



FEUP
Universidade do Porto
Faculdade de Engenharia

Partner 9

WaterStrategyMan Project

Kick-off meeting

Athens, 7-9 February 2002

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INSTITUTION

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FEUP

- The Engineering Faculty (FEUP) is the largest faculty of the University of Porto and has statutory, scientific, administrative and financial autonomy .
- The University of Porto is the biggest in Portugal, with approximately 25 000 students.
- The origin of FEUP dates from the creation of the Nautic School in 1762 and its present designation exists since 1926.





Areas of Activity

- Teaching

8 undergraduate courses, 24 MSc degree courses and doctorates in 8 fields of engineering, as well as numerous specialization post-graduate courses.

- Research

FEUP is currently involved in more than a hundred research projects, many of these on an international basis and in co-operation with industry.



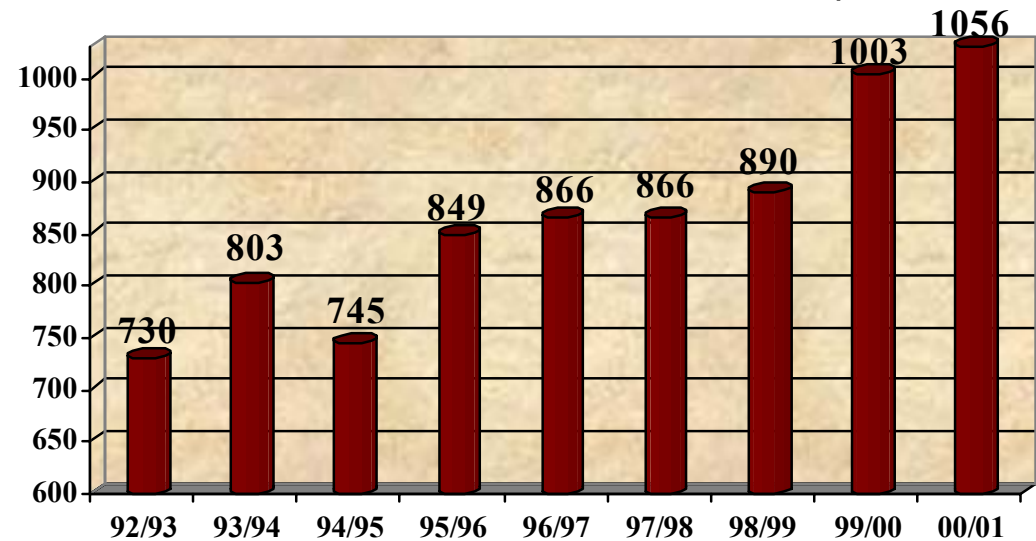
FEUP in Numbers

UNDERGRADUATE STUDENTS	4871
MSc STUDENTS	401
Ph.D STUDENTS	350
TEACHING STAFF	435
TEACHING STAFF (with Doctorate)	283
NON-TEACHING STAFF	201



ADMISSIONS

Total Number of New Students per Year





AREAS

TOTAL AREA	90.000 m ²
LECTURE ROOMS	17.000 m ²
LABORATORIES	41.300 m ²
LIBRARY	6.400 m ²
COMPUTER CENTER	1.200 m ²
ADMINISTRATIVE SERVICES	3.600 m ²
OFFICES	17.000 m ²
STUDENT UNION	1.500 m ²
SOCIAL SERVICES	2.000 m ²

LIBRARY



- More than 60.000 monographs, including technical materials.
- More that 500 periodies. On-line access to full-text services.
- Subscription of all important data in engineering: EL COMPENDEX, INSPEC, ICONDA, CURRENT CONTENTS, all acessable via the intranet.
- Library functions automated. Electronic commucation is used by the staff.
- Free access to the intranet. Group work and multimedia areas. About 600 places for reading.



Computer Center (CICA)

- **MISSION:** *TO PROVIDE INFORMATIC RESOURCES AND SERVICES TO ALL THE ACADEMIC COMMUNITY, PROMOTING ITS USE AND INOVATION*
- **FEUPNET:** ATM Local network with a OC-12 (622) Mbps) core. 6000 access points. Remote access from home using dial-up connections.
- **SiFEUP:** all relevant information. Infrastruture for application development .
- **UNIX/LINUX** and **NT** clusters. **BOWULF** cluster for research.
- 30 computer labs for general use. Dual boot **LINUX/NT** PCs.

