

Being Cost effective in preventing water stress

TerAGUA- The Castelo do Bode watershed approach

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for the implementation of European water directives
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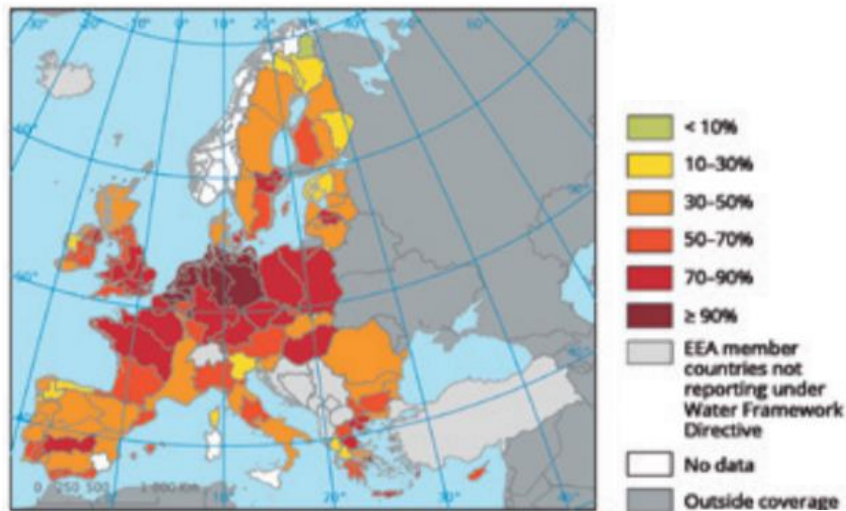
INBO –2021

To reduce water stress increasing B/C ratio

- Reduce/Prevent water contamination - **Understand water stress induced by human activities**
- Align water and territorial management with nutrients intake within the water cycle
- Understand SSD, SST, P, N, CQO, CBO watershed intake in the context of human activities - **LOCATION**
- Increase efficiency and equity regarding cost benefits allocation –planning, implementation, monitoring and review – responsible collaboration
- **Align the different acting boards** Institutional, socioeconomic, environmental though Circular economy and an ecosystems services perspective
- **Reducing contamination risk** - Research and Innovation– the relevance of Location improve efforts to.....
 - **Align economic growth with lower pressure over resources – Water/BGQ cycles**
 - **Detail/ Priority – Drinking water preservation**

2. Preventing/reducing water stress preventing contamination risk- increasing B/C ratio

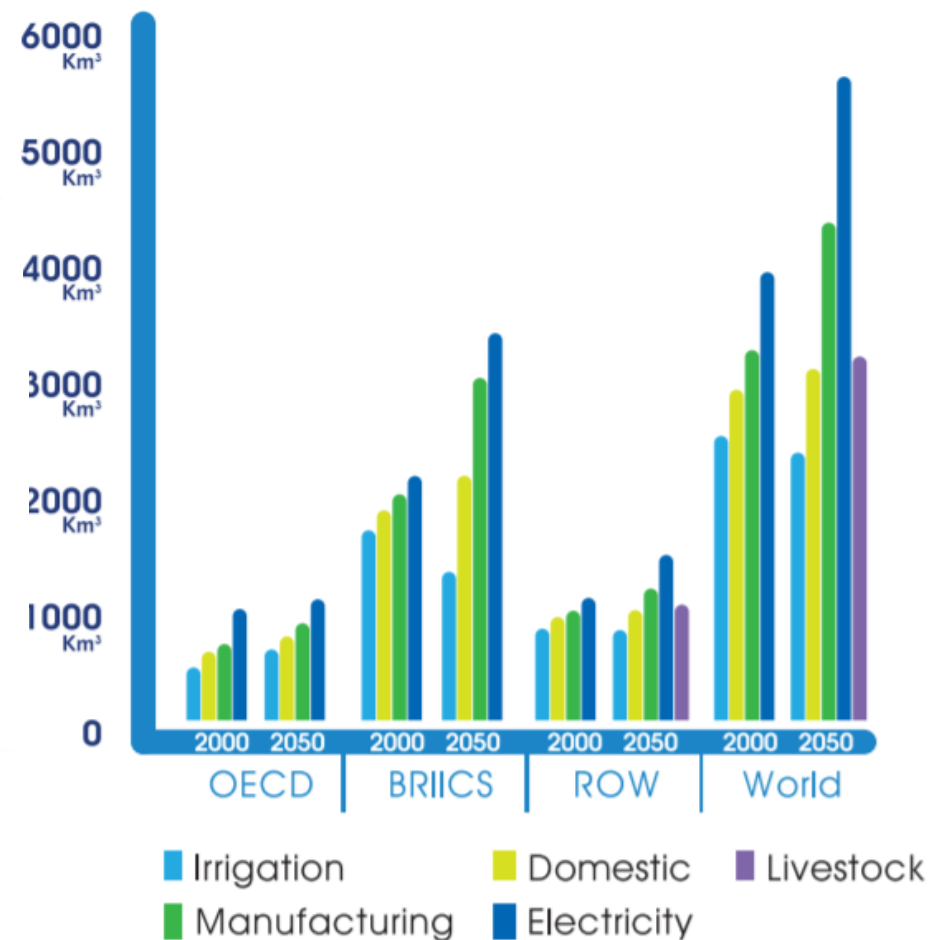
Business as usual... water demand increase
and water quality decreases



