Water-stress characterisation factors for future oriented LCA

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Introduction & objectives

- Water stress indicators in LCA often rely on information of water use/consumption and water availability in a specific area
- These indicators are usually applied to predict impacts of future investments, without considering changed water use patterns and climate change. The latter already affecting regional water availability.
- In this context of continuous change, characterisation factors (CFs) should be updated periodically to correctly reflect water stress
- **Aim: to provide water stress index (WSI) CFs at the sub-watershed scale for three temporal scenarios in Spain**

Materials & methods

- **Methodology**: Pfister et al. 2009. WSI annual: 0.01 (low stress) to 1 (severe stress)
- **Regionalisation units**: 117 sub-watersheds (Fig 1), compared to 51 watersheds in Pfister et al. 2009 (Fig 2)
- **Temporal scenarios**:
  - (i) current situation: current use and availability
  - (ii) Short-term future: projections for 2015
  - (iii) Mid-term future: projections for 2030
- **Data sources**: Watershed management plans and regional reports on potential effects of climate change
- **Uncertainty assessment**: Latin Hypercube procedure (5,000 runs) with the @Risk software

Fig 1)

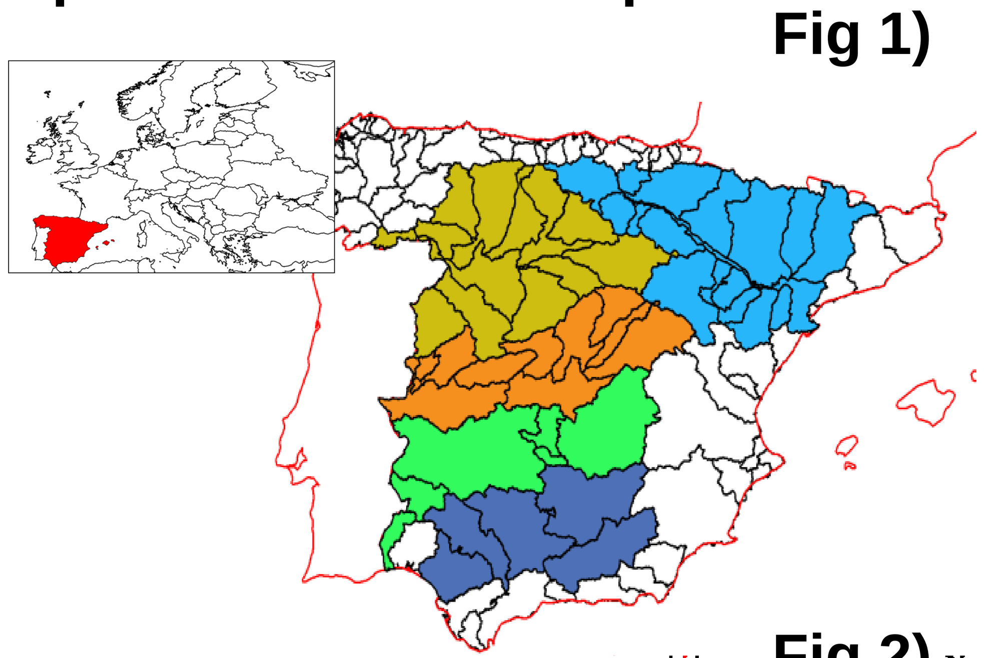
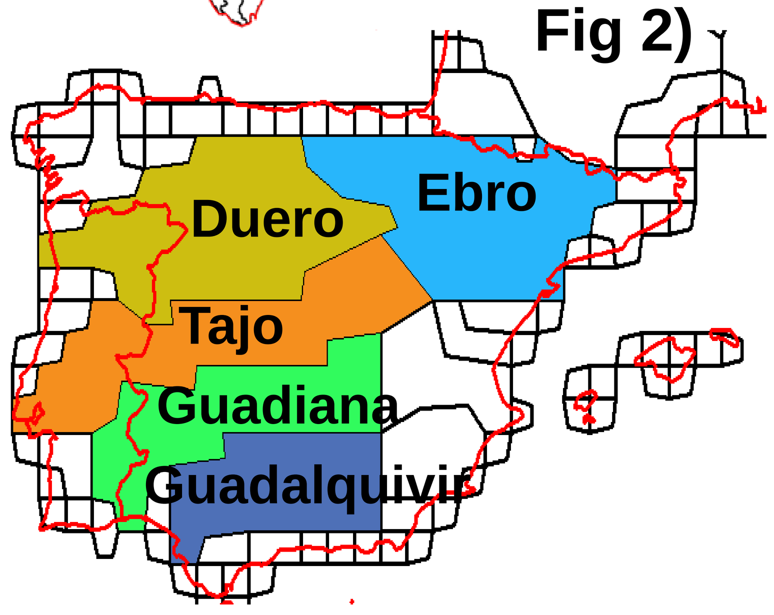


Fig 2)



Regionalisation units to calculate WSI CFs used in: this study (Fig 1); Pfister et al 2009 (Fig 2)