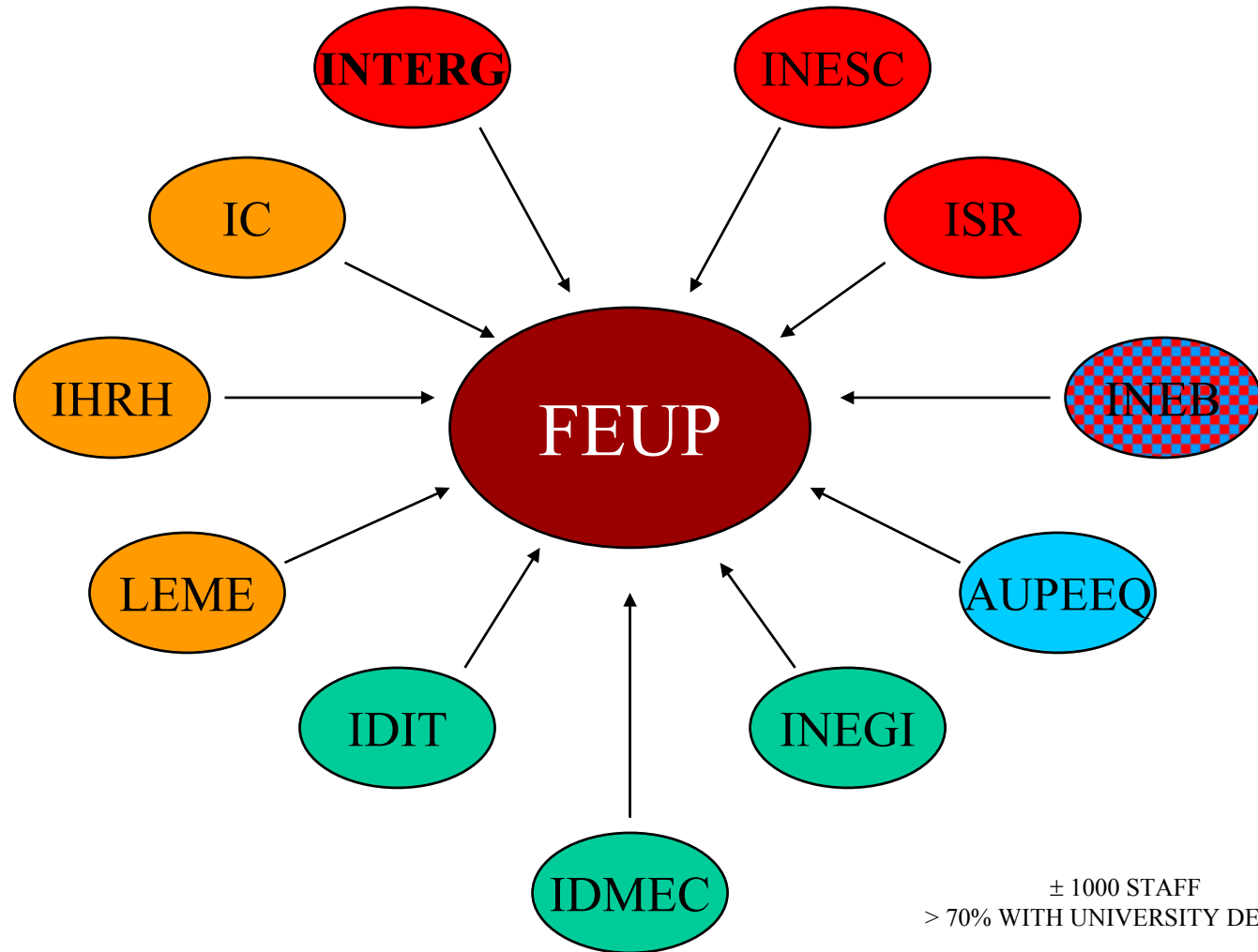
FEUP - INTERNATIONALIZATION

- MOBILITY PROGRAMMES
 - STUDENTS
 - TEACHING STAFF
 - NON - TEACHING STAFF
- FOREIGN Ph.D STUDENTS
- TEACHING STAFF WITH Ph.D.
 - U.S.A. - 15
 - U.K. - 50
 - FRANCE - 15
 - BELGIUM - 2
 - DENMARK - 2
 - CANADA - 2
 - SWITZERLAND - 3



- MORE THAN 50 R&D PROJECTS WITH FOREIGN INSTITUTIONS (JUST ON FEUP)
- VISITING PROFESSORS
- UNESCO CHAIRS (2)

UNIVERSE FEUP



RESEARCH CENTERS

- CEDEC** Centre for Research in Civil Engineering
- CEFAT** Centre for Research in Physics, Acoustics and Telecommunications
- CEFT** Centre for Research in Transport Phenomena
- CTQAA** Centre for Research in Chemical, Environmental and Food Technology
- CISE** Centre for Research in Electrical Systems
- LSRE** Laboratory of Separation and Reaction Engineering
- IMAT** Institute of Material Sciences
- NIA&R** Artificial Intelligence & Robotics Group
- LEPAE** Laboratory of Process Engineering Environment and Energy
- ISR-Porto** Systems for Development and Technological Research-Porto

Research Institutes (UNITS)

- AUPEEQ** University-Industry Interface Association in Chemical Engineering
- IC** Institute of Construction
- IDIT** Institute for Development and Technological Research
- IDMEC** Mechanical Engineering Institute
- IHRH** Hydraulics and Water Resources Institute
- INEB** Biomedical Engineering Institute
- INEGI** Institute of Mechanical Engineering and Industrial Management
- INESC** System and Computers Engineering Institute
- INTERG** Energy Institute
- ISR** Systems for Development and Technological Research
- LEMC** Laboratory for Testing of Construction Materials





Hydraulics and Water Resources Institute

Interface created in 1986 by the Hydraulics Group of FEUP

- 14 PhD's
- 3 MSc Assistants

PURPOSE:

- TRANSFERRING OF RESEARCH AND INDUSTRIAL KNOWLEDGE TO
 - INDUSTRY
 - PUBLIC ADMINISTRATION
- IN HYDRAULICS, WATER RESOURCES AND ENVIRONMENTAL AREAS.



Institutional Collaboration



- **Gaia city municipal water company**

Company responsible by water supply, sewage and wastewater treatment systems and management, urban and sea water rehabilitation

- **Collaboration to the Project: GIS expertise**





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Project RESEARCH GROUP

Rodrigo Maia (Prof. FEUP, *Main Responsible*)

Veloso Gomes (Full Professor FEUP, Director IHRH)

J. Poças Martins (Prof. FEUP, Director Águas de Gaia, E.M)

Pedro M. Castro (Prof. Univ. Moderna, Centre for Innovation and Development
of Águas de Gaia, EM)





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WORK RELATED TO THE PROJECT

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Hydraulics and Water Resources Institute

Projects on different Hydraulics, Water Resources and Environment, namely:

- Management of small coastal rivers in urban areas
- Management Plans for large Water Supply Systems (Porto Metropolitan Area System; Cávado River Supply Area System)
- Management Plans for large urban sewage systems (Porto Metropolitan Area)
- Coastal Management Plans.
- Impacts of rivers and sediment transport on estuaries (Douro River estuary) and coastal zones (NW Portuguese coastal zone).





