Douro River Basin

UNESCO IHP-HELP

International HELP Symposium on River Basin Level Responses to Water Scarcity and Drought under Uncertain Climate Futures

Mirandela / Portugal
27, 28 May 2010

Organization:

United Nations Educational, Scientific and Cultural Organization

International Hydrological Programme

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International UNESCO-HELP Douro River Basin Symposium

River Basin Level Responses to Water Scarcity and Drought under Uncertain Climate Futures

Water Scarcity and Drought: Setting the Stage

(Opening Session)

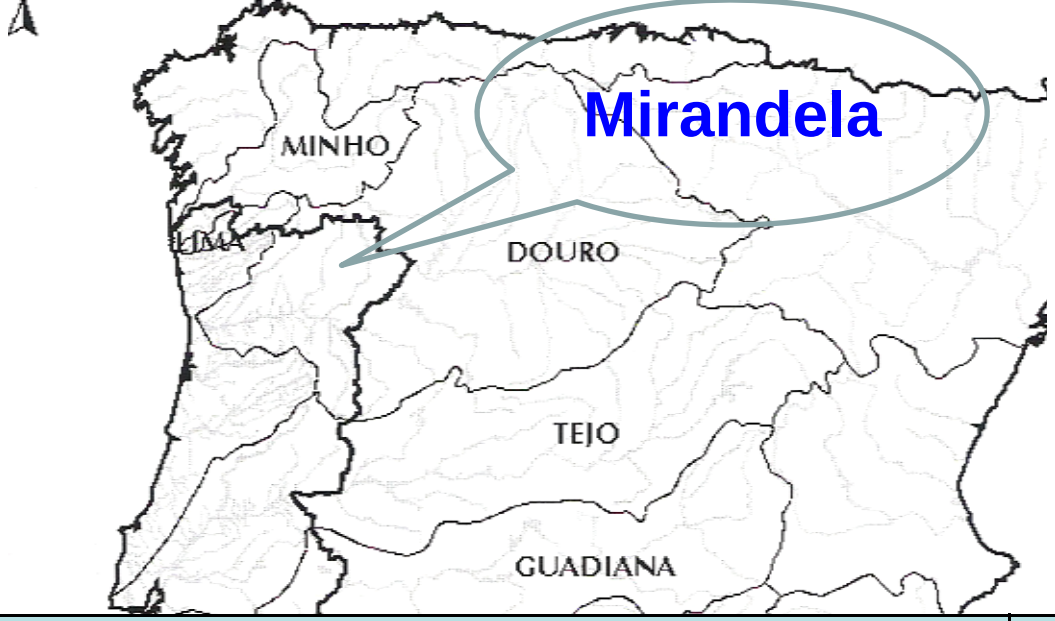
Mirandela, Portugal

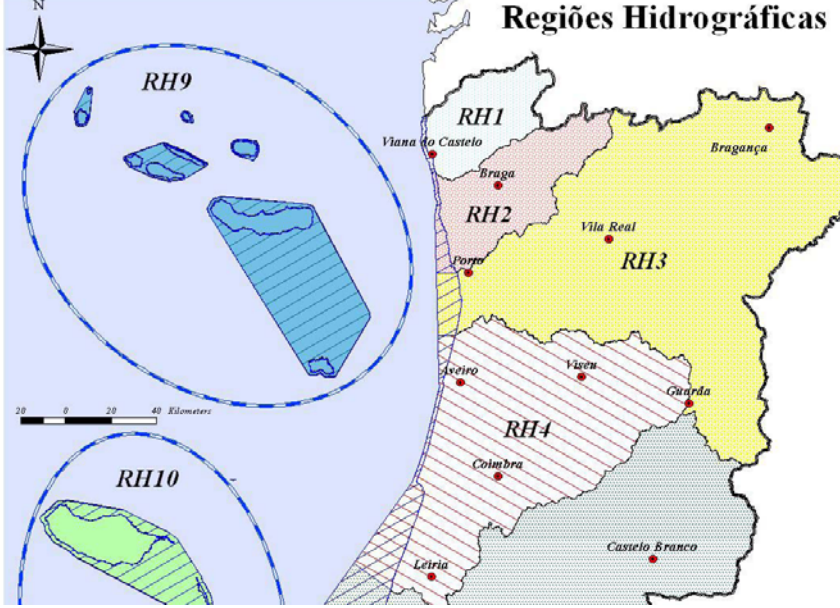
Naim Haie
University of Minho, Portugal
naim@civil.uminho.pt

