IGUESS – AN INTEGRATED GEOSPATIAL URBAN DECISION SUPPORT SYSTEM FOR SMART CITY ENERGY PLANNING

ULRICH LEOPOLD

The World on a map – Emweltkadaster fir Gemengen – March 12, 2015

LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY

Outline

1. The MUSIC project
   - Overview
   - Objectives
2. iGUESS
   - Objectives
   - Framework
   - Web interface
3. The DEADALUS Project
4. iGUESS for Tangible Tables
5. Conclusions

Let's start with the MUSIC Project

MUSIC

–

Mitigation of CO_2 Emissions in **U**rban Areas: **S**olutions for **I**nnovative **C**ities

A partnership of European cities and research institutes that takes the lead in innovative CO_2 reduction!

MUSIC project overview

The MUSIC Project

- **is** an INTERREG IVB NWE project of 5 European cities (Rotterdam, Ghent, Aberdeen, Montreuil, Ludwigsburg) supported by 2 research institutes (DRIFT & LIST);
- **aims** at reducing CO_2 emissions in urban areas by 2030 and beyond;
- **involves** urban stakeholders starting with frontrunners;
- **adds** energy as a geospatial layer to urban planning;
- **develops** innovative strategies for sustainable planning.

MUSIC is about creating opportunities

- Prepare for energy transition;
- Look for business opportunities;
- Reduce socio-economic and health impacts, e.g. energy poverty; urban heat island effects.
- Create a sustainable city with high quality of life;
- Explore and develop the city together.

MUSIC explores questions

- How to create a common understanding of problems and potentials for change?
- How to mobilise different types of actors and renewable energy potentials to work towards a sustainable future?
- How to get support within your organisation for an innovative approach to reduce CO_2 emissions?
- How to use decision support tools for a participatory planning process?
- How to estimate and localise renewable energy potentials to develop adequate policies and business opportunities?

What are the objectives of MUSIC?

1. **Institutional innovations:** carbon reductive /energy governance with **stakeholder based vision** via transition management.
2. **Technical innovations:** Geospatial Urban Energy **information and decision Support** System (iGUESS) for scenario analysis and decision support across different scales.
3. **Learning** from **pilot projects** by using implementation and assessment using transition management and iGUESS.

Outline

1. The MUSIC project
   - Overview
   - Objectives
2. iGUESS
   - Objectives
   - Framework
   - Web interface
3. The DEADALUS Project
4. iGUESS for Tangible Tables
5. Conclusions

Let's look into iGUESS

iGUESS

–

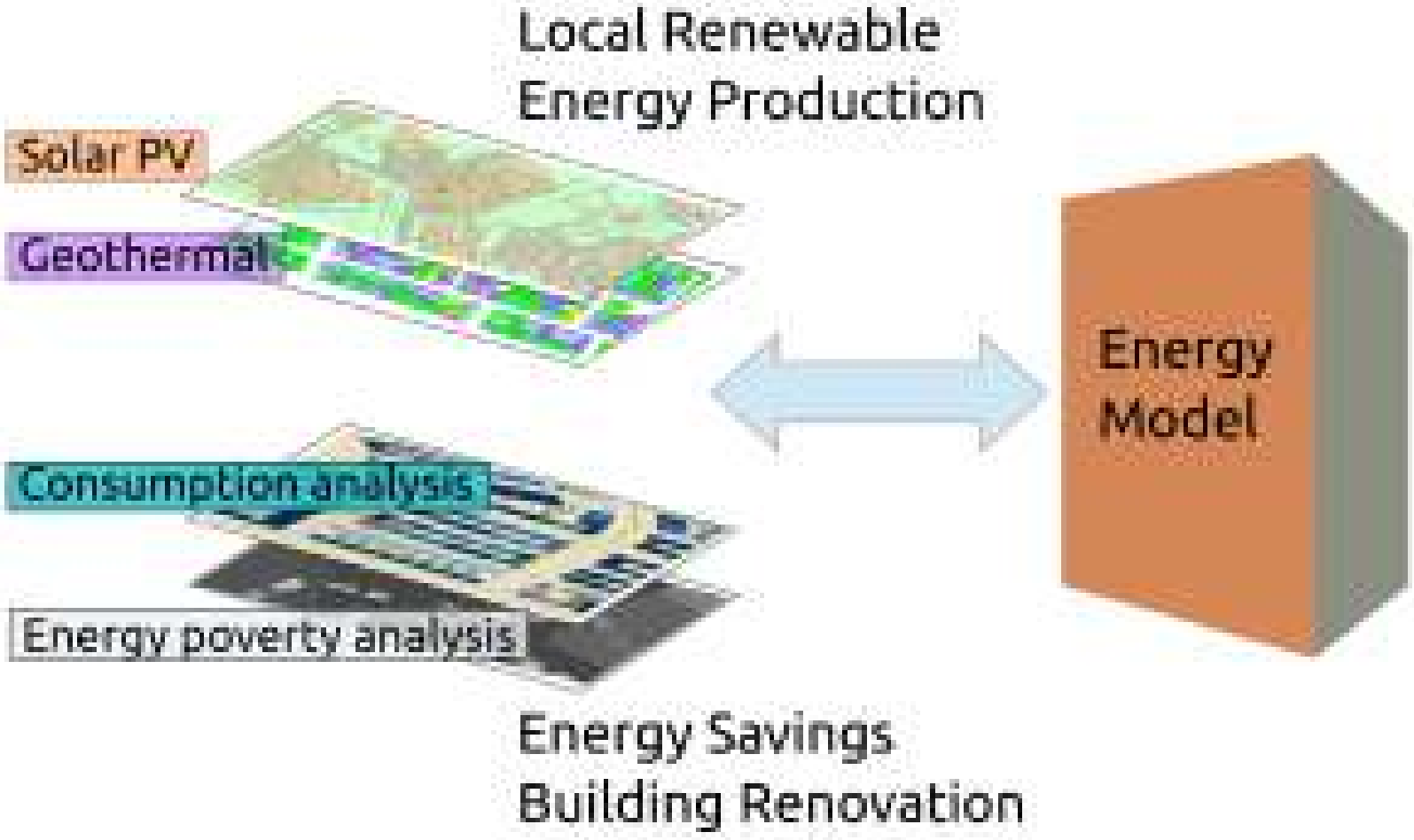
An **i**ntegrated **G**eospatial **U**rban **E**nergy information and decision **S**upport **S**ystem