Lavra and Perafita area small rivers requalification





Global Solution for Drainage, Treatment and Final Destination for the Sea and Douro River Estuary Coast of Porto and Gaia

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Hydraulics and Water Resources Institute

- **Project “Vulnerability Assessment of Portuguese Coastal Waters and Coastal Zones” (1994-1997)**

Client: Direcção-Geral do Ambiente, Ministry of Environment and Natural Resources

Partners: IHRH (Co-ordination, *Prof. Veloso Gomes*)

FEUP

ENSP, National School of Public Health

IZAN (UP), Augusto Nobre Zoological Institute

ICBAS (UP), Abel Salazar Biomedical Institute

IDAD (UA), Environment and Development Institute

U. MINHO, Earth Sciences Department

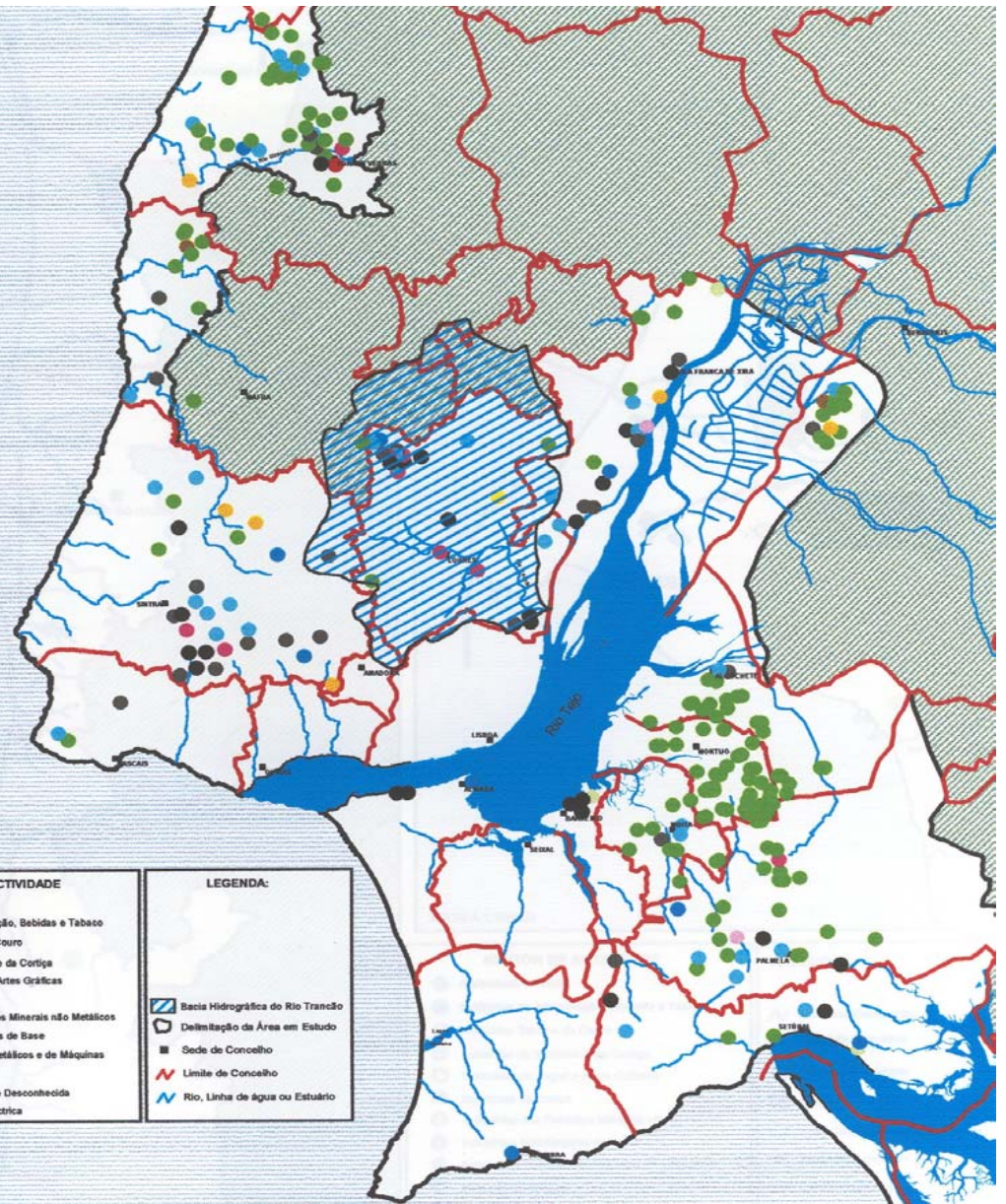
LNEC, National Laboratory of Civil Engineering

IMAR (UC), Sea Institute

AQUAIBÉRICA, Aquaculture and Fishing, Lda

850 000 Euro





SECTOR DE ACTIVIDADE	LEGENDA:
● Agricultura e Pesca	▨ Bacia Hidrográfica do Rio Trancão
● Indústrias da Alimentação, Bebidas e Tabaco	▭ Delimitação da Área em Estudo
● Indústrias Têxtil e do Couro	■ Sede do Concelho
● Indústrias da Madeira e da Cortiça	— Limite de Concelho
● Indústrias do Papel e Artes Gráficas	~ Rio, Linha de água ou Estuário
● Indústrias Químicas	
● Indústrias dos Produtos Minerais não Metálicos	
● Indústrias Metalúrgicas de Base	
● Fabricação de Produtos Metálicos e de Máquinas	
● Serviços de Saúde	
● Indústria de Atividades Desconhecida	
● Produção Energia Eléctrica	



Hydraulics and Water Resources Institute

• Coastal Protection Project (1998-2003)