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

Global water demand in 2000 and 2050



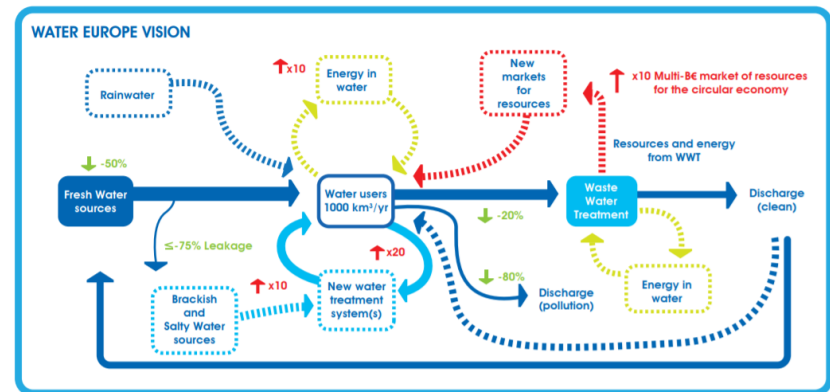
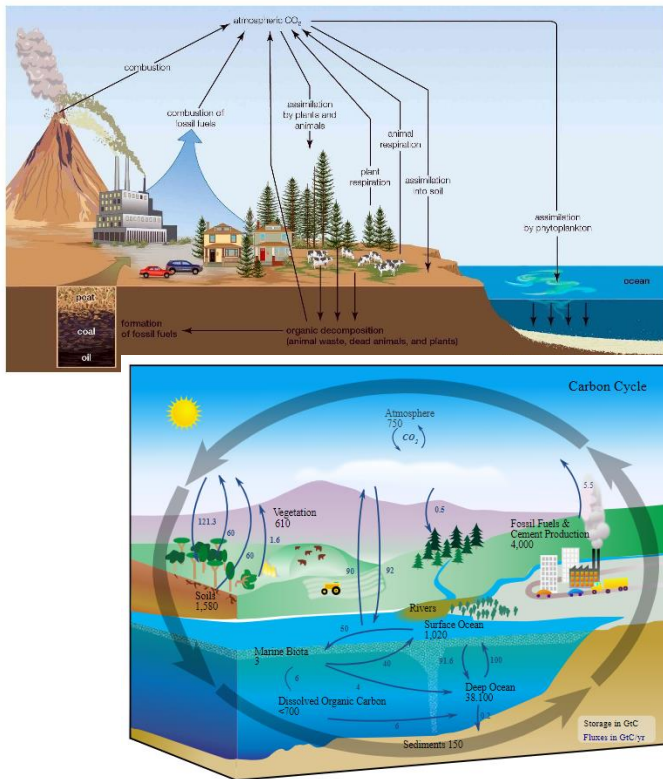
Source: water Europe, adapted from OCDE Environmental Outlook to 2050