27 / 28 May 2010

Order

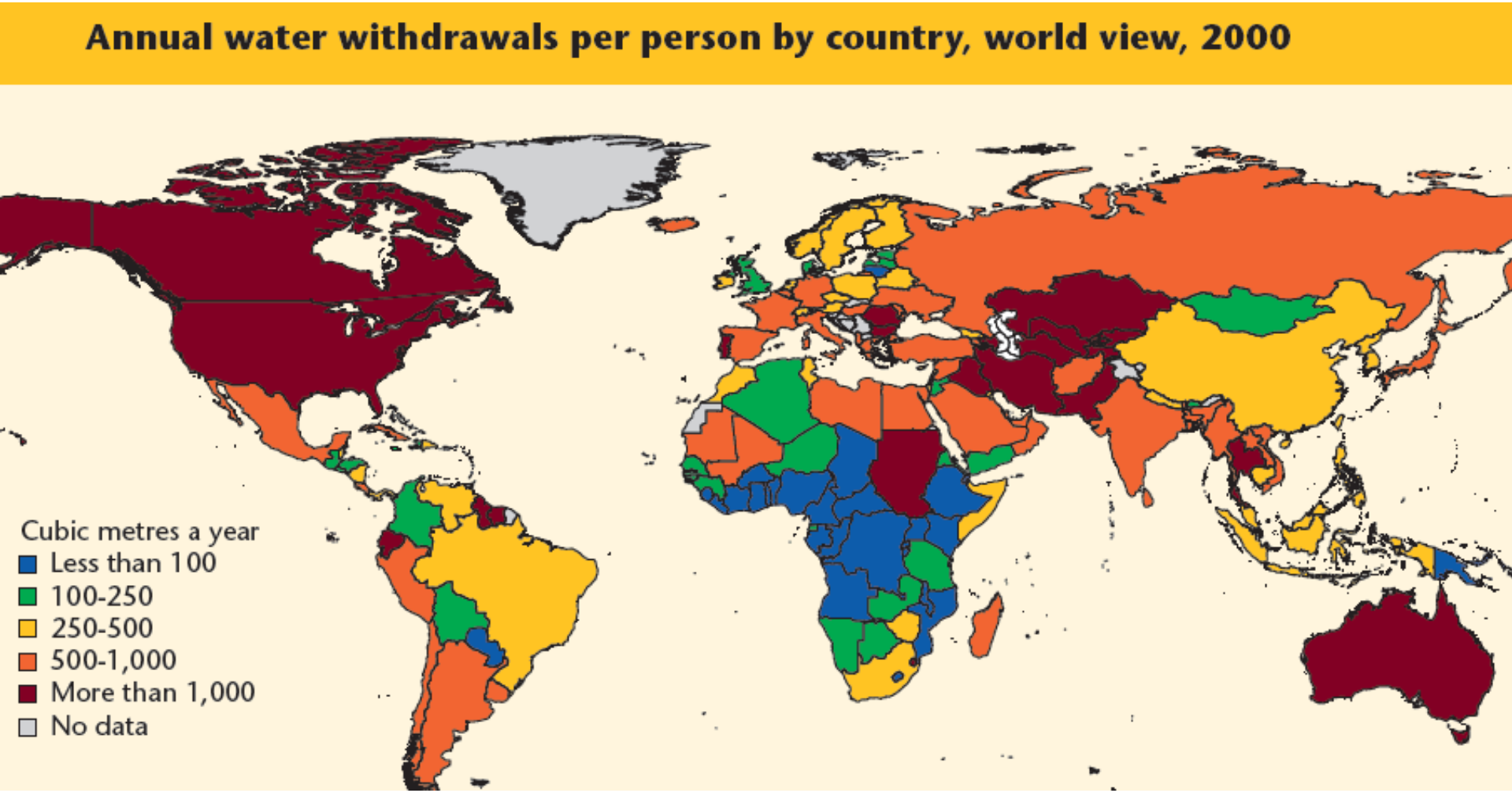
- Douro River Basin
- Pressures
- External Drivers, CC
- Uncertainty
- Responses