Client: Portuguese Ministry of Environment and Natural Resources

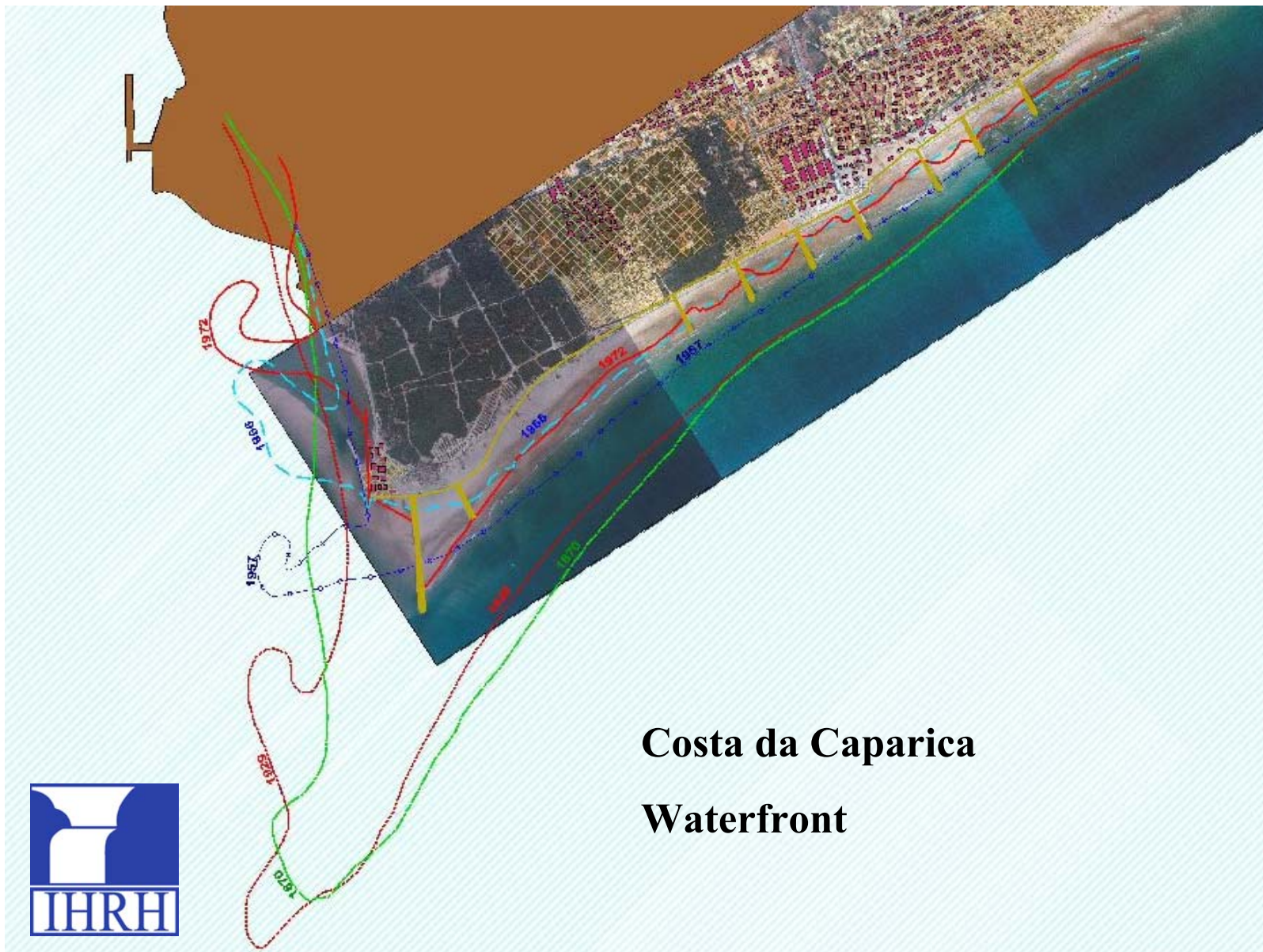
Partners: FEUP / IHRH (Main Researcher: *Prof. Veloso Gomes*)

80 000 Euro / year

Scope:

- **Assessment on Coastal Management Plans (POC's) elaboration and implementation**
- **Risk analysis evaluation of urban waterfronts and sand spits**
- **Analysis of alternative interventions**
- **Interventions re-avaliation**



