Addressing cross-sector and transboundary issues in adaptation to climate change: Spain-Portugal case

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Adaptation
The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate harm or exploit beneficial opportunities. In natural systems, human intervention may facilitate adjustment to expected climate and its effects.

*Incremental adaptation*
Adaptation actions where the central aim is to maintain the essence and integrity of a system or process at a given scale.

*Transformational adaptation* Adaptation that changes the fundamental attributes of a system in response to climate and its effects.

Vulnerability
The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts including sensitivity or susceptibility to harm and lack of capacity to cope and adapt. **Contextual vulnerability and Outcome vulnerability.**
Cross-sectoral focus

Urban

Competition for land

Biodiversity

Competition for water

Water

Impacts

Forests

Coasts
Integration of vulnerability assessments can be:

**Cross-sectoral integration** involves integrating impacts across related sectors. These are sectors that can be directly affected by climate change and by climate change impacts in other sectors. Cross-sectoral integration involves examining a small number of sectors that are strongly interrelated, such as water and health. For example, human health can be affected by changes in water resource management. Similarly, human health can be affected by decreases in food security, as a result of declines in agricultural production.

**Multi-sectoral integration**, involves combining results across all impacts in all sectors. The objective is to estimate the total effects of climate change or to compare relative impacts and vulnerabilities across sectors. This can involve examining impacts across sectors using a common method to sum, compare or contrast results following sector-specific vulnerability assessments. Alternatively, integrated approaches can be used to inform vulnerability assessments overall, helping to ‘frame’ the approaches used and to ensure that V&A is undertaken in an integrated manner from the beginning.
(1) **Biodiversity:** preserving and managing diversification of land use has great potential for reducing climate related risks.

(2) **Technical:** there is scope for the development and exchange of more sustainable technologies and information systems. Existing technical solutions run into limits and add to undesirable and/or long-term effects.

(3) **Financial:** there are opportunities for public-private partnerships in which marketable products obtain additional support in exchange for providing social and environmental services that support adaptation. This could help counter the assumption that adaptation is too costly and uncertain, compared to expected benefits.

(4) **Institutional:** divided, changing or unclear responsibilities are key constraints for adaptation actions. Engaging with potential opponents is an important activity in adaptation planning.

(5) **Social:** adaptation can fail or be counterproductive because social processes and structures are imperfectly understood. Culture and traditional knowledge – often valid to coping strategies – need to be taken into account when designing new policies and measures.

(6) **Cognitive:** diverse perceptions of risks and their causes should be taken into account in adaptation policies, supporting the notion of adaptation as a social learning process, crucial to address the mismatch between scientific adaptation theory and adaptation practice on the ground.
Challenges to monitoring and evaluation adaptation (Gigli, 2008; OECD, 2009)

Challenges related to measuring the performance of adaptation interventions, includes difficulties in clearly:

- Defining adaptation goals and objectives (i.e. what is successful/effective adaptation?);
- Defining success against uncertainty of impacts and moving baselines of climate conditions and disaster risk;
- Determining adequate timing for the evaluation of adaptation activities to derive a useful measure of effectiveness and efficiency of the intervention;
- Accounting for the reverse logic phenomenon (i.e. how to measure success if the event addressed by the intervention does not occur?);
- Distinguishing a project’s contribution to particular development outcomes in light of many other influencing factors (attribution gap);
- Identifying conclusive indicators for the performance and obtain the necessary reliable and measurable data.
International rivers in the Iberian Peninsula
Total water resources in common

<table>
<thead>
<tr>
<th>RIVER BASIN</th>
<th>Total Área (km²)</th>
<th>Portugal</th>
<th>Spain</th>
</tr>
</thead>
<tbody>
<tr>
<td>MINHO/MIÑO</td>
<td>17.080</td>
<td>850</td>
<td>16.230</td>
</tr>
<tr>
<td>LIMA/LIMIA</td>
<td>2.480</td>
<td>1.180</td>
<td>1.300</td>
</tr>
<tr>
<td>DOURO/DUERO</td>
<td>97.600</td>
<td>18.600</td>
<td>79.000</td>
</tr>
<tr>
<td>TEJO/TAJO</td>
<td>80.600</td>
<td>24.800</td>
<td>55.800</td>
</tr>
<tr>
<td>GUADIANA</td>
<td>66.800</td>
<td>11.500</td>
<td>55.300</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>264.560</strong></td>
<td><strong>56.930</strong></td>
<td><strong>207.630</strong></td>
</tr>
</tbody>
</table>