iGUESS Objectives

iGUESS – a decision support system which provides:

- **smart tools** to explore opportunities across different scales;
- a **simple interface** to complex, distributed information for sustainable urban development;
- an **open source platform** assuring interoperability and improved interaction with stakeholders.

iGUESS – A modular framework

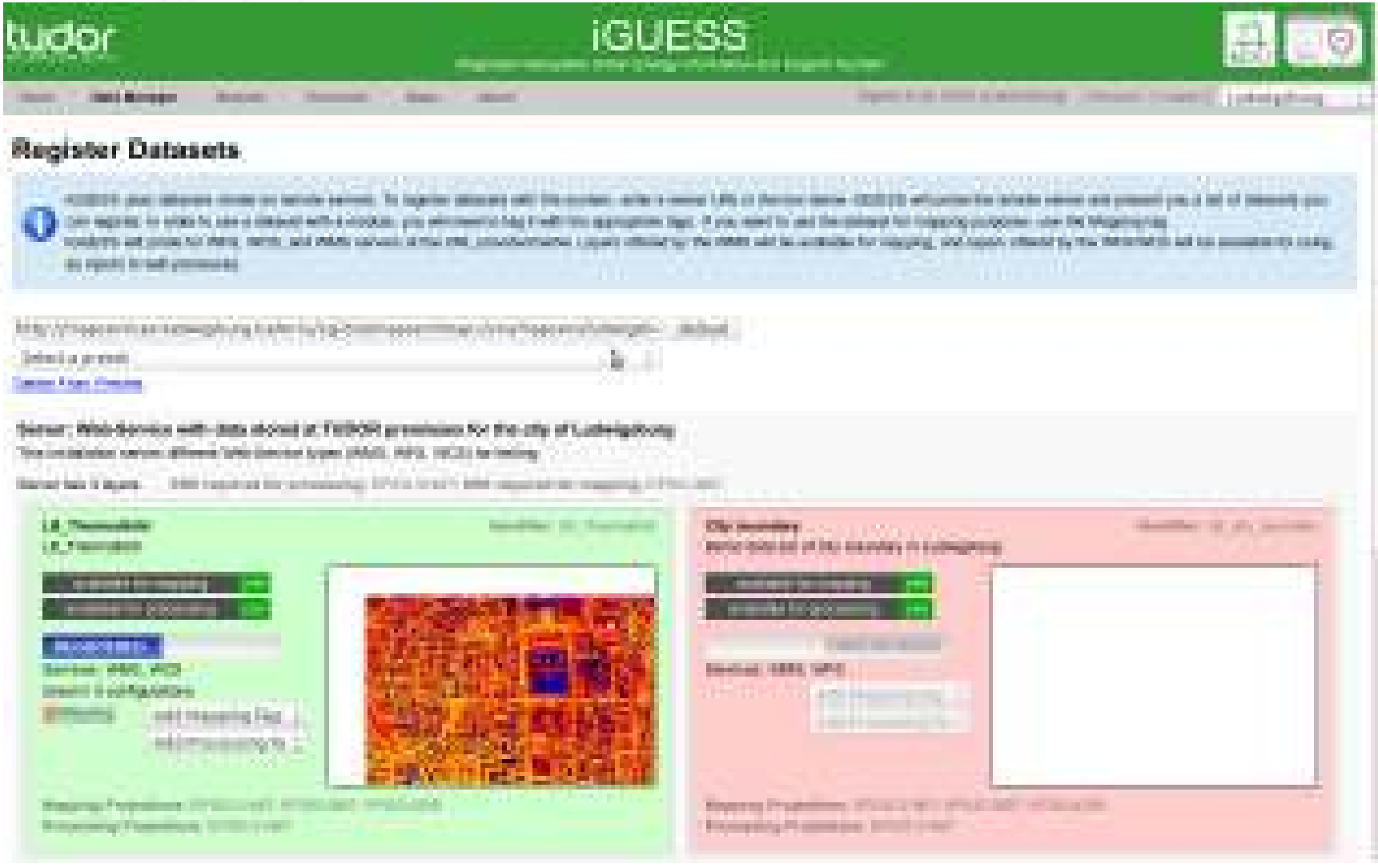


The iGUESS Start Page

The iGUESS Data manager

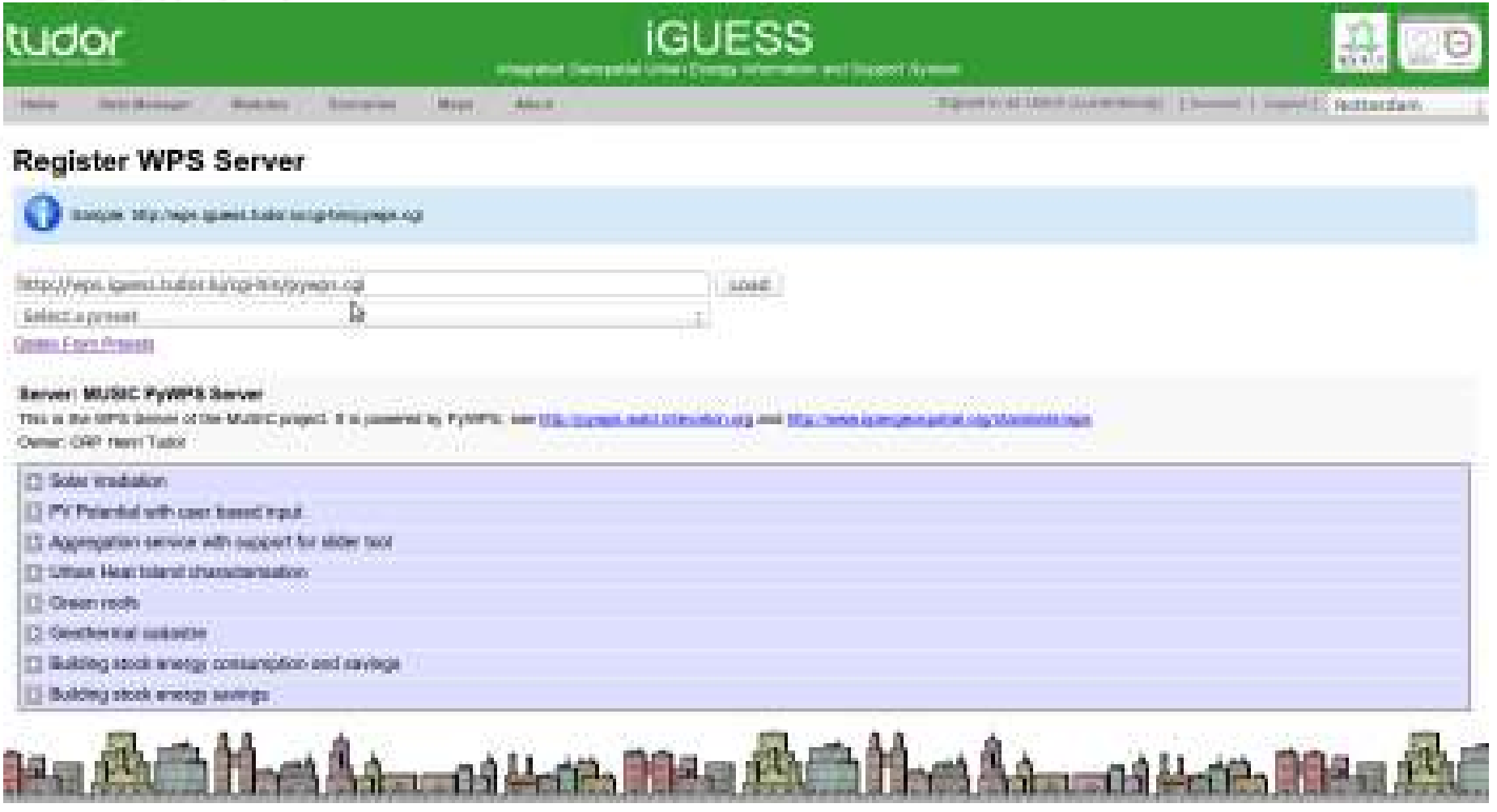
Retrieve information on data set

Register new Data Sets in iGUESS



Choosing a Renewable Potential Calculator

Linking in a Calculator across the Web