Results & discussion

- **Temporal analysis** of the WSI shows a relaxation of water stress over the short-term (Fig 3, 4) followed by a new increase (Fig 5)
- Short-term future: increase in water availability. Mid-term future: increase in water use and reduction in water availability

Fig 3) WSI current situation

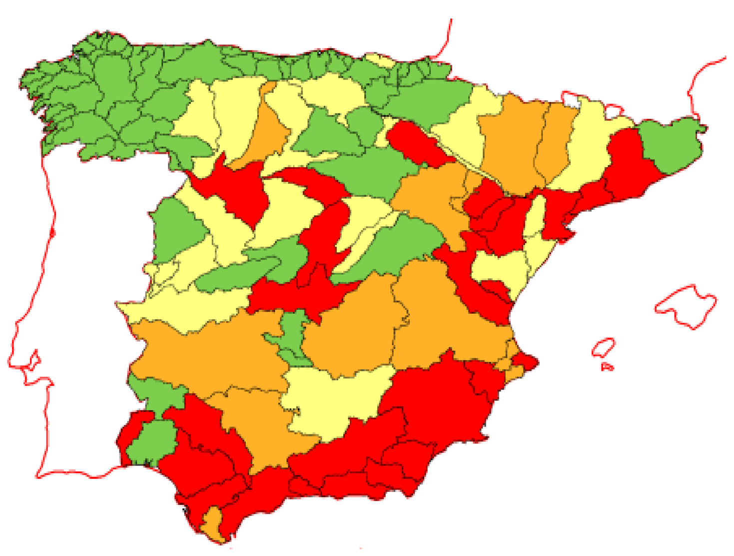


Fig 4) WSI short-term future

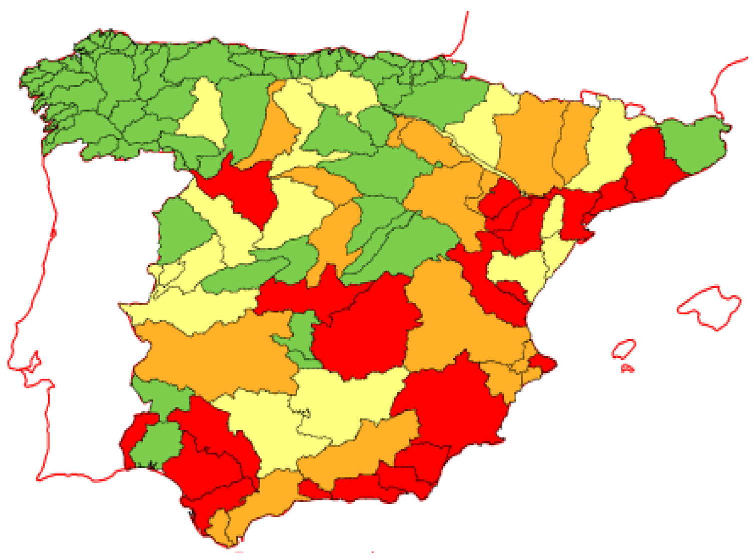
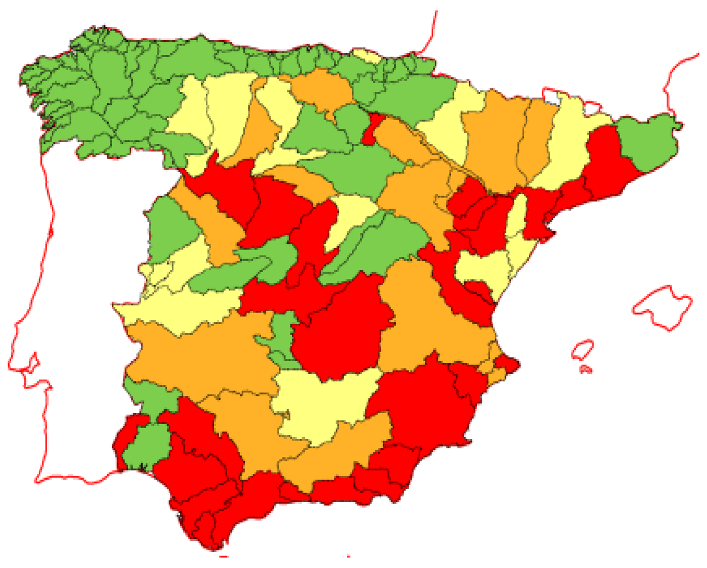