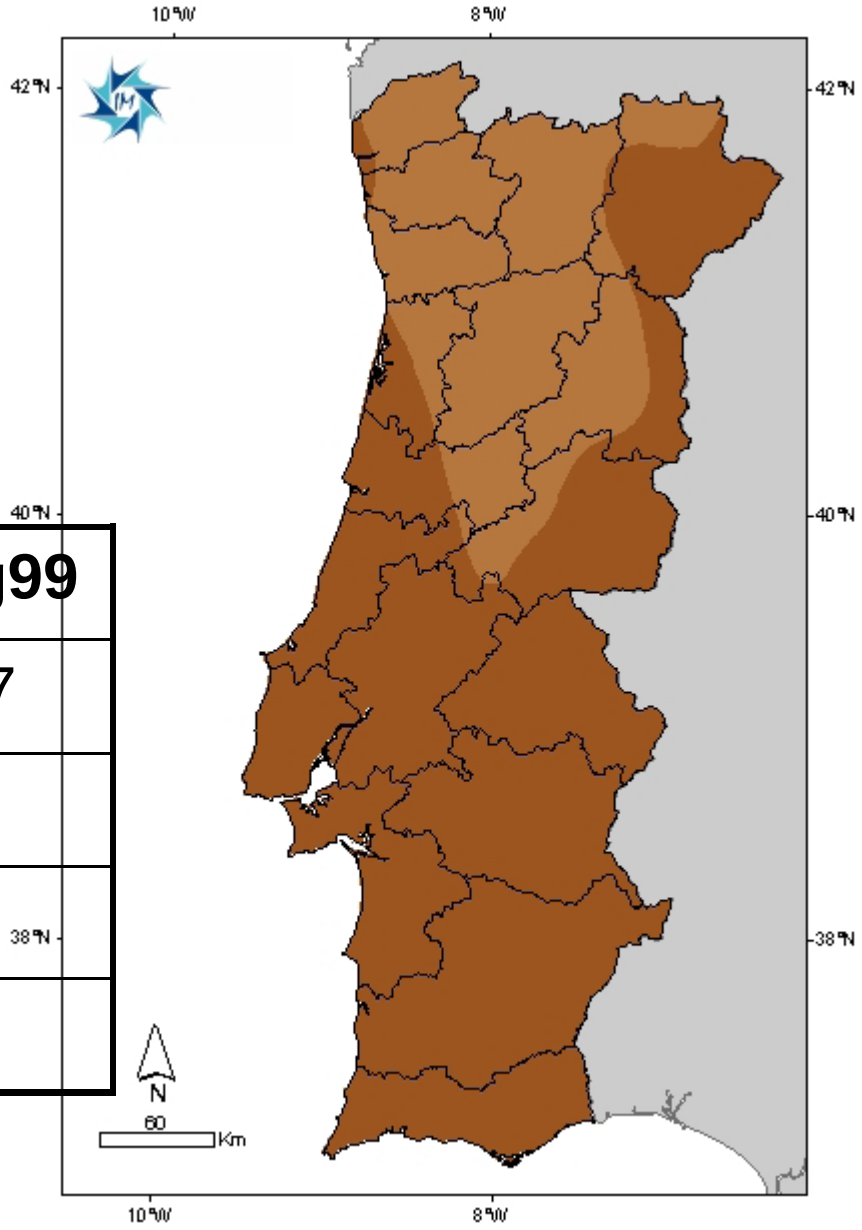
Douro River Basin	Portugal	Spain
Area, km2 (largest in Iberian Peninsula)	18,500 (19%)	79,000 (81%)
Average natural runoff, km^3/year	8.2 (35%)	15.0 (65%)
Liters/m^2/year	443	190
Volume/Person, m^3/capita	4740	6608