Registering the new Remote Calculator

Renewable Calculator – Solar irradiation

Renewable Calculator – PV potential

Exploring Solar Energy Potentials

Zoom-in Solar Potential at building level

PV Electricity Production Potential

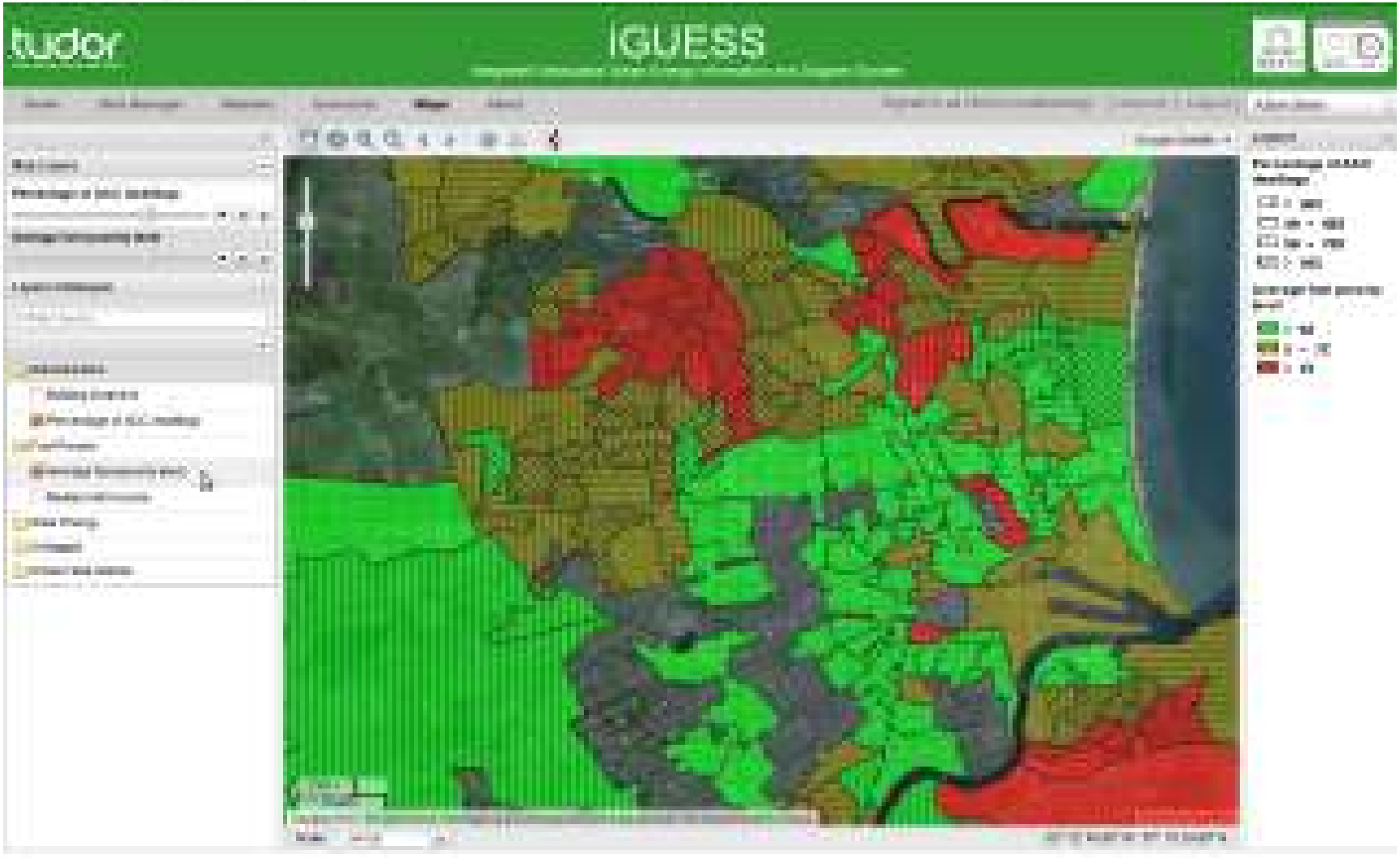
Looking at Geothermal Potential within the City