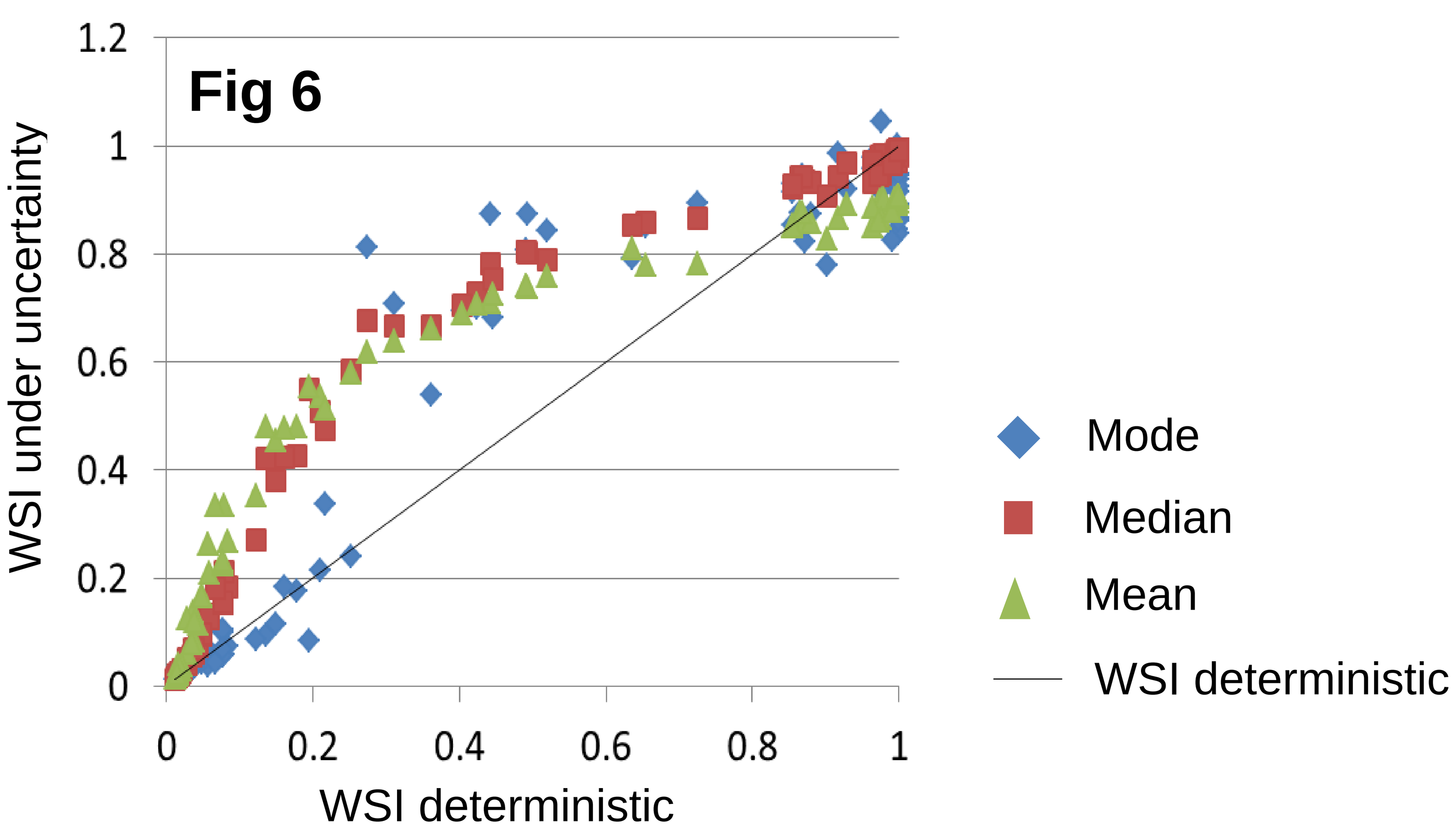
Fig 5) WSI mid-term future



WSI (m^3/m^3)

<0.09	0.09-	0.5-	>0.91

- **Uncertainty**: The WSIs under consideration of uncertainty were higher than the deterministic result for intermediate WSIs (Fig 6)



- **Comparison to Pfister et al. WSIs**: major differences are noticed (Table 1, see legend Figures 3 to 5).

Watershed	WSI [-] Past (Pfister et al.)	Current situation	Short-term future	Mid-term future
Duero	0.17 (n.a.)	0.19 (0.01-1.00)	0.10 (0.01-1.00)	0.20 (0.01-0.98)
Guadiana	0.99 (n.a.)	0.52 (0.01-0.96)	0.53 (0.01-0.96)	0.65 (0.01-0.98)
Tajo	0.53 (n.a.)	0.31 (0.03-1.00)	0.19 (0.02-1.00)	0.25 (0.10-1.00)
Guadalquivir	1.00 (n.a.)	0.93 (0.92-1.00)	0.63 (0.17-0.99)	0.72 (0.50-1.00)
Ebro	0.26 (n.a.)	0.39 (0.02-1.00)	0.38 (0.03-1.00)	0.55 (0.04-1.00)

Table 1: Mean WSIs for the largest watersheds in Spain and four temporal scenarios. In brackets WSI data range for the internal sub-watersheds

Conclusions & outlook

- Different spatial and temporal resolution results in different CFs. Which is the optimal resolution in connection with the LCI?

Acknowledgements

Decocel Innpacto project, supported by the Spanish Ministry of Economy and Competitiveness and the European Regional Development Funds and Industrial Chair *ELSA-PACT*, funded by Suez Environment, SCP, BRL, Val d'Orbieu-Uccoar, EVEA, ANR, Irstea, CIRAD/ADEME, EMA, ONEMA, and the region Languedoc-Roussillon

References

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