UN-WWDR 2009


Annual water withdrawals per person by country, world view, 2000
Cubic metres a year
Less than 100
100-250
250-500
500-1,000
More than 1,000
No data

% of territory affected by drought

	Aug05	Mar05	Aug99
Fair	0	26	57
Moderate	0	22	6
Severe	29	28	0
Extreme	71	24	0

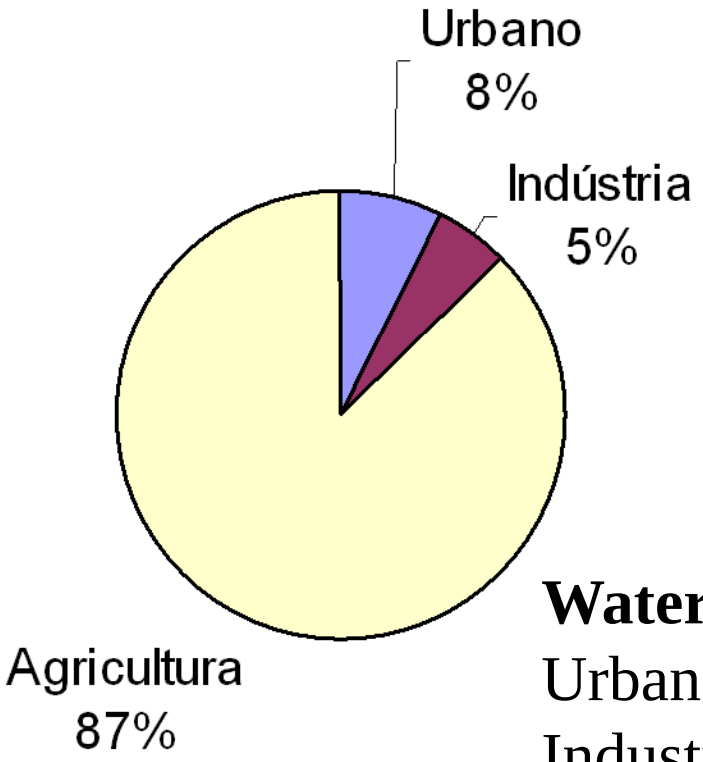


Palmer Drought Severity Index (PDSI) was used.


Judy Ledgerwood

Uso da Água em Portugal (M m3/ano)

Efficiencies:
Urban 60%
Agriculture 58%
Industry 71%



Water demand (m^3 / year)

Urban	570×10^6
Industry	385×10^6
Agriculture	6550×10^6

PNUEA, 2001, 2005

Water allocation is a problem.