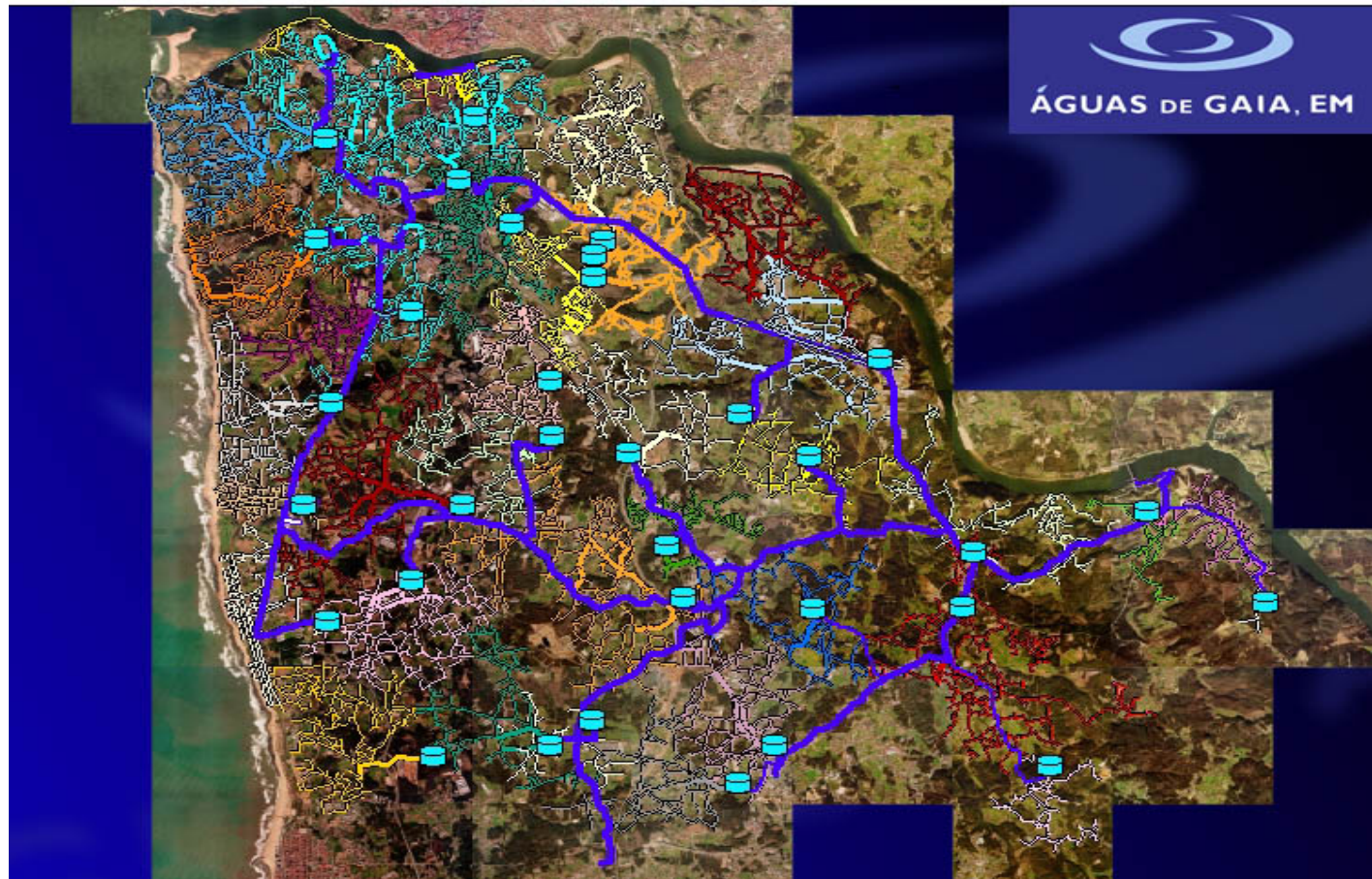


Costa da Caparica Waterfront



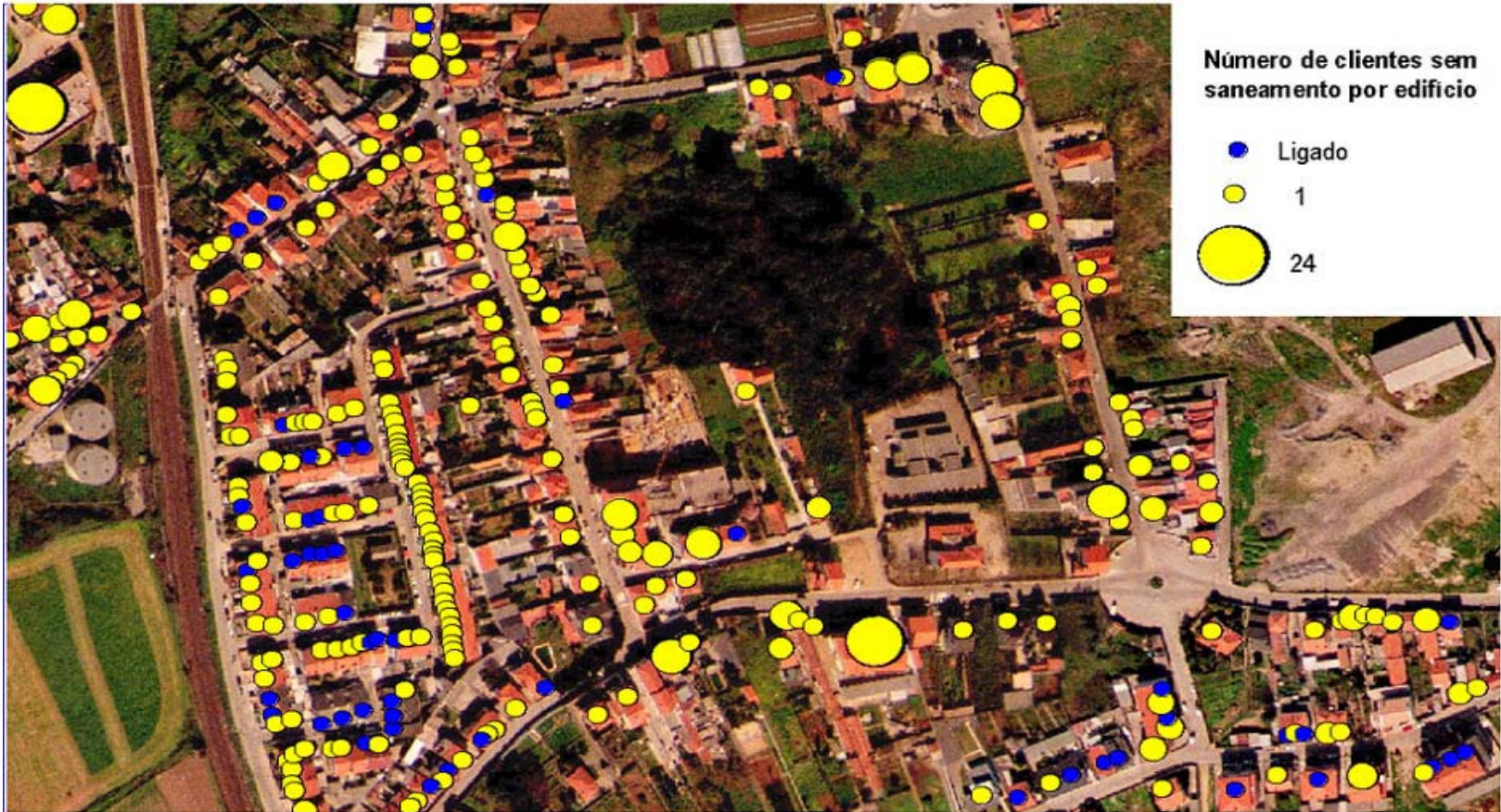
Other Relevant Team Projects

- **NATO PO-RIVERS, *Methodologies for Water Resources Development and Management in Portugal - application to the Northern Region*** (1988-93), NATO Science for Stability Program (**Director: Prof. J. Poças Martins**).
- **NATO MOLDOVA-WATERS “*Methodologies for Water Resources Development and Management in Moldova*”** (1996-2000), NATO Science for Stability Program, involving FEUP, New Lisbon University (UNL) and different university and institutional entities from Moldova (**Director: Prof. J. Poças Martins**).
- ***Real Time Monitoring and Decision Support Systems for International Rivers: Application to the Rivers Nistru and Prut*** (2000 –2003), NATO Science for Peace Program, involving Águas de Gaia, EM company, FEUP, UNL and different Moldava, Romenia and Ukraine entities (**Director: Prof. J. Poças Martins**).



