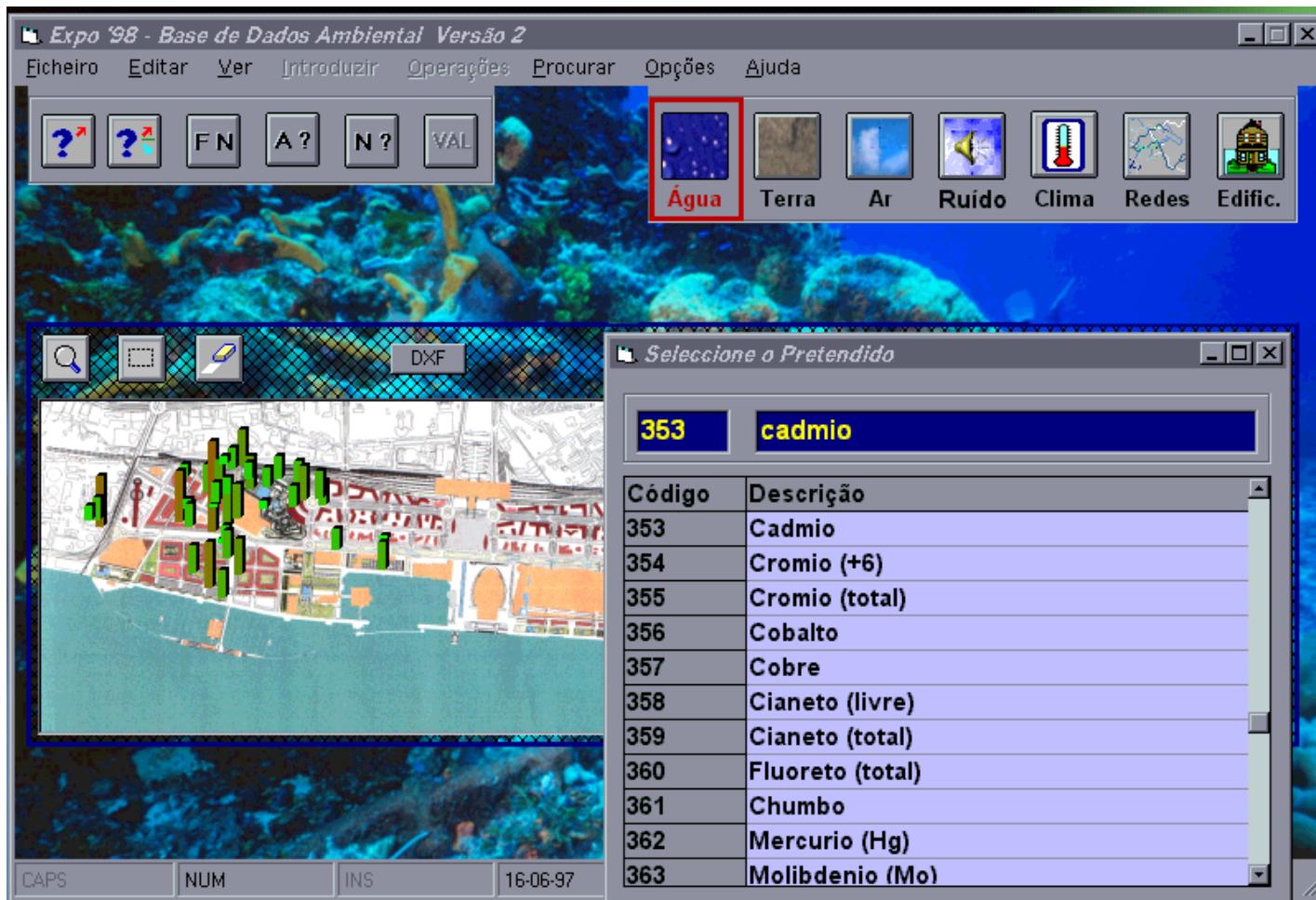
# Environmental Information System

- A comprehensive environmental information system was developed in early 1994. It has been updated since that date.
- It was implemented in Oracle

