Mini-Project 3: Water

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EPSRC
Food Energy Water LOCAL NEXUS NETWORK FOR REDISTRIBUTED MANUFACTURING
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Water Context

- Food
  - 70% of the world's freshwater withdrawals is committed to irrigated agriculture.
  - Agricultural water withdrawal accounts for 44% of total water withdrawal in OECD countries (UNESCO, 2012).
  - Total global water withdrawals for irrigation are projected to increase by 10 percent by 2050 (FAO 2014).
  - Irrigated crop yields are about 2.7 times those of rain fed farming (UN 2014).
- Energy
  - Water sector is one of the most energy intensive sectors in the UK using 9.02 TWh per year of electricity
  - Producing over 5.01 million tonnes of greenhouse gas (GHG) emissions

Proposal

- Assess the changing landscape of **water demands** in the context of localised production and related community initiatives
- Develop application scenarios that address these demands to inform **technology** portfolio analysis for water processing, including those for **optimising water-use efficiency**
- Investigate **graded water reuse and recycling** opportunities among processes involved in food production chain (e.g. water reuse within food facilities; collected/grey water for agriculture), energy generation and other domestic and industrial activities within the same locality
- **Exploit synergies** among localised/small scale **water and energy technologies and systems** (with P2) for improved resource recovery

Issues for Exeter team to consider

- **Scale**: point of use (household), cluster, neighbourhood

- **Water sources**: rainwater, stormwater, groundwater, grey water (non-faecally contaminated), black water (sewage), yellow water (urine)

- **Water storage**: storage requirements of each water source given particular agricultural or horticultural end uses

- **Water qualities**: best match between water quality demands and supplies

- **Treatment technologies**:

  capex and opex

- Saferain: a local/small-scale technology that takes rainwater and treats it to potable standard.
  - LCA to compare its performance with centralised systems.

- using green roofs or green walls for food production in addition to water collection and insulation (energy saving).

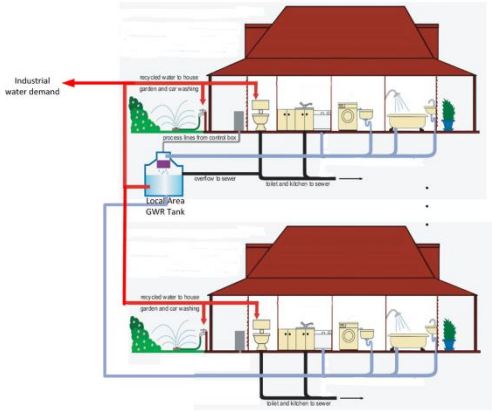
Source: http://sourceable.net/developing-a-thirst-for-urban-agriculture/

- smart monitoring and control to maximise benefits

- anaerobic digestion takes wastewater and food waste to produce energy
  - optimum scale and loading

Urban Water Optioneering Tool
UWOT

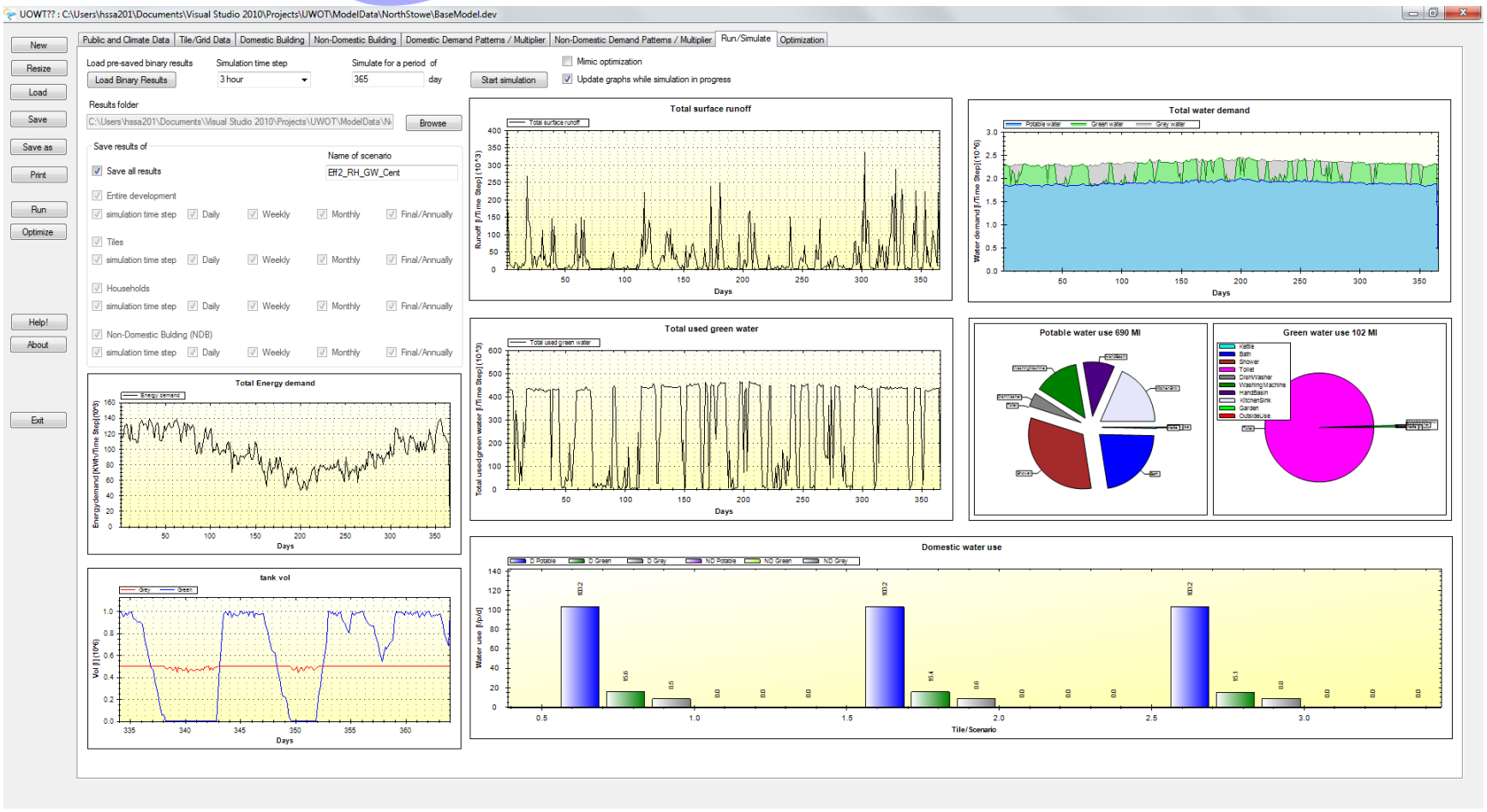
- Scenario based optioneering tool which attempts to quantify amounts of water generated from different sources and needed of each
- Calculates the following outputs for each scenario
  - Water requirement
  - Energy requirement
  - Land requirements
  - Capital cost
  - Operational cost



Local Area GWR scheme

- Water quality, Chemical consumption flux, Environmental impact (e.g. GHG, acidification and eutrophication fluxes)

UWOT?



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