Combining Solar and Geothermal potentials

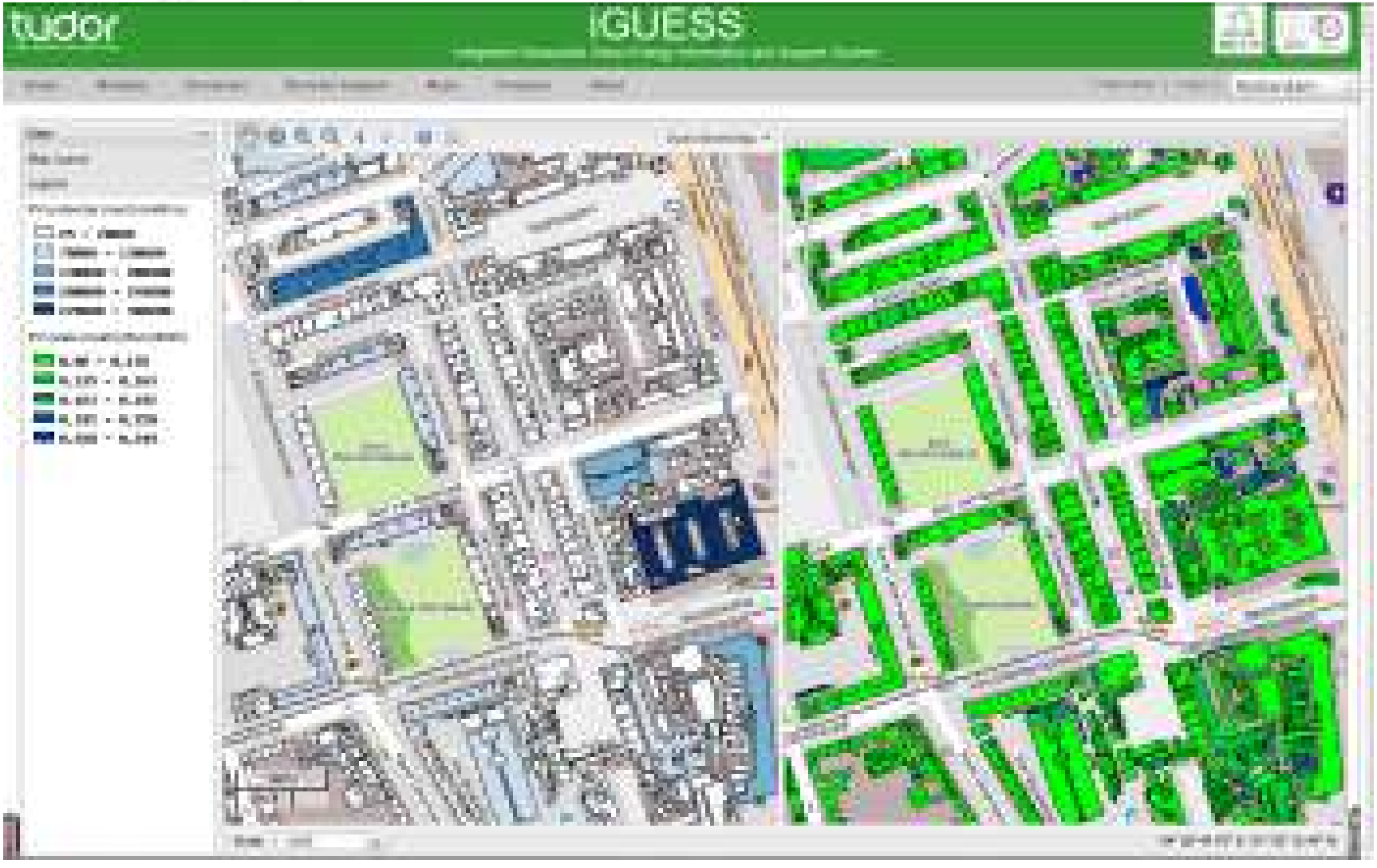
Exploring Energy Saving Potentials

Looking at Retrofit Investment Costs

Explore Energy Poverty across the City

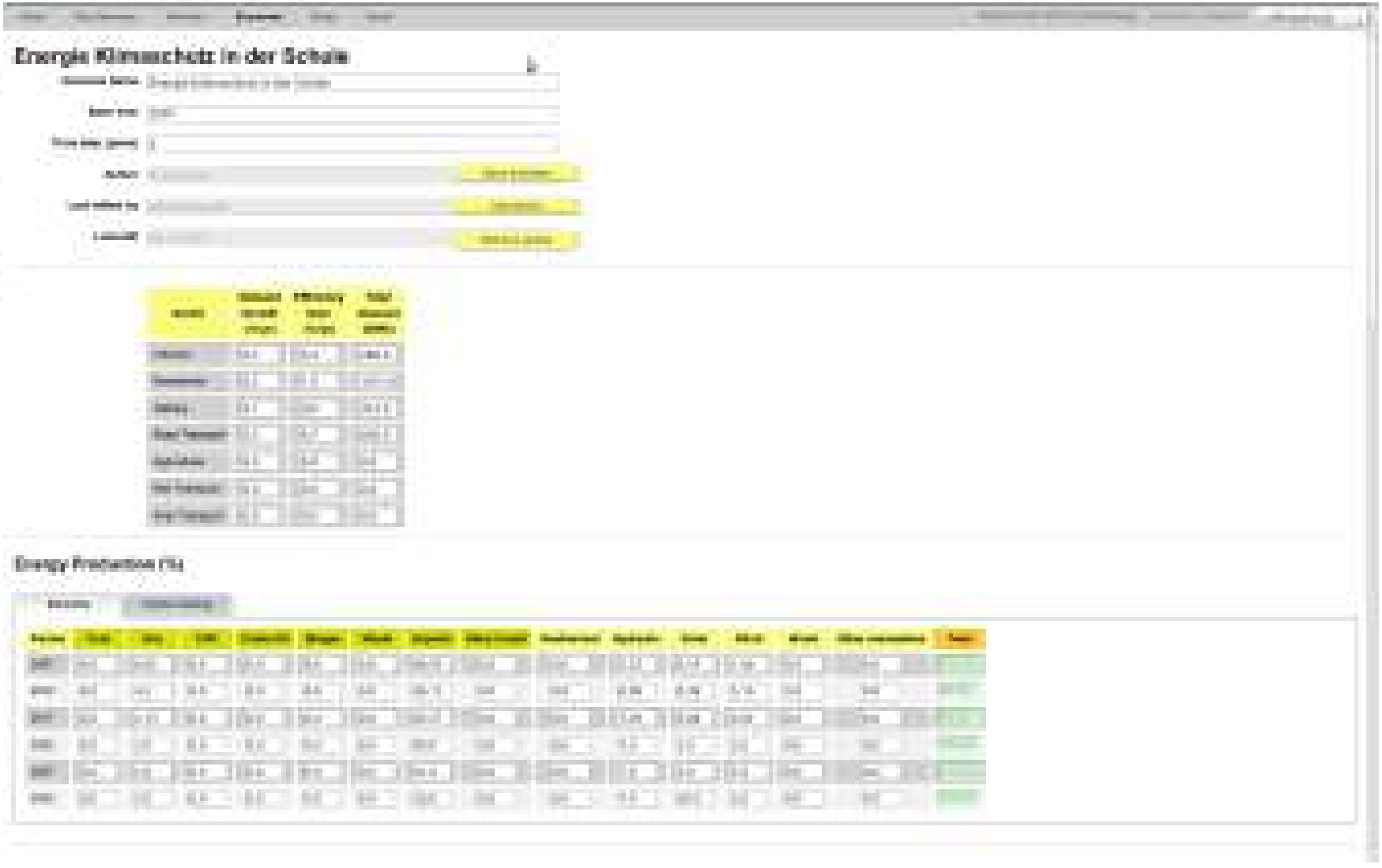


Comparing potentials to associated costs

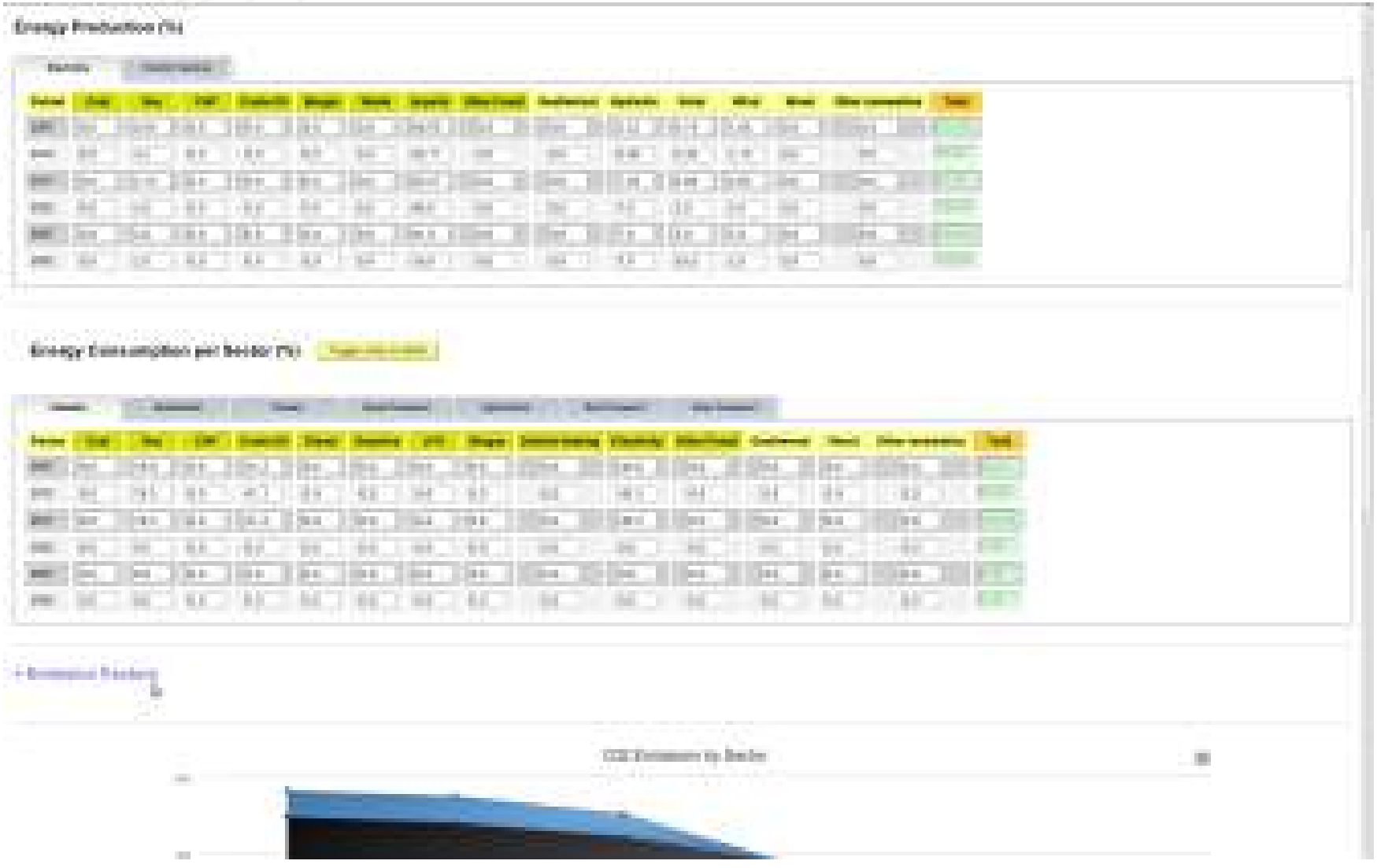


Planning neighbourhoods

Develop CO_2 Scenarios

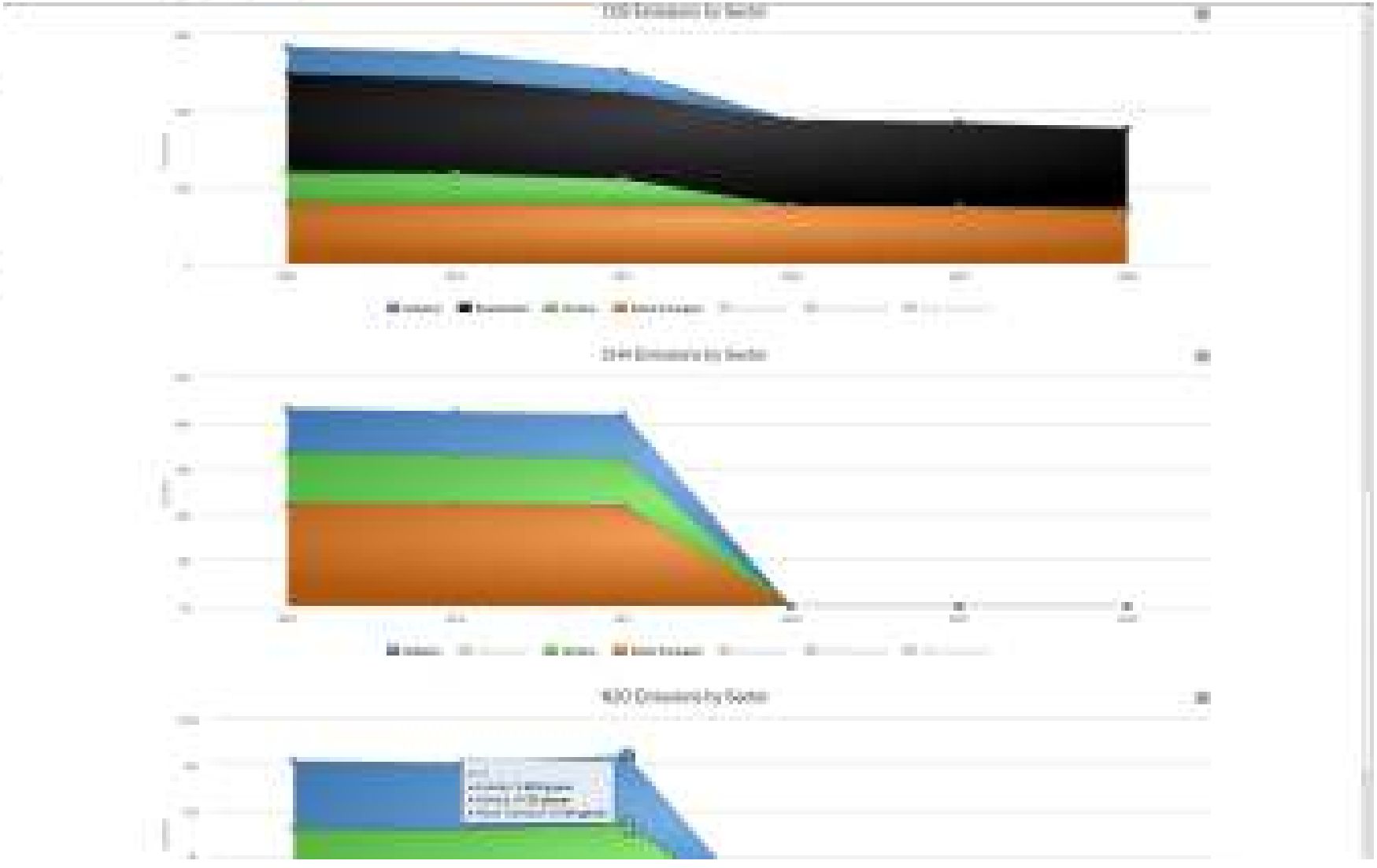


