Without water no energy, significant trade-offs between carbon and water footprints important for global energy and water policy

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Introduction
- Water and energy are strongly related. Emphasis on decreasing carbon footprints (CFs) might increase water footprints (WFs).
- Pre-2009 water for energy studies focussed on cooling water for thermoelectric generation and water for transport fuel production.
- Most pre-2009 studies used grey literature data from US industry, often copying data from one source to the other.
- WF studies could quantify water for bioenergy and hydropower, because assessments used publicly available data, e.g. weather and crop production data.
- This poster shows the contribution of WF studies to water for energy relations. It explains why water is needed for energy, indicates most cited water-energy studies until 2009 and important WF studies.

Water for energy:
- Water for mining fuels, e.g. coal, natural gas or oil.
- Water for operations, e.g. to cool power plants.
- Water to grow crops, green, blue and grey WFs.
- Water lost due to evaporation from hydropower reservoirs.

Most cited water – energy studies before 2009:

Results
- WF studies indicating water consumption for specific renewable energy types, e.g. bioenergy and hydropower.
- Energy from photosynthesis (crops, trees or algae) has large WFs compared to fossil energy, wind and PV.

Discussion and Conclusions
- WF studies gave new information on water consumption for specific renewable energy types.
- Bioenergy has large WFs and is less suitable to replace fossil energy than other renewables.
- Hydropower also has large WFs, but variation is large. Hydro with small WFs might contribute to decrease carbon footprints (CFs).
- Energy scenarios decreasing CFs should take large WFs of some renewables into account.

The way forward
- Energy policy needs reliable water data, and more case studies on energy WFs.
- Climate change affects crop growth and water needs, e.g. of energy crops, hydropower and thermal power plants. This requires more research.
- Policy should realise that the need to decrease CFs can only be realised when also water constraints are taken into account.