Water indicators in GBEP

First experiences and challenges ahead

Experiences from two country perspectives:
US and the Netherlands

Status:
US: Through exploration of data and maps
Netherlands: 3-4 months desk study 2012

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Indicator 5: Water use and efficiency

- **5.1** Water withdrawn from nationally determined watershed(s) for the *production processing* of bioenergy feedstocks, expressed as the percentage of total actual renewable water resources (TARWR) and as the percentage of total annual water withdrawals (TAWW), disaggregated into renewable and non-renewable water sources.

- **5.2** Volume of water withdrawn from nationally determined watershed(s) used for the *production* and *processing* of bioenergy feedstocks per unit of bioenergy output, disaggregated into renewable and non-renewable water sources.

*Example from US:*

*Production:*
e.g. Blue Water Volume per Bushel of Corn
Indicator 6: Water Quality

6.1) Pollutant loadings to waterways and bodies of water attributable to fertilizer and pesticide application for bioenergy feedstock production, and expressed as a percentage of pollutant loadings from total agricultural production in the watershed.

Outcomes from desk study in the Netherlands:

- Contribution of energy crop cultivation (mainly energy maize and rapeseed) to pollutant loadings in the water is very minimal;
- Some of the explanations are:
  - Bioenergy largely comes from residues and waste;
  - Biomass (especially from crops) partly imported

6.2) Pollutant loadings to waterways and bodies of water attributable to bioenergy processing effluents, and expressed as a percentage of pollutant loadings from total agricultural processing effluents in the watershed.

Outcomes from desk study in the Netherlands:

- Processing loadings to the surface water by bioenergy processing facilities is expected to be limited; maximum amounts set by law;
- Information is highly uncertain though and limited available.
WFP approach versus TAWR approach (as in GBEP): US modeling based on “Water Footprint Accounting”

http://water.es.anl.gov/Accounting.aspx
Water Foot Print Approach (WFP)

Biofuel Water Footprints by Region

- Surface water
- Groundwater

Blue Water (L water / L biofuel)

Regions:
- Northeast
- Appalachia
- Southeast
- Delta
- Corn Belt
- Lake States
- N Plains
- S Plains
- Mountains
- Pacific

Biofuels:
- Corn-eth
- Soy-bds

Map of the United States with states labeled.
WFP approach versus TARWR / TAWW approach (as in GBEP) - Considerations

TARWR / TAWW:
• Water withdrawal: abstraction surface and groundwater;
• Subdivided to production and processing of bioenergy.

Total WFP:
• Green WFP: water evaporated during crop growth (incl. rain);
• Blue WFP (evaporated) surface and ground water used for irrigation;
• Grey WFP: contaminated water during the production process.

• Country reports available on WFP (supported by UNEP-UNESCO);
• Specific energy reports available on m3 / GJ bioenergy for various biofuels in Europe and Netherlands;

Approaches are not fully comparable at this point
Explore how WFP can be used in GBEP (guidance)?
The important role of modeling and maps for spatial indicators

Regional Variability in Rainwater Consumption for Agriculture
The important role of modeling and maps for spatial indicators

Water Analysis Tool - water.es.anl.gov

- Select feedstock type
- Select county, state, region
- Calculate green, blue, and nitrogen grey water
- 10-year average or single year
- Water use by unit of land, feedstock, or fuel
- Map, chart, and table display
The important role of modeling and maps for spatial indicators

Example case study Water Quality Netherlands

- Crop area for energy based on merging maps with GIS (watersheds & energy crop map);
- Data for N and P based on maximum norms crops on country level;
- Statistical data available on country and province level

GIS needed for merging spatial data with statistical resources: EXPERTISE!
- European approach seems useful (and more efficient)
- International maps are available and free; explore!!
- Examples: FAO AQUAMAPS (recently launched)
Data availability and defaults

Based on case study Netherlands (water quality)

- **Example bottleneck:** No to limited data available on pollutant loadings for processing (especially not specified to technologies and different end-uses) or about water use of conversion technologies;
- **Possible solution:** Tier approach in combination with data collection

How could a Tier approach work over time?

**Tier 1**
- Default data (based on literature, input other countries, regionalized data (e.g. Europe))

**Tier 2**
- Selection of data collection (e.g. for most relevant ones, risk assessment, most innovative technologies)

**Tier 3**
- Actual data, as required for indicator
Highlight regional and crop variations

Water Footprint (L water/kg dry feedstock)

- Regional range
- County max
- National average

Corn
Soybean

Blue Water
Highlight regional and crop variations

Based on water quality indicator (NL):

• Now, indicator [6.1] asks for loadings of total bioenergy feedstock in comparison with total production;

• Risk analysis: Interesting to look (also for policy reasons) to individual crop differences in areas with eutrophication, drought or oversupply of water (crop-region combinations)

Example Netherlands:
• Rapeseed and maize require more N and P than SRC
• N and P rich areas could move their policy towards promoting SRC
• Especially e.g. near nature areas.

• Also highlight potential benefits from bioenergy!
Attribution and system boundaries

Examples for **Attribution**

- U.S. water monitoring does not distinguish between bioenergy crops and other crops
- Farmers often grow a mix of crops using the same irrigation system
- A single crop type often flows into commodity market with mixed end uses
- Feedstock production and processing may occur in different watersheds

Examples for **defining system boundaries:**

- Netherlands: watersheds cross country level (to Belgium, Germany)
- Difficult to disaggregate renewable from non-renewable water resources

Photo: Jim Bauer
Overcoming the challenges: next steps?

Adapting to country’s policy needs

• Highlight regional – crop combinations / technologies based on risk and benefit analysis

Improvements in methodologies, data and outcomes

• Always present results in a narrative (while rating relevance, level of uncertainty, data availability) not just one single number

• Explore how Water Foot Print approach (and available country reports) can be used in GBEP (guidance)

• Guidance on how to deal with allocation and system boundaries

• Cooperation in collecting water data that are difficult to find for everyone (and more or less similar for all countries): e.g. pollutant loadings of an ethanol plant;

• Explore the Tier approach

• Mapping and modeling: Explore the use of international available GIS maps, build up a library and knowledge on spatial modeling