Develop CO_2 Scenarios

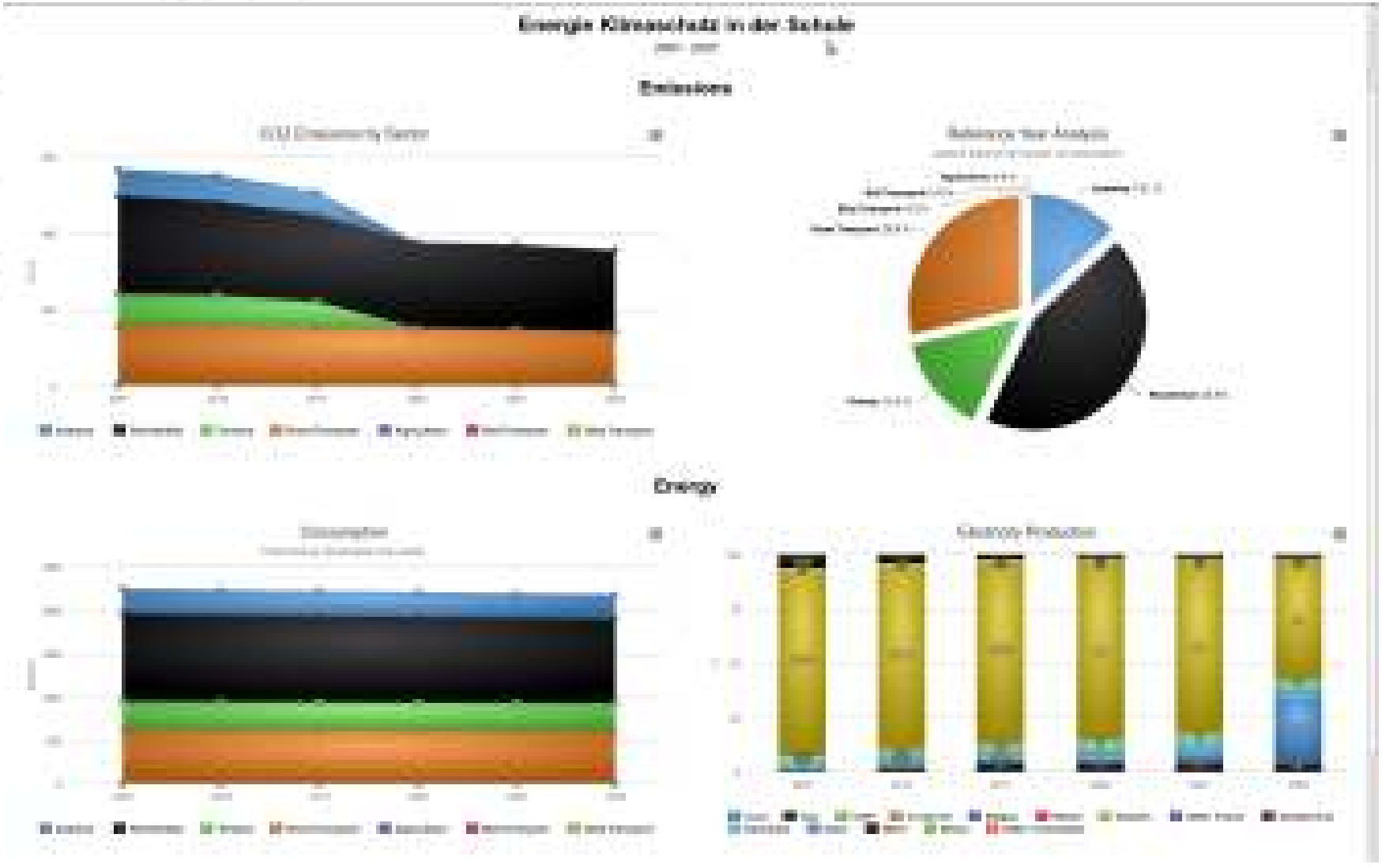


Develop CO_2 Scenarios

Develop CO_2 Scenarios



Assess Scenarios



Outline

1. The MUSIC project
   - Overview
   - Objectives
2. iGUESS
   - Objectives
   - Framework
   - Web interface
3. The DEADALUS Project
4. iGUESS for Tangible Tables
5. Conclusions

DEADALUS – Project overview

Postdoctoral project AFR/FNR
Dr. Alessio Mastrucci