2. Preventing/reducing water stress - preventing contamination risk

Integrating BGQ cycles with water cycle

The water and Biogeochemical cycles /human activities integration

- an obvious need



An opportunity for Europe: Increasing water resource efficiency and circularity



Water/Nutrient/anthropogenic related consumption and discharge permanent monitoring, review and integration

3. Approach- TerAgua Collaborative platform Towards sustainable Water management- - contamination risk assessment

Risk level = impact X occurrence probability

| 6x4 RISK MATRIX | | | | | |
|---|----------|-------------------|-----------------|---------------|---------------|
| P r o b a b i l i t y | Frequent | 24 Very High | 18 Very High | 12 High | 6 high |
| | Probable | 20 Very High | 15 High | 10 High | 5 Moderate |
| | Possible | 16 Very High | 12 High | 8 Moderate | 4 Moderate |
| | Remote | 12 High | 9 Moderate | 6 Moderate | 3 Low |
| | Unlikely | 8 High | 6 Moderate | 4 Moderate | 2 Low |
| | Rare | 4 Moderate | 3 Moderate | 2 Low | 1 Low |
| | | 4 Catastrophic | 3 Serious | 2 Relevant | 1 Low |
| IMPACT | | | | | |

| Risk level | Definition |
|------------|--|
| Low | Acceptable risk level. The control measures are suficiente. Require constant monitoremment and review |
| Moderate | Not desirable. A plan of action should be developed, if possible, for the implementation of supplementary control measures in accordance with the risk priorities. |
| High | 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. |
| Very Hight | Not acceptable. It implies the suspension of the activity / process until effective control measures are implemented that reduce the level of risk. |

Adapted de: Shuttleworth, (2017).

This isolated approach can fil evaluating risk .

Therefore it must integrate and be combined with a broader perspective.

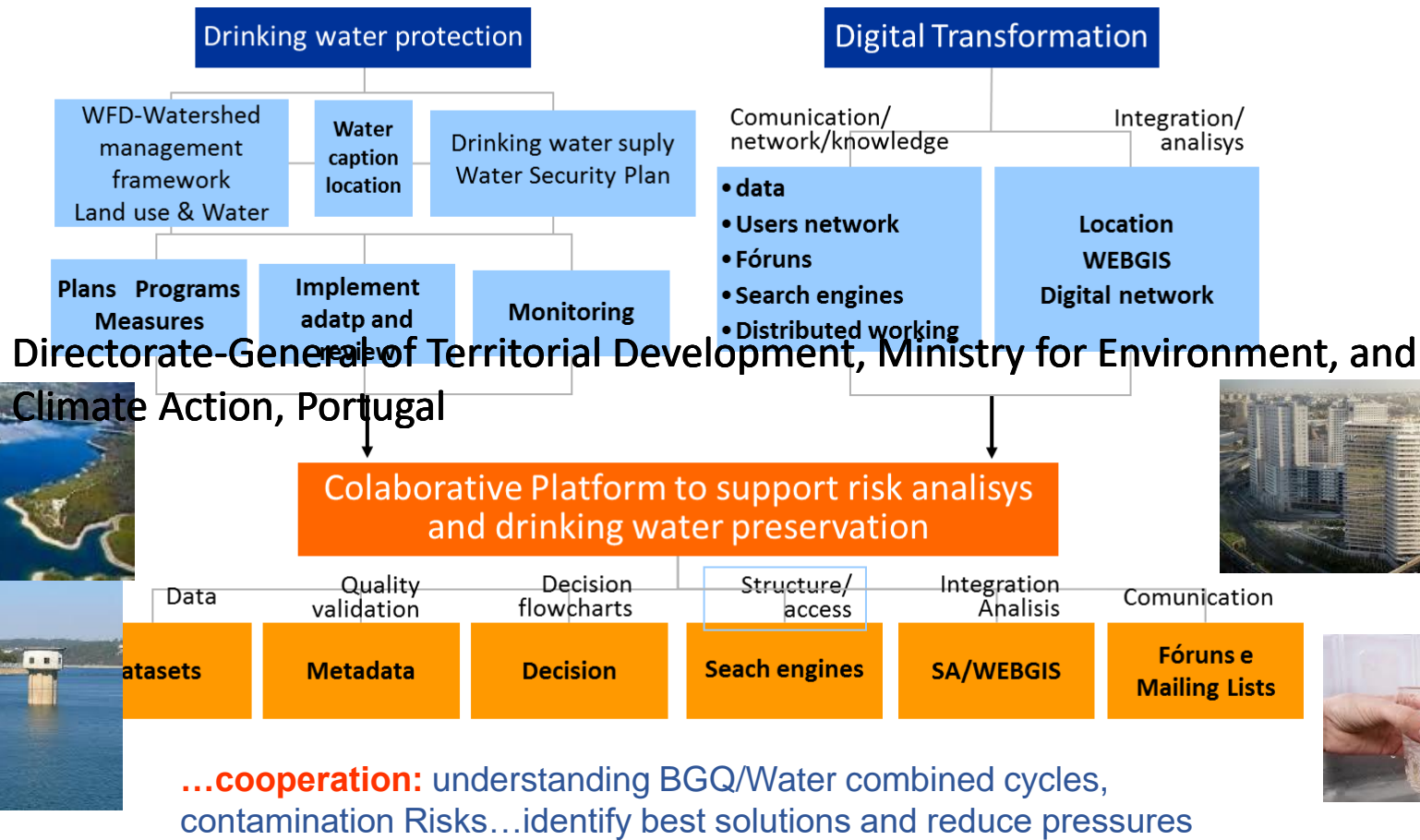
3. Approach - TerAgua Collaborative platform for Water Nitrogen contamination risk assessment