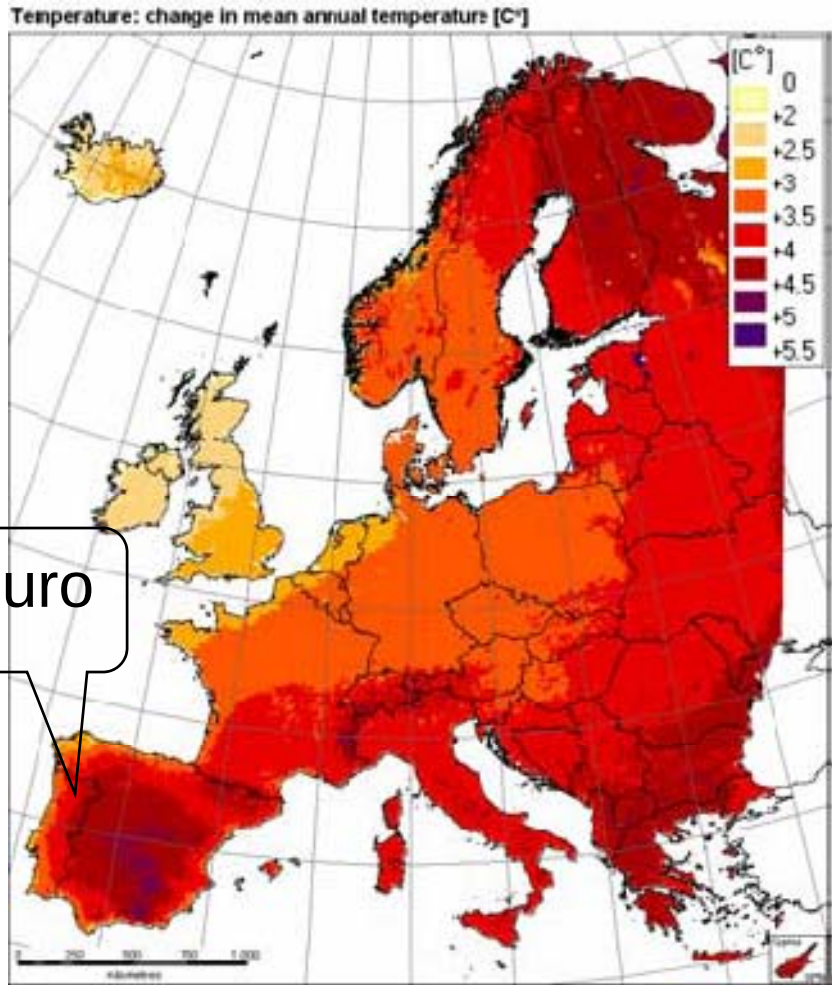
CO_2e emissions now

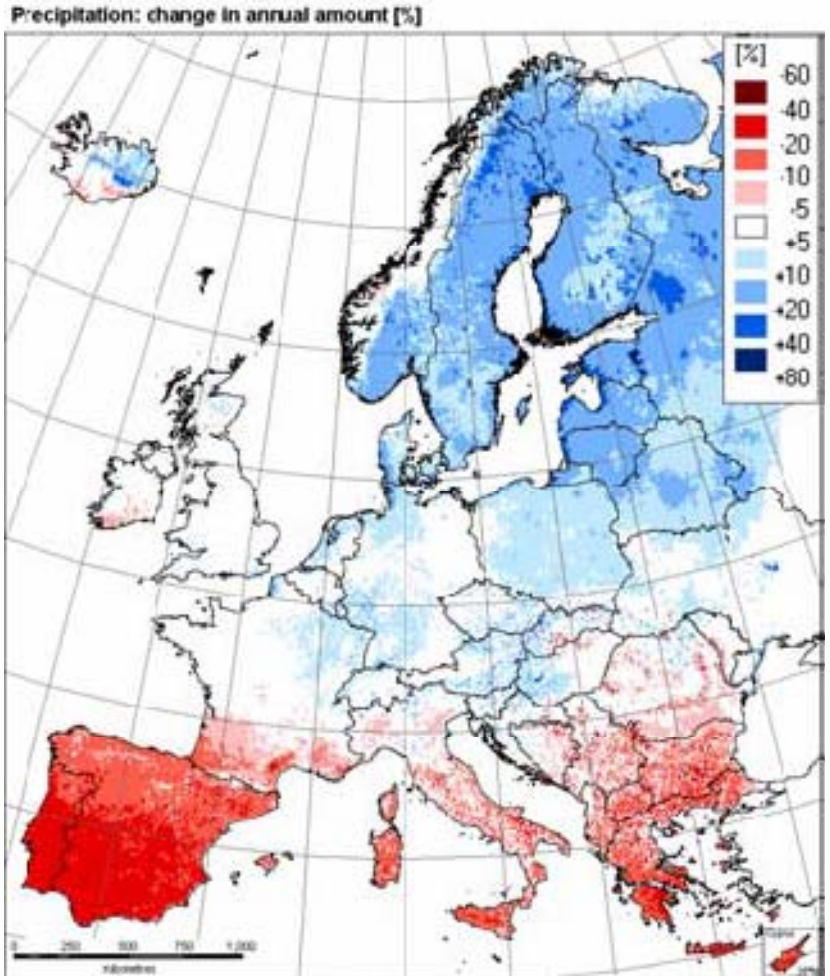
90 000 000

Kg / min !

"Annual GHG emissions are now at about 47 billion metric tons of carbon dioxide equivalent.“ Alex Bowen, Mattia Romani, and Nicholas Stern, 2010. Finance & Development. March.