# Environmental Information System



# Environmental Information System

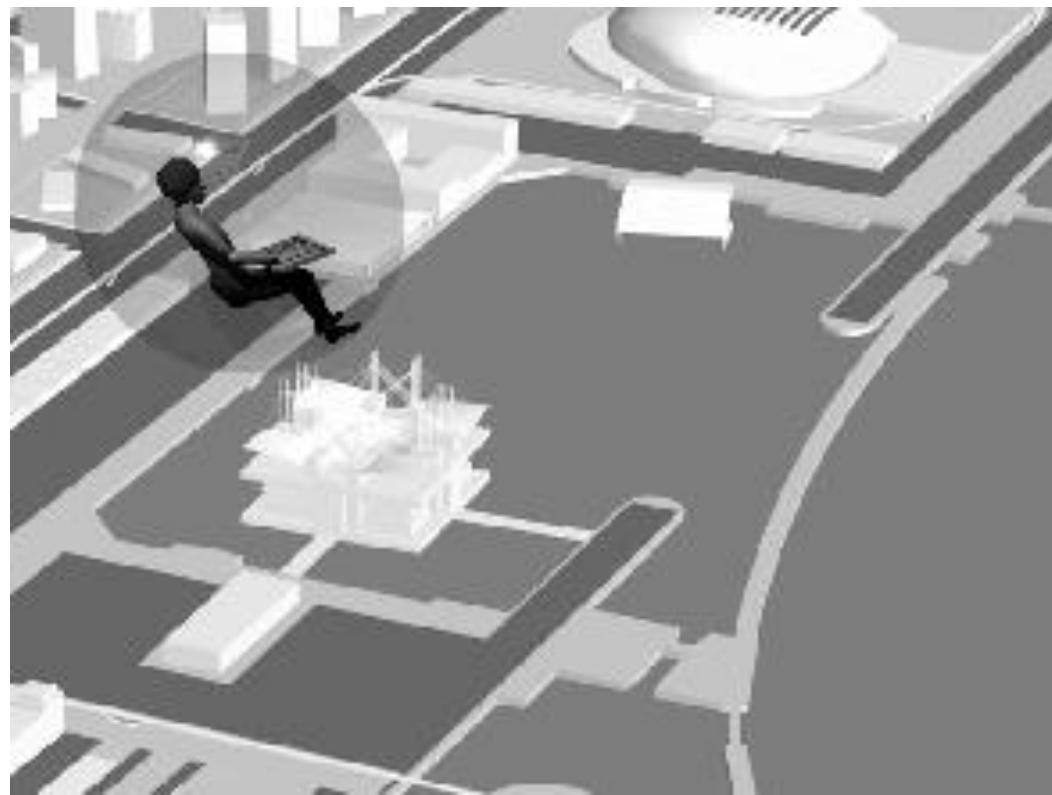


# Exploratory System

- Open Web site with synthesis of all studies  
([www.expo98.pt/ambiente](http://www.expo98.pt/ambiente))
- Internal Web site with all the reports and projects and access to information system, models and visualization tools  
([http://sig.cnig.pt/sea\\_www](http://sig.cnig.pt/sea_www))

# Exploratory System

Initial interface



# Exploratory System

Sistema de Exploração Ambiental da Expo'98 - Microsoft Internet Explorer

**SISTEMA DE EXPLORAÇÃO AMBIENTAL  
PAINEL DE CONTROLE**

**NAVEGAÇÃO NO ESPAÇO E NO TEMPO**

Mapas    Fotografias Aéreas    Zoom    Pan

93    98    99

**NAVEGAÇÃO POR TEMAS AMBIENTAIS**

Água    Ar    Ecologia    Paisagem    Ruido    Solo

**FERRAMENTAS AUXILIARES**

MAP98.JPG

**Legenda:**

Plat. Embasamento	Equipamento Colectivo
Uso Misto / Multiuso	Equipamento Turístico
Multiuso / Comércio	Espaço Verde
Habitação	Espaço Verde Equipado
Habitação / Comércio	Equipamento Desportivo
Comércio	Sapal
Indústria	Plano de Água
Serviço Urbano	Rio Tejo / Rio Trancão