Water Supply Network

Management of Reservoirs (flows, water levels, consumption control, water loss detection, etc.)



Sewerage System

Control of non-connected clients



ÁGUAS DE GAIA, EM

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Ribeira do Espírito Santo

Rehabilitation and Renaturalization of urban creeks



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ROLE IN THE PROJECT

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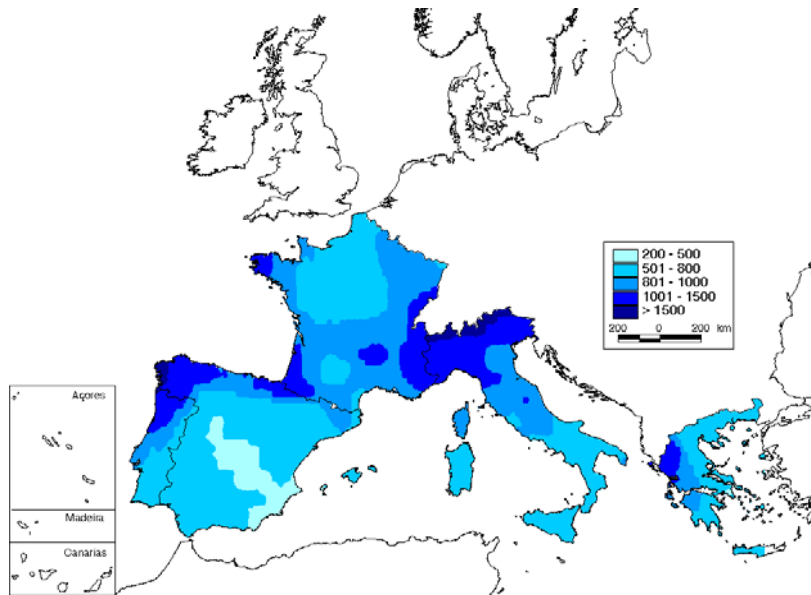


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ROLE IN THE PROJECT:

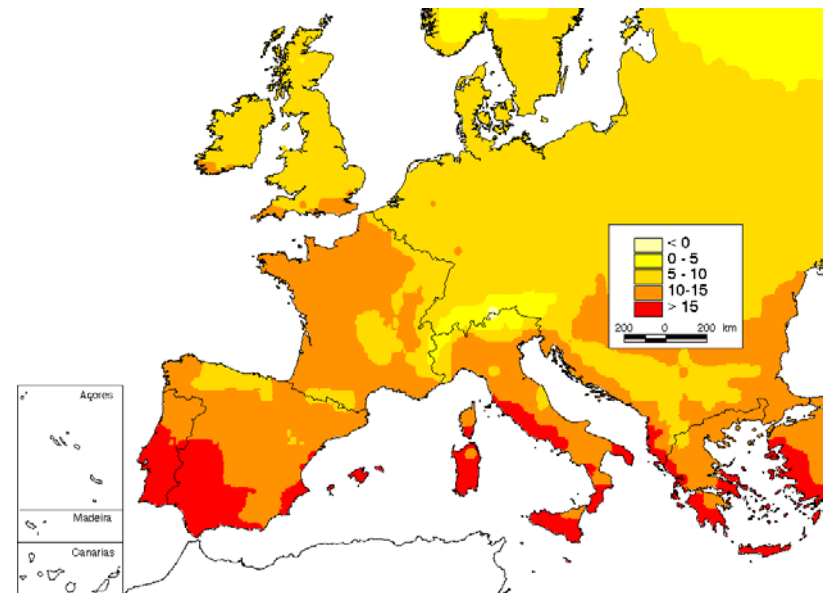
- **Portuguese Case Study**
- **WP6**
- **WP8.1, WP8.2, WP8.3, WP9**
- **Rest of work packages**





Averaged yearly precipitation

Temperatures



Portuguese Case Study Context

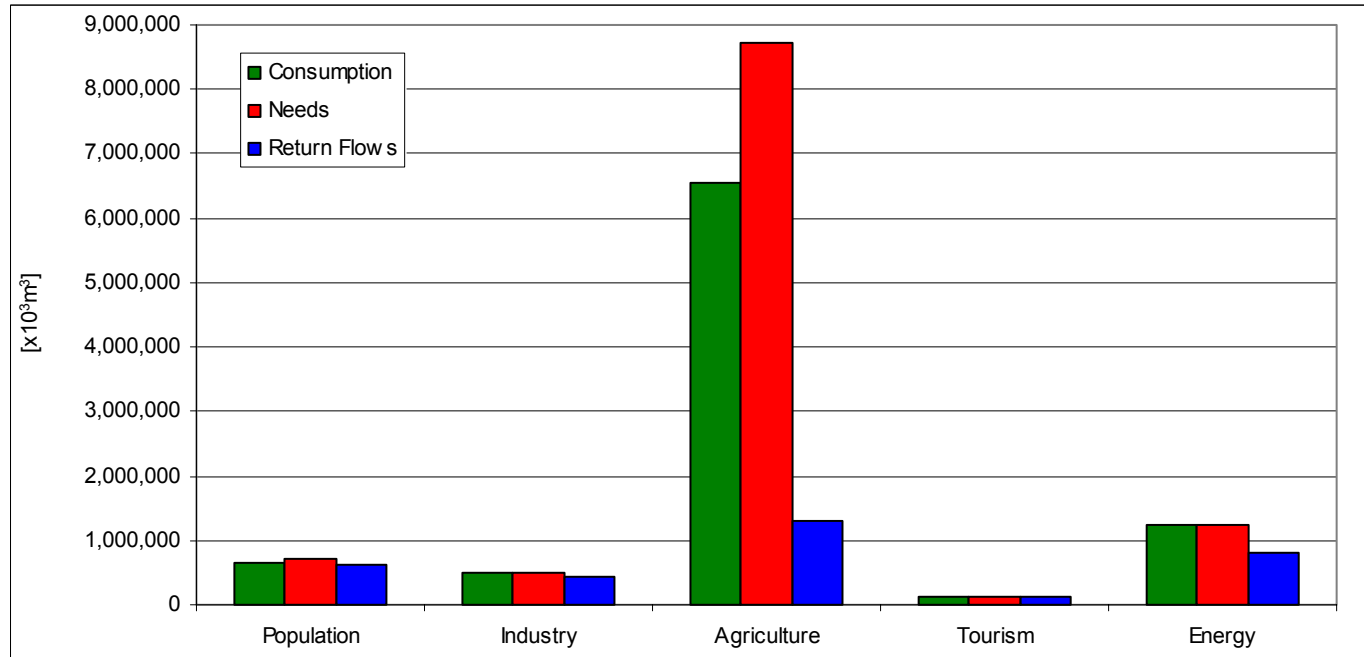
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Water use by activities

