FINAL CONFERENCE BRIEFING PAPER

EERAdata

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 847101

EERADATA PROJECT

The EERAdata project has developed and tested a decision-support tool to help local administrations in the collection and processing of their building and demographic data towards an assessment and prioritisation of Energy Efficiency measures in planning, renovating, and constructing buildings.

While EU policy assigns a primary role to Energy Efficiency (EE), the lack of a holistic understanding of the impact of EE investments has hindered its integration in the policy-making process. Coordination between demand and supply side of energy policy is not targeted, and there is a need to gather the evidence on the benefits of EE in ecological and socio-economic terms, as well as on its interactions with the broader policy context and energy market.

- EERAdata will operationalise the Energy Efficiency first Principle (EEfP) on a municipal and regional level
- It assesses the multiple benefits that arise through energy efficiency measures applied on single buildings
- It has created a software solution and related database which helps municipalities and regions to perform these assessments

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PROJECT GOALS

- Broader justification for energy efficiency investments
- Identifying economic and monetary benefits for various stakeholders
- Argument and motivation for more comprehensive energy efficiency measures
- Changing the role of buildings
- Increasing wellbeing and health
- Quantifying the impact of building renovation on societal issues (fuel poverty, environmental pollution, climate change, etc.)

PROJECT OUTPUTS

1. Scientific calculation methodologies to assess EE in the economic, social, and environmental sectors
2. Parameter and indicator list for socio-economic and LCA assessment
3. Data collection guidelines and templates
4. Assessment and Decision-Support Tool (EERAdata DST)
5. Comprehensive database with default and proxy values
6. Implementing Guidelines

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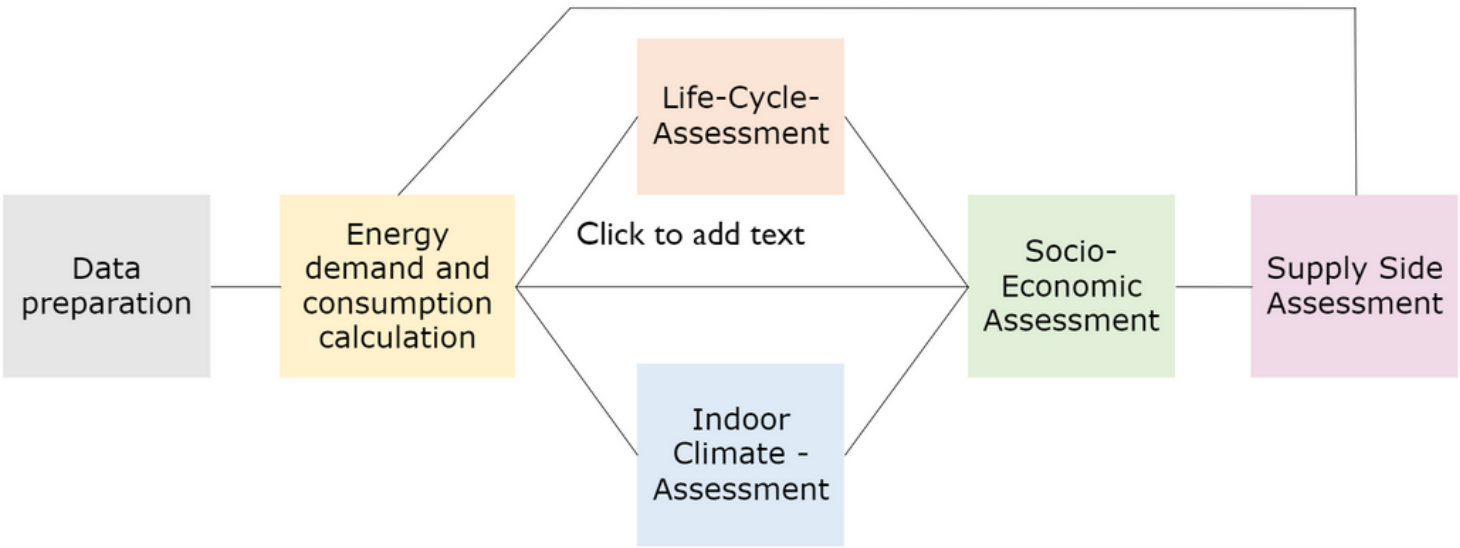
ASSESSMENT MODULES

The EERAdata project and the Decision Support Tool are based on 6 modules with 5 assessment methodologies which are interconnected. The process starts with building and municipal data preparation and integration into the DST databases. Based on this data, the energy demand and consumption of one or multiple buildings is calculated. This feeds into the life cycle assessment and indoor environment assessment modules. The results of all three modules are then monetised and further evaluated in the Socio-economic assessment module. The final element is the supply side assessment which estimates the cost benefits of alternative supply side investments, compared to the previously calculated energy efficiency investments. All calculations can be done for the status quo of the selected building and multiple renovation options which can be combined and compared with each other.