Mean annual evolution until end of century

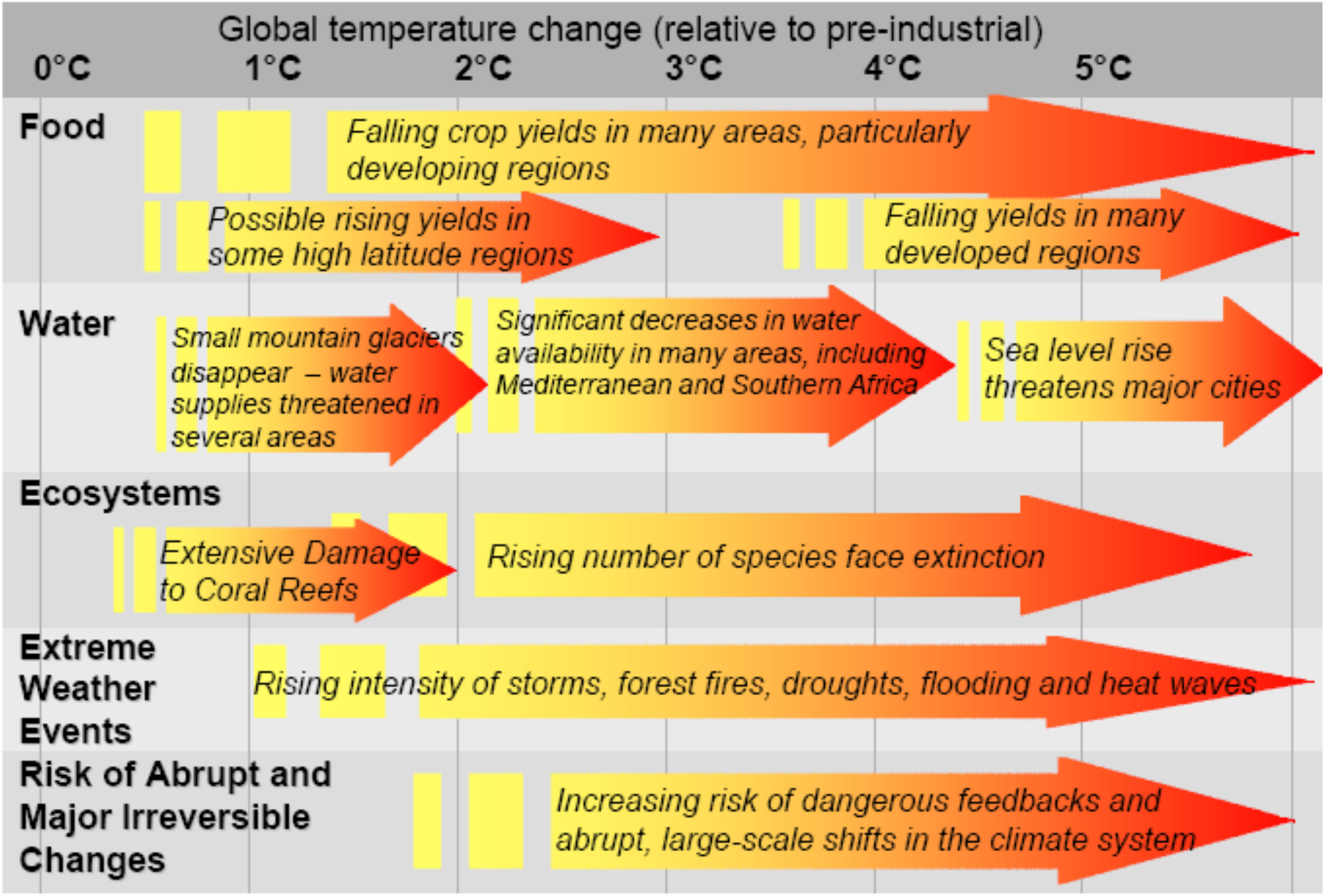




Temperature **Precipitation**

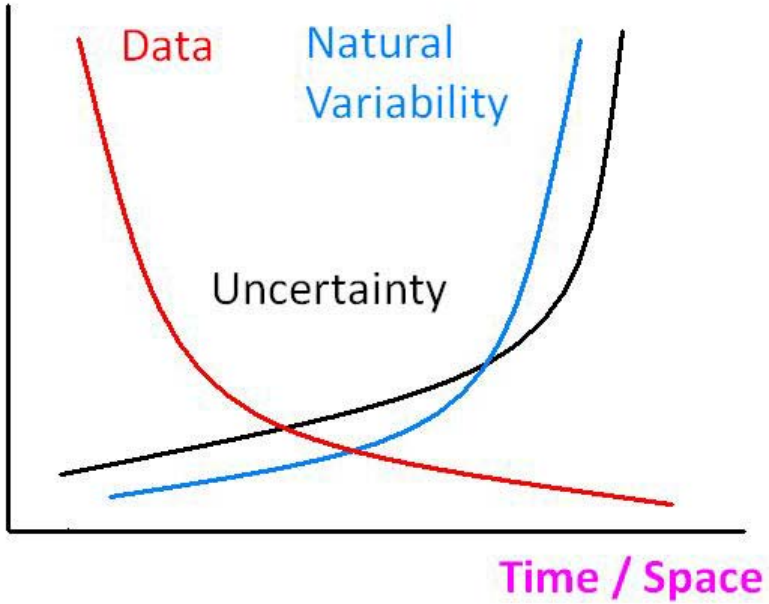
(European Commission 2007)