Collaborative Spatial Data Infrastructure in order to:

- Integrate different Biogeochemical and water cycles at different scales and in line with human activities C/P
- Monitor water bodies and adjust water monitoring networks in preventing water stress
- Integrate uses and activities related to water use or discharge
- Perform BGQ/W cycles analysis within each activity and sector – Urban, Agriculture, forestry, industrial ...
- Plan activities considering the BGQ/W Cycles at the watershed scale, using the ecosystems services perspective and water use priorities - assure drinking water assessment to all citizens
- Perform territorial analysis at local, and smaller scales, integrating EU sustainable development perspectives- the relevance of location- in risk analysis.
- Cost and benefit allocation among private or public sector and general population according to C/B criteria

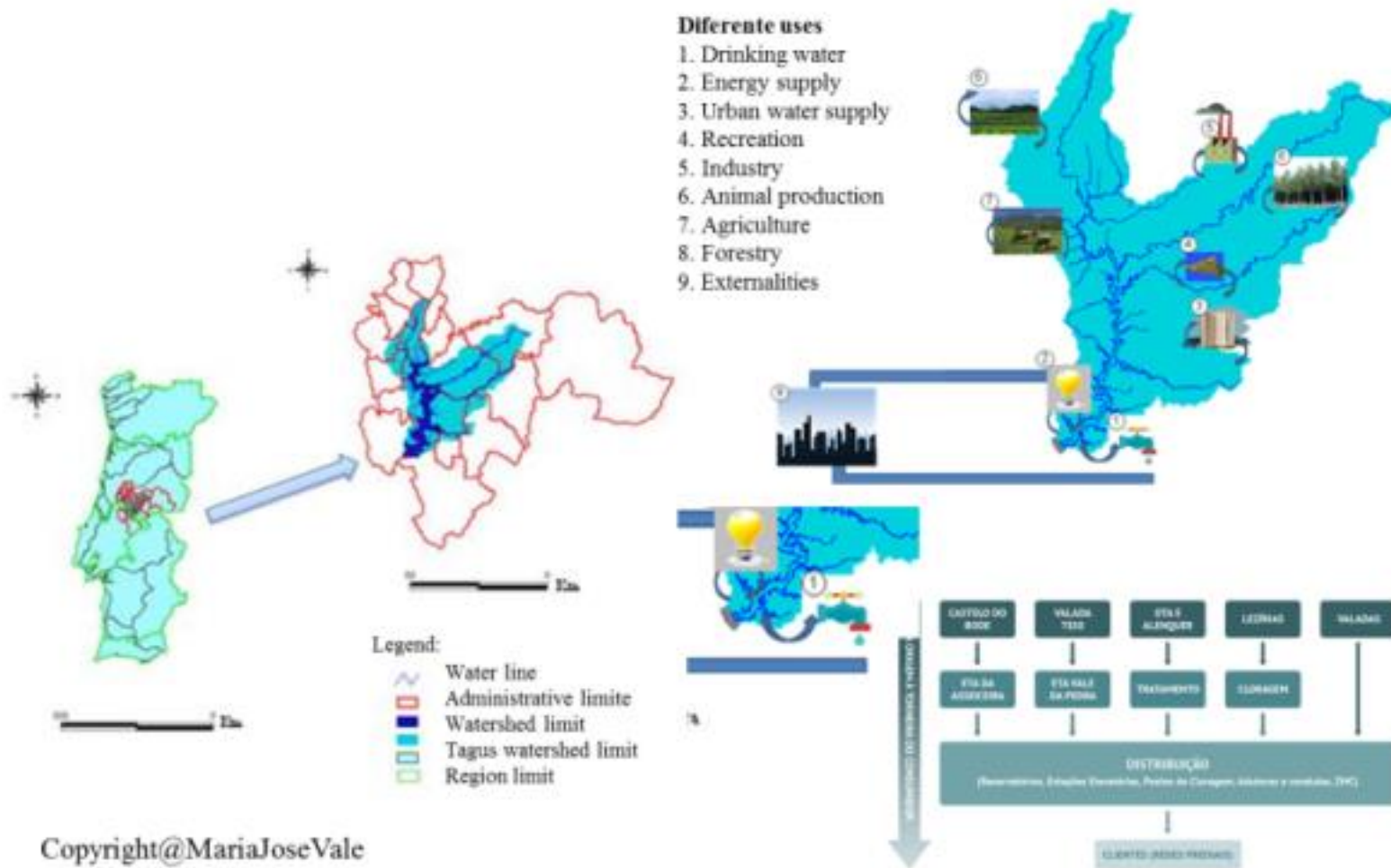
3. Approach - TerAgua Collaborative platform to assure C/B evaluation and water management efficiency