- Total water resources
- Surface water resources
- Groundwater resources
- Total water uses
Iberian Peninsula: Annual Precipitation

Source: Ninyerola, Pons and Roure (2005)
Annual variation of the precipitation in Portugal

Source: Portuguese Weather Service

STRONG VARIABILITY
Water Transfer Between River Basins

Sharing water resources

<table>
<thead>
<tr>
<th>Rainfall (mm)</th>
<th>Portugal</th>
<th>Spain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minho/Miño</td>
<td>2040</td>
<td>1228</td>
</tr>
<tr>
<td>Lima/Limia</td>
<td>2280</td>
<td>1440</td>
</tr>
<tr>
<td>Douro/Duero</td>
<td>1030</td>
<td>611</td>
</tr>
<tr>
<td>Tejo/Tajo</td>
<td>830</td>
<td>633</td>
</tr>
<tr>
<td>Guadiana</td>
<td>580</td>
<td>521</td>
</tr>
<tr>
<td>TOTAL</td>
<td>6760</td>
<td>4433</td>
</tr>
</tbody>
</table>

Average flow transfer among RBDs (hm³)
The Tagus-Segura water transfer

The water transfer in figures:

- In 1978 the first water runs through the transfer.
- From the Iberian System in Central Spain:
  - 600 hm$^3$ of water goes to the Mediterranean Southeast region.
  - 50 hm$^3$ of water goes to the protected area Tablas de Daimiel.
- Length: 286 km

More water, but not for irrigation

Since 1999 the whole 600 hm$^3$ of water per year is being transferred. The main reason for the increase in transferred water is the improvement of the availability of infrastructures to make use of the water. In spite of this increase, not all planned irrigations are working. It can be concluded that the transferred water goes more and more to urban and tourist water supply instead of irrigation.
Tagus-Segura water transfer
The Tagus-Segura water transfer has serious negative impacts on the donor river basin

- 60% of the natural flow in the Tagus river basin is being transferred.
- The natural surplus decreased 10% due to climate conditions, while the amount of transferred water increased.
- There is less inflow of clean water and more inflow from the contaminated rivers from Madrid. This means that the water quality in the Tagus has deteriorated.
Annual transferred quantities

[Graph showing annual transferred quantities from 1978/79 to 2000/01, with data points from 1981 onwards showing a significant increase.]
The Albufeira Convention on the Cooperation for the Protection and Sustainable Development of Water Use in the International Iberian River Basins was signed by Portugal and Spain in 1998.

The main instruments for its implementation are the:

a) **Commission for the Follow-up and Development of the Convention (CADC)**

b) **Conference of the Parties (COP)**

The international recommendations to solve potential conflicts were adopted in the Convention.

The Convention guarantees stream flows to Portugal in “normal years” which, besides precipitation, involve in their definition the volume of water accumulated in dams in Spain.

“**Non-significant harm rules**” are limited to cases of environmental damage.
There are instances where the minimum flows have not been respected:


**Shortcomings**

- Limited stakeholder involvement in the CADC
- Small number of COP meetings
- No common management plans for the international rivers, only cooperation between national plans
- No shared climate change adaptation strategy for the international river basins
Precipitations tendencies in Europe 1960-2014

Scandinavia
Annual change of 20.64mm per decade

Iberian Peninsula
Annual change of -37.07mm per decade

EEA Report, 2013
A tale of two Europes

One threatened by drought  One threatened by floods

Figure 1.4 Water stress in European river basins under a base-line scenario by 2030

Figure 1.3 Recurrence of flood events in Europe between 1998 and 2005

Note: The water exploitation index is the percentage of available water resource abstracted each year.
Source: EEA, 2005b.

Source: EEA, based on data from Dartmouth Flood Observatory.
Too much - River floods

- The number of river flood events increased due to better reporting and land-use changes
- River floods are projected to become more frequent (also flash and urban drainage floods)

Relative change in river floods with a return period of 100 years between future period and 1961-1990 (SRES A1B)

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Too little - Water stress

- Minimum river flows are projected to decrease throughout Europe (especially in summer)
- Water stress is projected to increase, especially in the south. This is due to increases in water abstraction and/or decreases in water availability.
- In a ‘sustainability’ scenario water stress can be reduced.
- For agriculture increased efficiency for irrigation can reduce water abstractions, but this may not be sufficient to have enough water for aquatic ecosystems.