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DATA MANAGEMENT AND PREPARATION

The data management comprises three layers of datasets:

- **Building related data** for the specific buildings like geometry, age, technology, materials
- **Municipal data** like location of building, weather, economy, environment, tax system, etc.
- **Global datasets** like statistics, scientific findings, modelling elements, norms, etc.

There are three quality levels of data in the calculation process:

- There is **minimum required data** which represent the minimum data which is needed to run calculations, like building geometry or weather data. This data has to be real, building specific data.
- There is **desired data**, which improve the results of the calculations significantly, like the real building u-values, heating system details, energy sources, materials, etc.
- There is **detailed data** which improve the results but are hard to find and integrate into the database. Mostly this refers to model-related data or details like window opening area or the exact shading factors etc.

ENERGY DEMAND AND CONSUMPTION CALCULATION

The energy demand calculation is the first assessment that is applied on the selected building. It is based on a static calculation of energy loads related to the geometry, construction, and energy systems of the building and its surrounding temperatures.

- Specific and total final energy demand for heating and domestic hot water
- Specific and total primary energy demand for heating and domestic hot water
- Total heating load for heating and domestic hot water

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LIFE CYCLE ASSESSMENT

The life cycle assessment takes into account the building materials and technology. It assesses the global warming potential and primary energy demand over the whole life cycle from construction over operation to end of life. Outputs are:

- Embedded specific and total primary energy demand for renewable and non-renewable sources
- Operational specific and total primary energy demand for renewable and non-renewable sources
- Embedded specific and total global warming potential in kg CO2 eq.
- Operational specific and total global warming potential in kg CO2 eq.

INDOOR CLIMATE ASSESSMENT

The indoor climate assessment is based on empirical data and simulates the indoor climate in the selected building by taking into account parameters like building geometry, weather, window openings, ventilation, terrain factors and many more. It estimates the productivity and health of occupants in schools based on indoor temperature and CO2 concentration. Outputs are:

- Indoor temperature and CO2 concentration over the year
- Indoor air quality categories
- Teachers and pupils' performance
- Teachers and pupils' sick days
- Monetised values for performance increase and reduction of sick days

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SOCIO-ECONOMIC ASSESSMENT

Based on the LCA and Indoor climate assessments, the socio-economic impacts are monetised. Outputs of the other modules are processed into a probability network (Bayesian Network) in which they are combined with socio-economic parameters and local conditions of the assessing municipality. Out of CO2 emission numbers, the various CO2 costs are calculated, for example. The outputs are:

- Job creation in FTE/year and reduced unemployment expenditure
- Trade and Income tax revenues as one-time effects for the investment
- Fuel poverty alleviation
- Social, Tax and Emission trading CO2 costs
- Energy cost
- Particulate matter emissions

SUPPLY SIDE ASSESSMENT

Supply side assessment was integrated as a counterpart to the other modules. It assesses what would happen when all the investment is made on on-site or decentral renewable energy generation instead of energy efficiency. Some solutions are on-site PV, wind parks, biomass, etc. Outputs are:

- Investment cost for supply side solution
- CO2 emission reduction
- Energy cost reduction
- Various supply side options