Water resources use:

Portugal: 20-25%

Spain: 40 to 45%

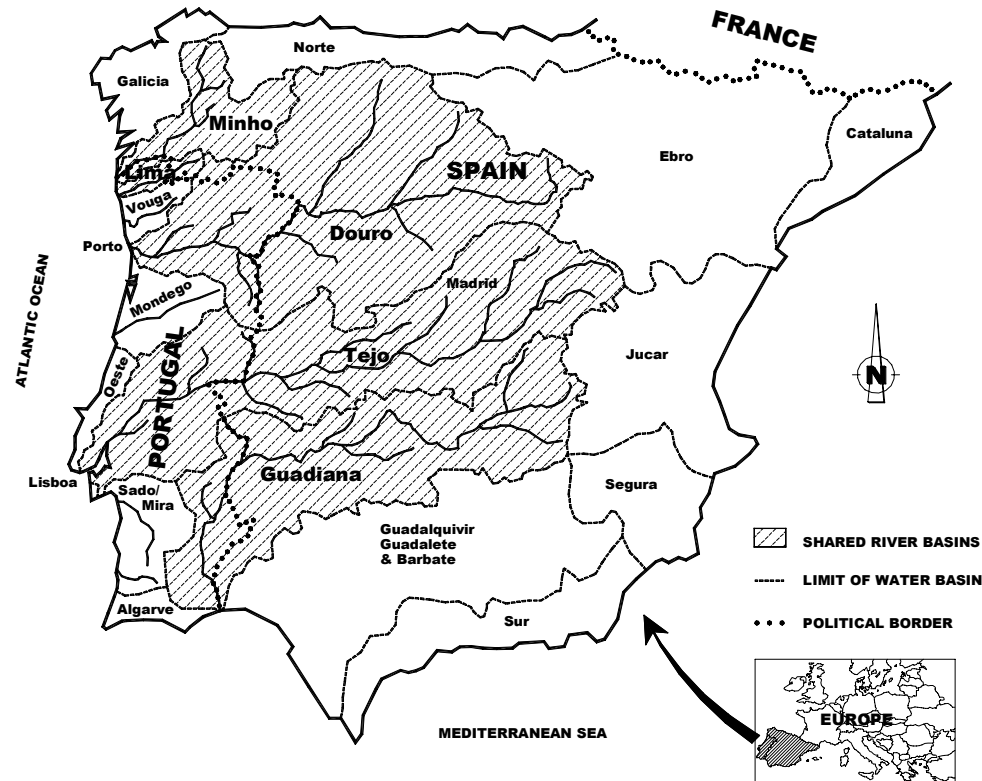
UE: 21%

Portuguese Case Study Context



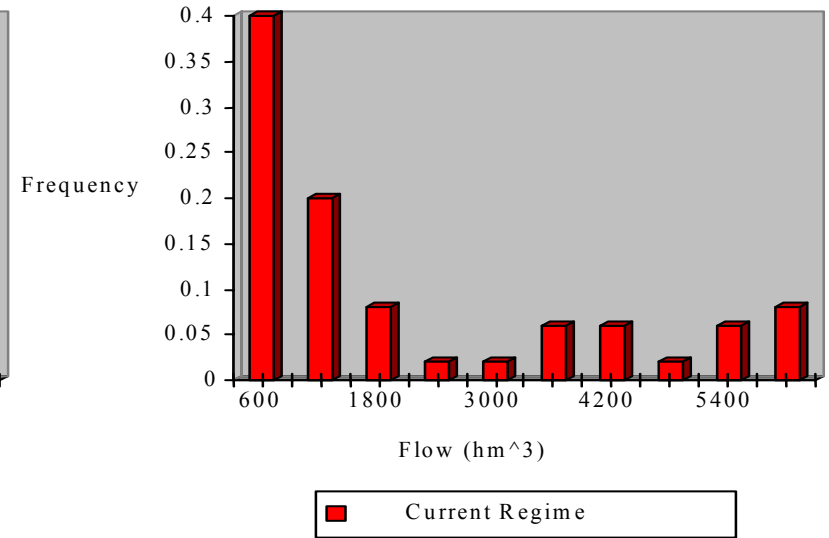
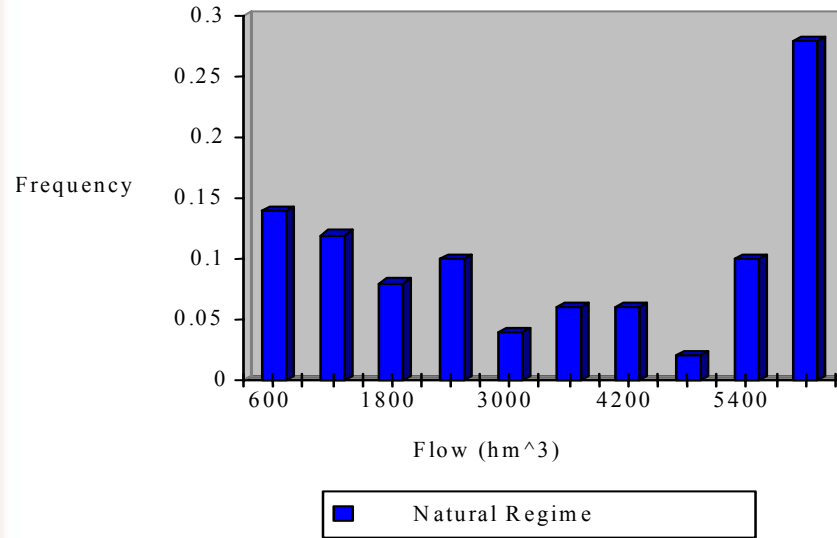
Country	Population (1995) (*10 ³) inhab.	Internal resources			External resources*		Total resources		
		mm	Km ³	hm ³ /inhab.ano	mm	km ³	mm	km ³	hm ³ /inhab.ano
Portugal	9,797	379	35	3,573	271	25	650	60	6,124
Spain	39,109	220	111	2,838	0	0	220	111	2,838
EU	371,024	367	1,187	3,199			367	1,187	3,199