Source: EEA
EU funded research projects where adaptation in the Tagus and Guadiana river basins are studied:

**National level:**
- ADAM
- MEDIATION

**International level:**
- IMPRESSIONS (high-end scenarios) (involves the University of Lisbon)
- BASE (involves the University of Lisbon)
Guadiana
Spain/Portugal
Europe
Semi-arid climate, forest, agriculture, tourism.
Significant temperature increase, rainfall decrease
Case Study 1 – Adaptation options for agriculture in the Guadiana River Basin, Spain

The first case study was focused on the Guadiana river basin in south-central Spain, with an application of AHP to adaptation in the agricultural and water sectors. This basin is expected to be one of the most seriously affected by climate change in Spain, with potentially high impacts on irrigated agriculture. The case study began by specifying the adaptation strategies being considered by policy-makers at the national and regional level, representing the starting point for a stakeholder-driven appraisal and prioritization of potential options.
Conclusions, Adaptation enhanced by:

- Environmental, technical, financial, institutional, social, and cognitive / informational aspects of adaptation. In particular: clear implementation responsibility, flexible financial instruments, benefit and burden sharing, social learning and (transboundary) cooperation.

- Adaptation pilot projects and regional coalitions that test and debate a diverse set of new ideas. Pilots can deliver both on process & outcome.

- (Traditional) agro-ecological production systems and landscapes that regulate climate impacts.

- Concrete adaptation plans to share with government and donors.

- Support for diverse set of potentially better-adapted new activities rather than compensate impacts on existing activities.

- (Free & easy) access to info on climate impacts & adaptation options.
**IMPRESSIONS**

*Task leader: University of Lisbon and JDTâbara; Contributors: SEI, CU, ETHZ, PIK*

The main theme of the Iberian case study is land use and water resource management, including links to the global scale through migration from North Africa. The study will focus on socio-ecological resilience to high-end scenarios in two cross-boundary areas of Spain and Portugal, namely the Guadiana and Tagus river basins. The approach will assess changes in institutional practices and the information needed by national and local decision-makers to cope with high-end climate change, drawing on the multi-scale climate and socio-economic scenarios from WP2 and CCIAV modelling. The modelling work will simulate the interrelationships and feedbacks between key processes in hydrology, water management, forestry, agriculture, land use, population change and migration.
<table>
<thead>
<tr>
<th>Case Study</th>
<th>CC Primary Impacts</th>
<th>Adaptation Actions analyzed during BASE</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEEDS (Uni Leeds)</td>
<td>Flooding</td>
<td></td>
</tr>
<tr>
<td>Mental Health UK (Exeter)</td>
<td>Extreme events/flooding</td>
<td>Options for treatment</td>
</tr>
<tr>
<td>Cornwall Health (Exeter)</td>
<td>Mixture including Flooding, Heatwaves, temperature and precipitation increase</td>
<td>Primary, Secondary and Tertiary health interventions</td>
</tr>
<tr>
<td>Kalajoki River Basin (Syke)</td>
<td>Flooding (from precipitation)</td>
<td></td>
</tr>
<tr>
<td>Iberian (UPM; BC3; FFCUL)</td>
<td>Water scarcity</td>
<td></td>
</tr>
<tr>
<td>Mekong Delta (Deltares)</td>
<td>Flooding</td>
<td></td>
</tr>
<tr>
<td>Brasil (FFCUL)</td>
<td>Extreme weather events</td>
<td>Reforestation</td>
</tr>
<tr>
<td>Cuba (FFCUL)</td>
<td>Extreme weather events</td>
<td>Early warning System</td>
</tr>
<tr>
<td>US East Coast</td>
<td>Extreme Weather events</td>
<td>Intruments to support adaptation actions</td>
</tr>
</tbody>
</table>
Figure 1.1.10: Projected precipitation anomalies over Alentejo. Dashed/Solid lines represent RCP4.5/RCP8.5 scenario. Black lines refers to annual averages. Red/blue lines refers to summer/winter season. The anomalies are computed with respect to the period 1971-2005. A 5 year running average is applied. Units are [mm/d].
Thank you for your attention