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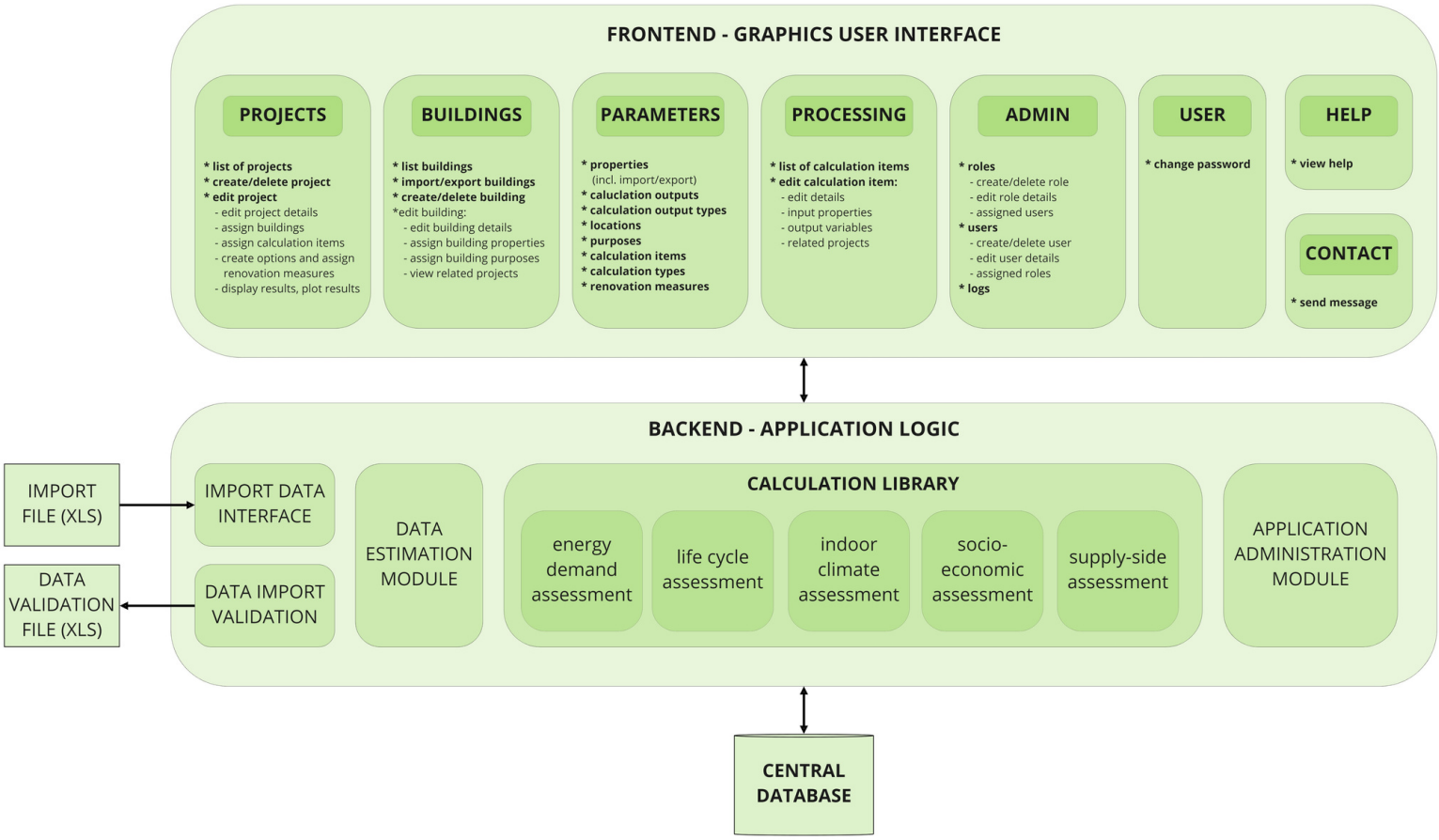
EERADATA DECISION SUPPORT TOOL

The EERAdata Decision Support Tool integrates all 5 assessment methods and the complex data management system into one browser-based software solution. It comprises and imports functions for building data and three user types. The normal user can create projects by combining buildings assigning renovation measures and assessment methods. These projects are then processed, and results are listed. The expert user can import buildings, define parameters, and can change all properties of the tool to adjust it to local conditions. The admin user can create users and assign roles for the further use of the tool.



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KEY RESULTS

The 5 assessment modules calculate outputs for single buildings or several buildings in a batch simulation. These outputs can be sorted by the directness of impact for the planning and investing entity:

1. WITHOUT BENEFITS, ONLY ENERGY RELATED SAVINGS

- Energy cost reduction

→ Payback time: baseline

2. WITH WIDER SOCIO-ECONOMIC BENEFITS

+ Reduction of sick days among teachers
+ Increase of teachers' performance
+ Tax returns (income and trade tax)
+ Reduction of CO2 emission cost (Tax, Emission Trading costs)

→ Payback time: reduction up to a factor of 5-15

3. WITH SOCIETAL SOCIO-ECONOMIC BENEFITS

+ Increase of pupil performance due to higher learning performance in school
+ Reduction of sick days among pupils in schools
+ Job creation and related reduction of unemployment expenditure
+ Reduction of social CO2 emission cost

→ Payback time reduction up to a factor of 15-45

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4. TO COMPARE SUPPLY SIDE ASSESSMENT

- Energy cost savings

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