Internal, external and total water resources



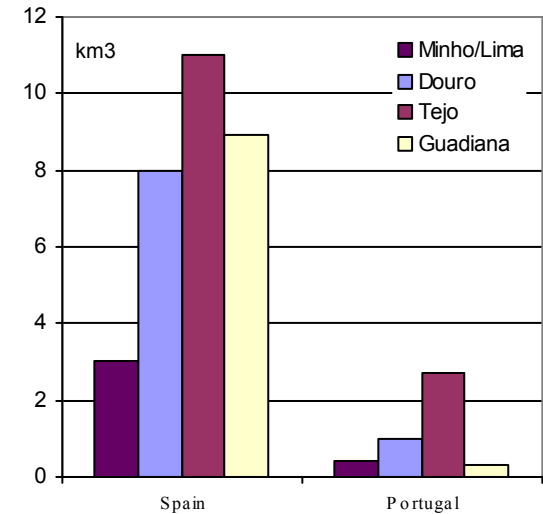
Portuguese Case Study Context

Guadiana River (border section)

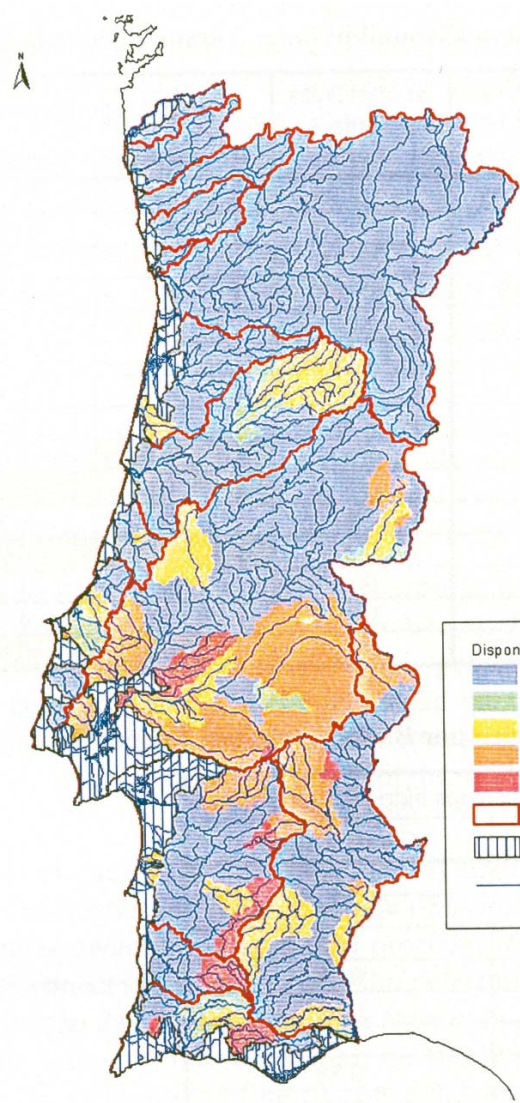


Upstream influence on Portuguese water resources

Storage Capacity



Portuguese Case Study Context



River Basin	Yearly usable water (regularized flow), (1)			Total Needs (hm3) (2)	Ratio (1) / (2)		
	G 90 %	G 80 %	G 50 %		G 10 %	G 20 %	G 50 %
Minho	5931	6693	8465	89	66,63	75,19	95,10
Lima	2110	2462	3065	228	9,28	10,82	13,47
Cávado	1769	1960	2099	310	5,70	6,32	6,77
Ave	612	794	1048	370	1,65	2,15	2,83
Leça	38	60	94	31	1,25	1,96	3,08
Douro	9112	11920	17841	1224	7,44	9,74	14,57
Vouga	721	1108	1732	447	1,61	2,48	3,87
Mondego	1452	2324	3430	869	1,67	2,67	3,95
Lis	63	121	225	73	0,85	1,65	3,07
Rib. Oeste	131	163	267	193	0,68	0,85	1,38
Tejo	6398	8878	14021	2096	3,05	4,24	6,69
Sado	612	716	918	655	0,79	0,94	1,40
Mira	268	289	291	90	2,99	3,21	3,23
Guadiana	962	1476	3156	358	2,69	4,18	8,81
Rib. Algarve	105	160	327	256	0,40	0,67	1,28

Disponibilidades / Necessidades	
	Escassez hídrica em menos de 5% dos anos
	Escassez hídrica entre 5% a 10% dos anos
	Escassez hídrica entre 10% a 20% dos anos
	Escassez hídrica entre 20% a 50% dos anos
	Escassez hídrica superior a 50% dos anos
	Limite de plano de bacia hidrográfica
	Áreas não abrangidas pela avaliação
	Rede hidrográfica

Water deficient regions

River Basin	Balance of freshwater resources	
	Monthly Guarantee	Annual Guarantee
Minho	1,00	1,00
Lima	1,00	1,00
Cávado	1,00	1,00
Ave	0,92	0,58
Leça	0,74	0,04
Douro	1,00	1,00
Vouga	0,94	0,58
Mondego	1,00	1,00
Lis	0,64	0,00
Rib. Oeste	0,71	0,00
Tejo	1,00	1,00
Sado	0,88	0,56
Mira	1,00	1,00
Guadiana	1,00	1,00
Rib. Algarve	0,96	0,80

Portuguese Case Study Context