Ecohacking cities: Data science for sustainable cities and a preview of the Environmental Sustainability Platform

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Ecohacking:
the application of data science to solving sustainability challenges

• Bottom up: resource simulation
• Top down: statistical learning
• A preview: cloud-based analytics and visualization
Bottom-up: resource simulation

Simulated energy consumption

Simulated water consumption

Household electricity consumption (kWh/day)

- Fridges
- Computers
- Lights
- Clotheswashers
- Dishwashers
- Televisions
- Water heating
- Heating
- Cooling

Potable water demand (L / hh / day [month])

- Basin demand
- Bath demand
- Clotheswasher demand
- Dishwasher demand
- Shower demand
- Sink demand
- Toilet demand
- Lawn demand
- Pool demand
- Garden demand
- Cooler demand
Bottom-up: resource simulation

Cohort-component stock modelling

Simulating appliance turnover

Graphs showing the number of appliances by vintage over time and the proportion of total stock by vintage type.
Bottom-up: resource simulation

Resource demand scenario modelling

Household water demand [Litres / hh / day]

- Revised demand
- Shower savings
- Clothes washing machine savings
- Dishwasher savings
- Toilet savings
- Tap savings

Years: 2000 to 2030
Bottom-up resource simulation

Integrated (physical-economic) strategic assessment
Top-down: statistical learning

‘Dumb’ meter data binning

Enhances temporal resolution of quarterly meter readings

Smart meter data disaggregation

Extracts disaggregated end use insights (e.g. shower frequency, duration) from aggregated smart meter data
Top-down: statistical learning

Machine vision for detecting roofs, pools, gardens
Top-down: statistical learning

Matched pairs savings evaluation

Participant-control based statistical evaluation of the energy / water savings of efficiency programs
A preview: cloud-based analytics & visualization

Data portal
browser-based interface for uploading data files

Data platform
secure server, files store and data store

Analytics services
cloud-based web processing services generate derived data

Data explorer
browser-based interface for analysing data

Both open source:
github.com/ckan/ckan
github.com/TerriaJS/terriajs
Ecohacking:
Data science at the UTS Institute for Sustainable Futures

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