**Escala:** 0 200 m

**Data:** 26/06/97

**Título:**  
Planta de Síntese da Ocupação Final  
(Fase Pós-Expo'98)

**EXPO'98**

# Virtual Tejo

## Virtual Tejo user interface

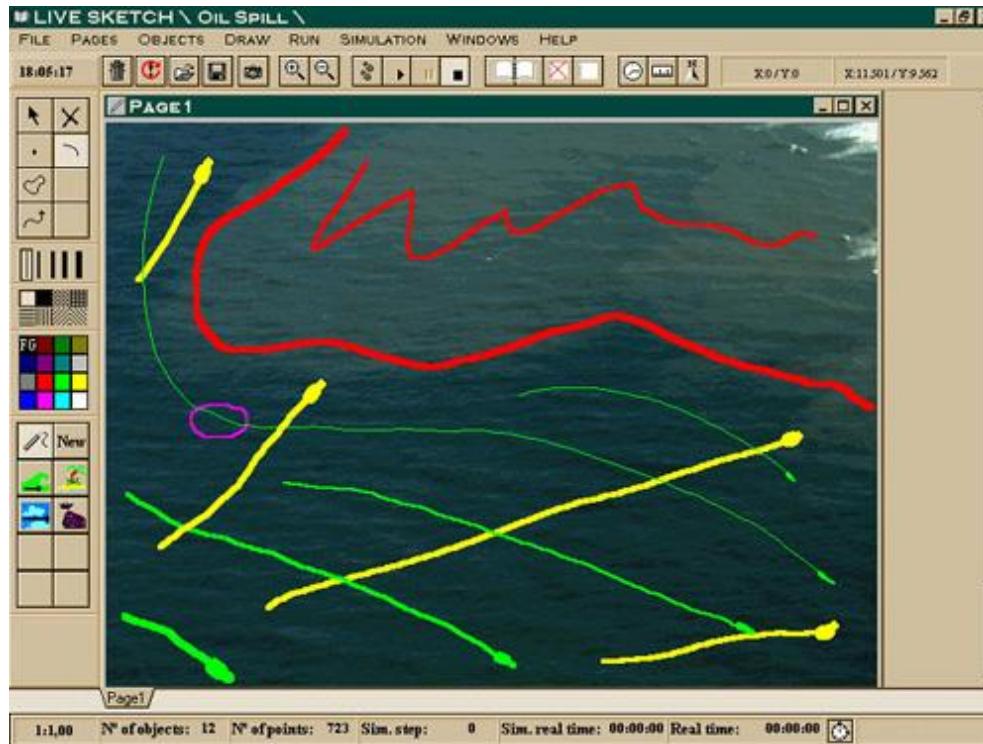


### Tool Legend

1. Create Building
2. Create Factory
3. Create Tree
4. Translate Object
5. Rotate Object
6. Delete Object
7. Move/Stop Toggle
8. Fly/Walk Toggle
9. Virtual pointer