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



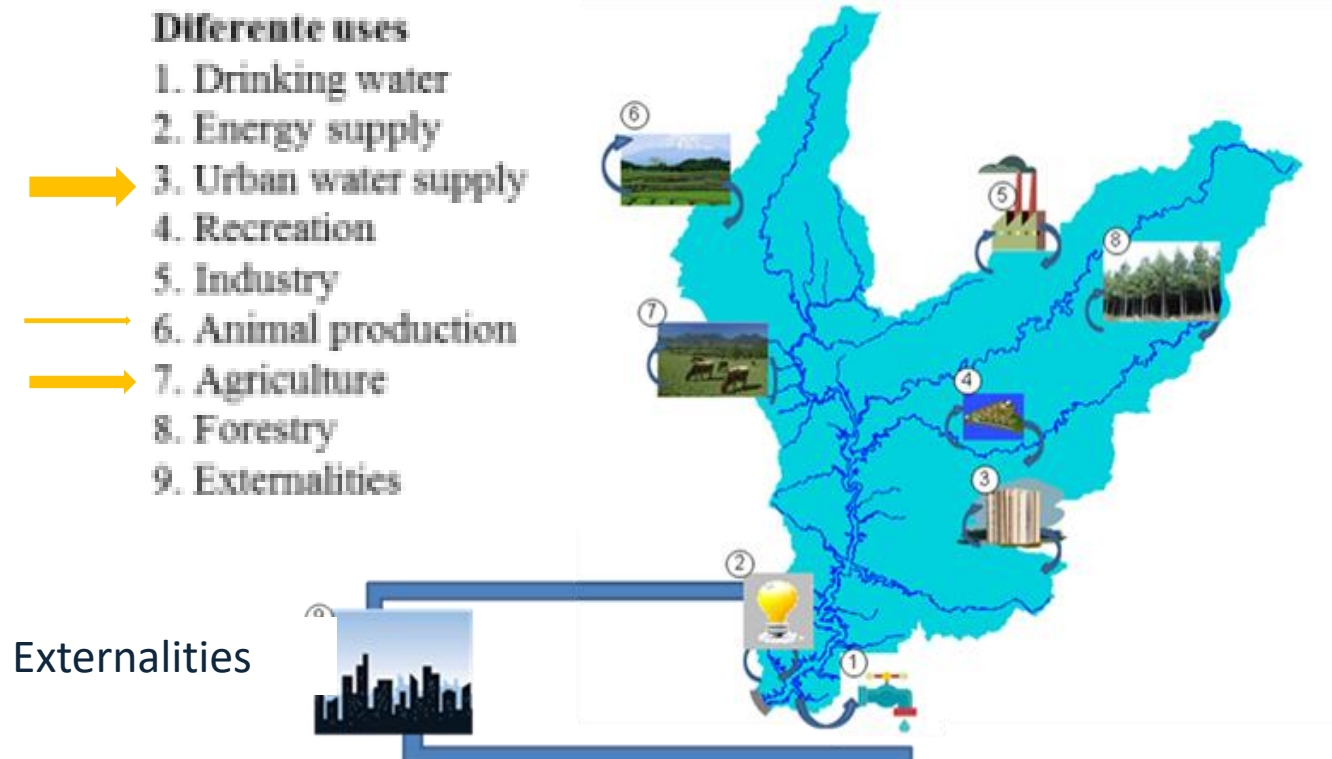
4. Using TerAgua to promote efficient management of Castelo do Bode watershed

Drinking water Risk analysis- Integrated perspective



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

The Castelo do Bode example:



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

Significative anthropogenic related issues:

