Spatio-temporal characterisation of electricity consumption: case of Switzerland

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Spatio-temporal characterisation of electricity consumption
Role of Big Data & Spatio-temporal data

Central generation
One way flow
Passive consumers

Distributed generation & Storage
Two-way power flow
Motivation

• Decentralised energy systems
• Intermittent future renewable energy resources
• Smart meters / digitalisation

Aim: To develop a bottom-up model of geo-spatial and temporal electricity consumption to improve the understanding of the demand side management potential (energy efficiency programmes / demand response)
Pillars of the model

Electricity consumption of a municipality

Industry and services
- Unitary consumptions
- Percentage of usages
- Number of employees

Public lighting & Common area of the buildings
- Number of street lights / illuminance
- Lifts, lighting

Households
- Appliances
- Heating
- Hot water
Data collection

• Datasets are the first challenges.
• More than 20 datasets & measurements used to develop the sub-models and models.
• Barriers:
  1- Unavailable data
  2- Available data but unwilling to share.
  3- Available data: BIG DATA (computational loads) -> knowledge
METHODS / RECOMMENDATIONS

- Per hectare: number of employees and per sector code
- Requires a matching pixel $\rightarrow$ municipality
- Computational skills and softwares.
- Lack of expertise & time required

Import of file in database $\rightarrow$ Spatial join pixel $\rightarrow$ municipality (99.5% match) $\rightarrow$ Import of join result into database $\rightarrow$ Export statistics per municipality
Collaboration with the institutions & utility

• Utility company: SIG
  → Provide measured data of Service & Industrial.
  → HVAC systems.
  → Accurate measurements of public lightings.

• Government & canton institutions:
  → Audits
  → Feedback
Update of the ElectroWhat tool

Interaction between
• DNOs
• Energy suppliers
• Researchers

www.electrowhat.ch
What learned & next?

• Challenging as research & organisation

• Protocols: formalizing data collection, collaboration within and between governments
THANK YOU!

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HEATING DEMAND

Pixel matching of:
• Building stock data
• Dwelling area
• Temperature readings

Computational skills and softwares.
Lack of expertise & time required