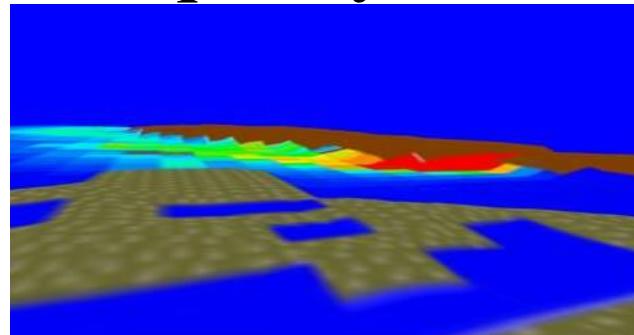
# Virtual Tejo

- Modeling by sketching



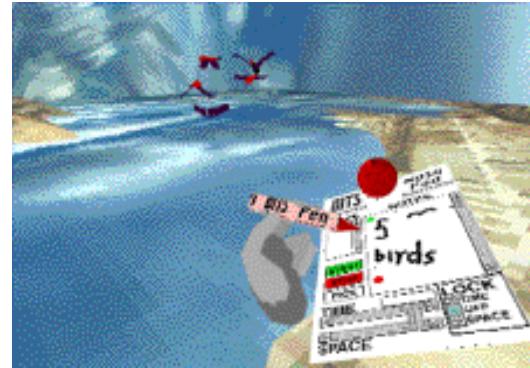
# Virtual Tejo

- Visualization of water quality models
  - Aerial views
  - Aquatic ecosystem



# Virtual Tejo

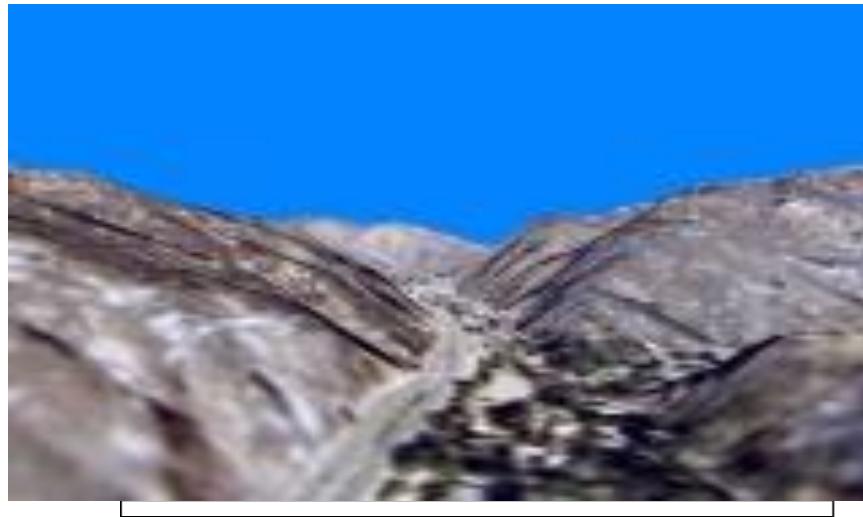
- Browsing in Time and Space (BITS)
  - Take notes
  - Pick up objects
  - Space and time travel
  - All in a virtual environment



# Virtual Tejo

- Virtual Tejo became Digital Portugal, a virtual fly-over of an aerial photograph mosaic of the whole country displayed at Expo98 (1 million users)
- Lisbon and Porto, the two major cities, were shown at 1 meter resolution
- To download demo see [www.imersiva.ch](http://www.imersiva.ch)

# Digital Portugal



# Digital Portugal

Scenario



# Lessons Learned

- Saving costs in sampling is dangerous
- Dealing with citizen and the media should be taught in environmental engineering
- The Web facilitates project management with the Working Site concept
- The time lag between research results and actual practice is being reduced

# References

- Fonseca, A., Gouveia, C., Camara, A.S. and Silva, J.P. (1995). “Environmental Impact Assessment Using Multimedia Spatial Information Systems”, Environment and Planning B, 22: 637-648.
- Camara, A.S. et al. (1998). “Virtual Environments and Water Quality Management”, J. Inf. Systems, ASCE, 4/1: 28-36.

# References

- Camara, A.S. Environmental Systems: A Multidimensional Approach. Oxford, U.K.: Oxford University Press, 2002
- Web site with all papers, videos and demos:  
<http://gasa.dcea.fct.unl.pt/gasa/gasa98.htm>