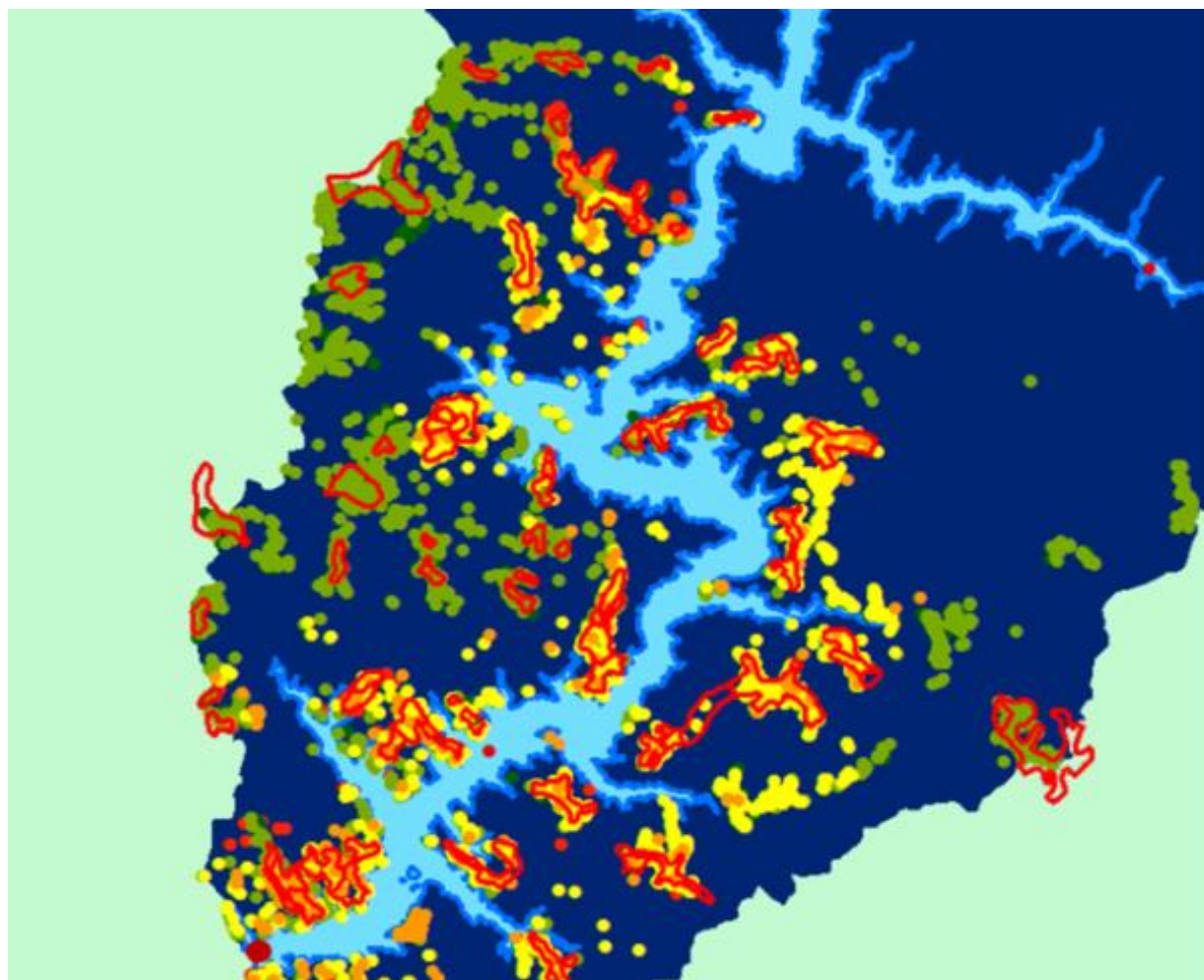
1. Pressures according to different human activities in the Tagus river watershed (including the west region)

N Discharge estimates – RH5 including Tagus watershed

| Setor | Carga rejeitada (Ton/ano) | | | |
|--------------|---------------------------|---------------|--------------------|--------------------|
| | CBO ₅ | CQO | P _{total} | N _{total} |
| Urbano | 78 936 | 43 221 | 4 038 | 12 935 |
| Industrial | 21 718 | 7 776 | 89 | 1 297 |
| Pecuária | 22 768 | 9 088 | 866 | 2 526 |
| Agricultura | - | - | 805 | 6 492 |
| Golfe | - | - | - | - |
| TOTAL | 123 422 | 60 085 | 5 798 | 16 757 |

2. Undetected pressures within the water quality monitoring official network: ex. those identified in the NitroPortugal project by Cameira et al, 2019 e 2021.

