Being Cost effective in preventing water stress
TerAGUA- The Castelo do Bode watershed approach

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Portugal

19th Europe-INBO International Conference
for the implementation of European water directives
Wednesday 8th to Friday 10th of December

Europe-INBO
1. Main Goal

To reduce water stress increasing C/B efficiency

- Understand *water stress induced by human activities*: landuse - water intake. Water contamination
  - Align water with territorial management
  - Water cycle / Biogeochemical Cycles - P, N, CQO, CBO / watershed intake in the context of human activities - LOCATION
  - Increase efficiency and equity regarding cost benefits allocation

- Build development plans, monitor their implementation, and enable review

To promote responsible collaboration

- **Align the different acting boards** Institutional, socioeconomic, environmental
- **Combine** *Circular Economy and Ecosystems Services perspectives*
- **Reduce risk of water scarcity**- Research and Innovation– the relevance of Location
- **Align economic growth with lower pressure over resources**
  - Detail/ Priority – Drinking water preservation
Business as usual... water demand increase and water quality decreases

Global water demand in 2000 and 2050

Percentage of classified water Bodies with less than good ecological status or potential in rivers / lakes.
Source: Multiple Waters for Multiple Purposes and Users, Water Europe, (04/2020); EEA

Source: water Europe, adapted from OCDE Environmental Outlook to 2050
2. Preventing/reducing water stress - preventing contamination risk

Integrating BGQ cycles/ with water cycle/and ecosystem services

The water Cycle/ Biogeochemical cycles /human activities/circular economy integration

- an obvious need

Water/Nutrient/anthropogenic related consumption and discharge

Monitor, Integrate and Review

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Risk level = impact X occurrence probability

<table>
<thead>
<tr>
<th>Probability</th>
<th>Frequent</th>
<th>Probable</th>
<th>Possible</th>
<th>Remote</th>
<th>Unlikely</th>
<th>Rare</th>
<th>Very High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequent</td>
<td>24 Very High</td>
<td>18 Very High</td>
<td>12 High</td>
<td>6 high</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Probable</td>
<td>20 Very High</td>
<td>15 High</td>
<td>10 High</td>
<td>5 Moderate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Possible</td>
<td>16 Very High</td>
<td>12 High</td>
<td>8 Moderate</td>
<td>4 Moderate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remote</td>
<td>12 High</td>
<td>9 Moderate</td>
<td>6 Moderate</td>
<td>3 Low</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unlikely</td>
<td>8 High</td>
<td>6 Moderate</td>
<td>4 Moderate</td>
<td>2 Low</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rare</td>
<td>4 Moderate</td>
<td>3 Moderate</td>
<td>2 Low</td>
<td>1 Low</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Catastrophic</td>
<td>4 Serious</td>
<td>3 Relevant</td>
<td>2 Relevant</td>
<td>1 Low</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Risk level**

<table>
<thead>
<tr>
<th>Risk level</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Acceptable risk level. The control measures are sufficient. Require constant monitoring and review.</td>
</tr>
<tr>
<td>Moderate</td>
<td>Not desirable. A plan of action should be developed, if possible, for the implementation of supplementary control measures in accordance with the risk priorities.</td>
</tr>
<tr>
<td>High</td>
<td>Tolerable with an organization's commitment at the highest level and after cost/benefit assessment. It implies the development of a scheduled action plan for the implementation of reasonable measures required to reduce risk.</td>
</tr>
<tr>
<td>Very High</td>
<td>Not acceptable. It implies the suspension of the activity/process until effective control measures are implemented that reduce the level of risk.</td>
</tr>
</tbody>
</table>


This isolated approach can fail in evaluating risk
Therefore it must integrate and be combined with a broader perspective

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Collaborative Spatial Data Infrastructure in order to:

- Integrate different Biogeochemical and water cycles, combining scales, in line with human activities - time and space
- Monitor water bodies and adjust water monitoring networks to prevent/reduce water stress
- Integrate uses and activities related to water use or discharge
- Plan activities considering the BGQ/W Cycles at the watershed scale, using the ecosystems services perspective and water use priorities - drinking water assessment to all citizens
- Perform territorial analysis at local scales, integrating EU sustainable development perspectives - the relevance of location in data analytics.
- Cost and benefit allocation among private or public sector and general population integrating environmental and social criteria into C/B analysis.
Problem: How to integrate water sustainability and contamination risk prevention Combining BGQ cycles-Water cycle-human activity cycle in order to assure cost benefit efficiency in resources management

3. Approach - TerAgua Collaborative platform to assure C/B evaluation and water management efficiency

...cooperation: understanding BGQ/Water combined cycles, contamination Risks...identify best solutions and reduce pressures
4. Using TerAgua to promote efficient management of Castelo do Bode watershed

Drinking water Risk analysis- Integrated perspective

Different uses
1. Drinking water
2. Energy supply
3. Urban water supply
4. Recreation
5. Industry
6. Animal production
7. Agriculture
8. Forestry
9. Externalities

Legend:
- Water line
- Administrative limite
- Watershed limit
- Tagus watershed limit
- Region limit

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4. Using TerAgua to promote efficient management of Castelo do Bode watershed

The Castelo do Bode example:

- Diferente uses
  1. Drinking water
  2. Energy supply
  3. Urban water supply
  4. Recreation
  5. Industry
  6. Animal production
  7. Agriculture
  8. Forestry
  9. Externalities

Externalities
Significative anthropogenic related issues:

1. Pressures according to different human activities in the Tagus river watershed (including the west region)

   the COST of URBAN related Water Stress

CBO5 Discharge estimates – RH5 - Tagus river watershed

<table>
<thead>
<tr>
<th>Sector</th>
<th>CBO5</th>
<th>CQO</th>
<th>P_total</th>
<th>N_total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urbano</td>
<td>78,936</td>
<td>43,221</td>
<td>4,038</td>
<td>12,935</td>
</tr>
<tr>
<td>Industrial</td>
<td>21,718</td>
<td>7,776</td>
<td>89</td>
<td>1,297</td>
</tr>
<tr>
<td>Pecuária</td>
<td>22,768</td>
<td>9,088</td>
<td>866</td>
<td>2,526</td>
</tr>
<tr>
<td>Agricultura</td>
<td>-</td>
<td>-</td>
<td>805</td>
<td>6,492</td>
</tr>
<tr>
<td>Golfe</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>123,422</td>
<td>60,085</td>
<td>5,798</td>
<td>16,757</td>
</tr>
</tbody>
</table>
4. Using TerAgua to prevent water stress and assure water management efficiency: The Castelo do Bode watershed example

Legend:
- Water caption
- Urban area
- Buildings (2010)
- Buildings (1998)
- Water front
- Watershed
- delimitation

Urban sprawl evolution and potential CBO5, urban related impact in water quality, (Source: Ter-Agua, Vale et al, 2019)
Land cover change and its potential impact on water quality (Ter-Agua, Bruno M., Vale, M. Reis, R. 2019)
The relevance of TERAGUA– taking advantage of Digital Transformation

1. Identify/Understand /prevent water stress problems at local, regional, national and European scales – define priorities- assure supply at affordable fair prices - drinking water

2. Integrate territorial analysis and land use planning, BGQ and water cycles, environmental and socioeconomic perspectives- within allocation of resources

3. Improve Water regulations - adapt and review- promote effectiveness

4. Review and update water monitoring networks – adjust sampling stations location

5. Identify significative issues, measures to be implemented considering water stress and scarcity in time and space. Acting locally but bearing in mind the regional, national and international concerns

6. Being cost effective- Price- sustainability- governance efficiency.... Fair distribution C/B

Work together and dissociate economical growth from the growing pressure over water resources: water abstraction and quality decline.

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... facing challenges with innovative approaches promoting C/B EFFICIENCY and effective RESPONSIBLE COOPERATION

Muito obrigada
Thank you

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