Projected Impacts of Climate Change



STERN REVIEW

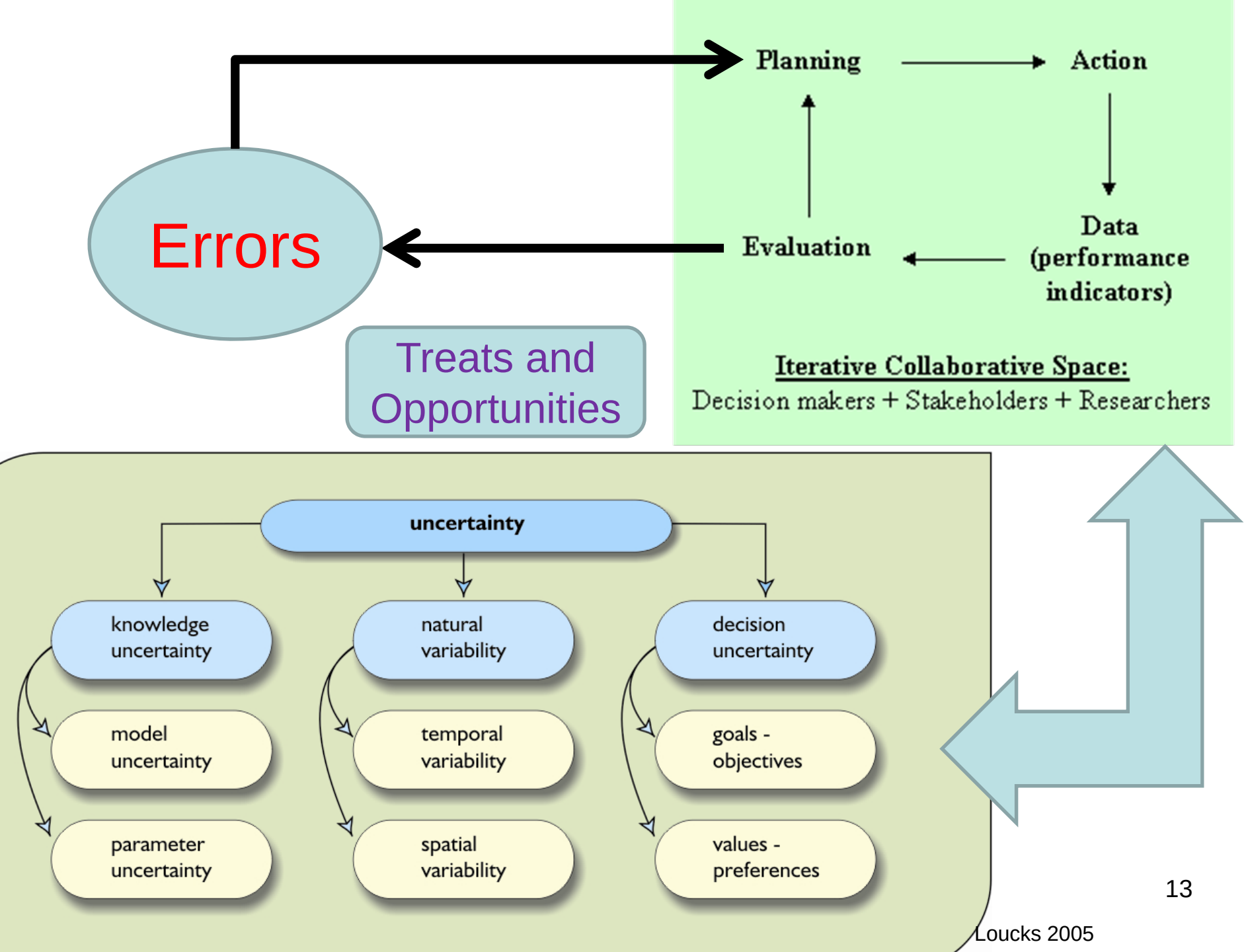
System functions, uses and issues



functions & uses	flooding	scarcity	erosion/sedimentation	biodiversity	continuity	salinity	acidification	pollution	eutrophication
	issues								
human health	●	●	●			●		●	●
ecosystem functioning	●	●	●	●	●	●	●	●	●
fisheries	●	●	●	●	●	●	●	●	●
recreation	●	●	●	●	●	●		●	●
drinking water	●	●	●			●	●	●	●
irrigation		●				●		●	●
industrial use		●	●			●		●	●
hydro power		●	●		●				
transport medium & navigation	●	●	●		●				

WS&D most problematic

Loucks, P, 2005


Planning
Action
Data (performance indicators)
Evaluation
Errors
Treats and Opportunities
Iterative Collaborative Space:
Decision makers + Stakeholders + Researchers
uncertainty
knowledge uncertainty
model uncertainty
parameter uncertainty
natural variability
temporal variability
spatial variability
decision uncertainty
goals - objectives
values - preferences

Loucks 2005


Thank you!
Obrigado!

UNESCO IHP-HELP

Simpósio Internacional Gestão de Bacias Hidrográficas e Respostas à Escassez de Água e Secas em Futuros Climáticos Incertos

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Sociedade Portuguesa de Simulação Ambiental e Avaliação de Riscos

Universidade do Minho Escola de Engenharia

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