4. Using TerAgua to prevent water stress and assure water management efficiency: The Castelo do Bode watershed example



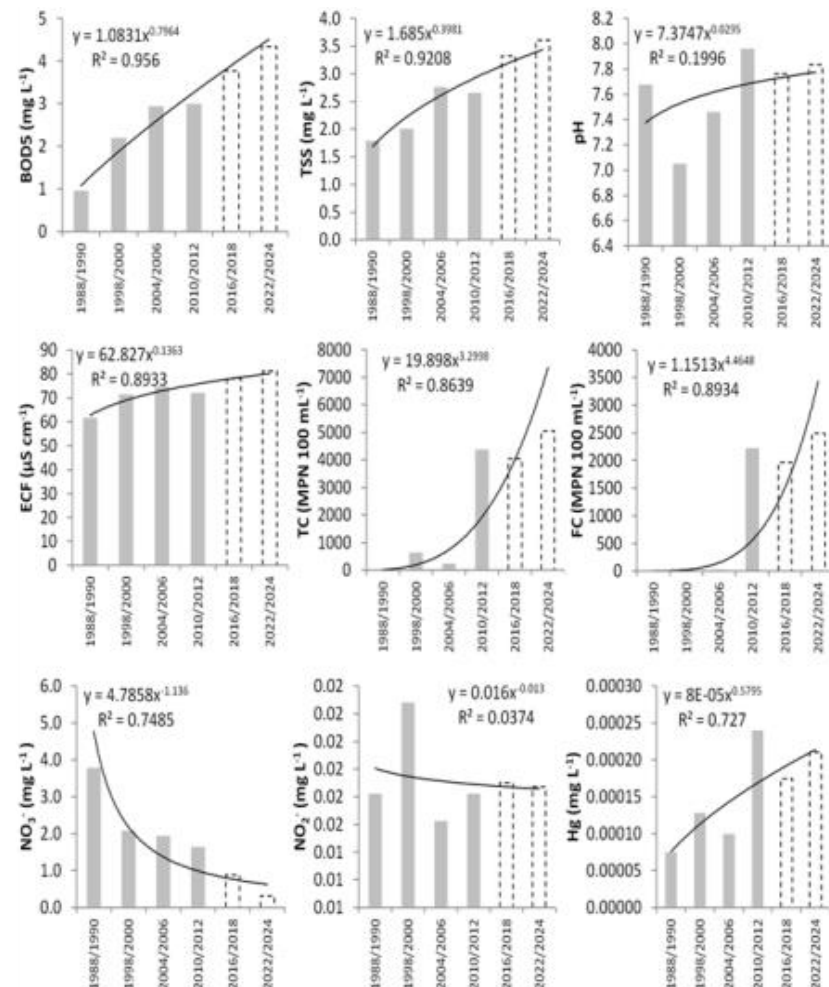
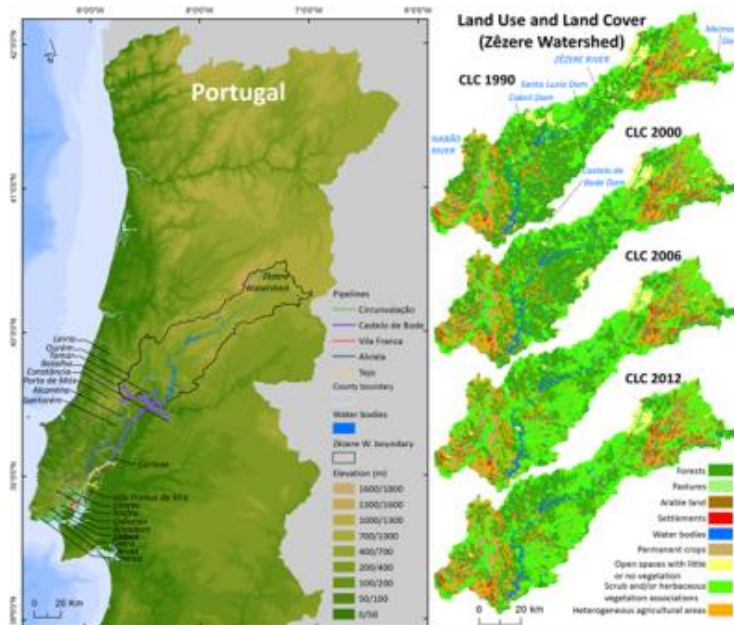
Legend:

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

Urban sprawl evolution and potential N, urban related impact in water quality, (Source: Ter-Agua, Vale et al, 2019)

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

Land cover change and its potential Impact on water quality (Ter-Agua, Bruno M., Vale, M. Reis, R. 2019)



5. Discussion and main conclusion: new insights

The relevance of a TERAGUA– taking advantage of Digital Transformation

1. Identify/Understand /prevent water stress problems at local, regional, member state and European scale – define priorities- drinking water- assure supply at affordable fair prices
2. Integrate territorial analysis, local BGQ cycle, environmental and socioeconomic perspectives- within allocation of resources- C/B
3. Improve Water regulations - adapt and review- promote effectiveness
4. Review and update water monitoring networks – adjust sampling stations location, increase benefit/cost ratio
5. Identify significative issues, measures to implement considering water stress risk and scarcity. Acting locally
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.

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

**Muito obrigada
Thank you**

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