Supervisor: Dr. Enrico Benetto
Partner institution: MINES ParisTech (France)
Duration: 2 years, 10/2014 - 09/2016

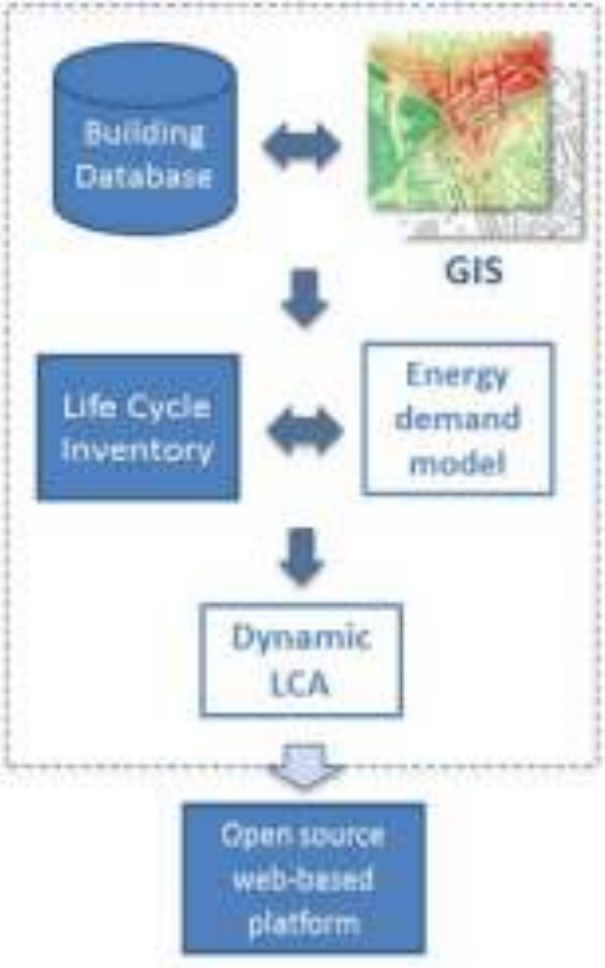
- **OBJECTIVE:**

Evaluate the effect of **retrofitting residential buildings on the environmental impact at the city scale** in space and time considering their **whole life cycle** for decision support in sustainable urban planning.

- **METHODOLOGY:**

Integrated approach:
- Dynamic Life Cycle Assessment (LCA),
- Energy modelling,
- Geographical Information Systems (GIS),
- Web-based open-source platform.

Case Study: Esch-sur-Alzette (Luxembourg)



DEADALUS – Expected outcomes

Tool to predict energy savings and environmental impact reduction of the residential sector for decision support in sustainable urban planning implemented in **iGUESS**.

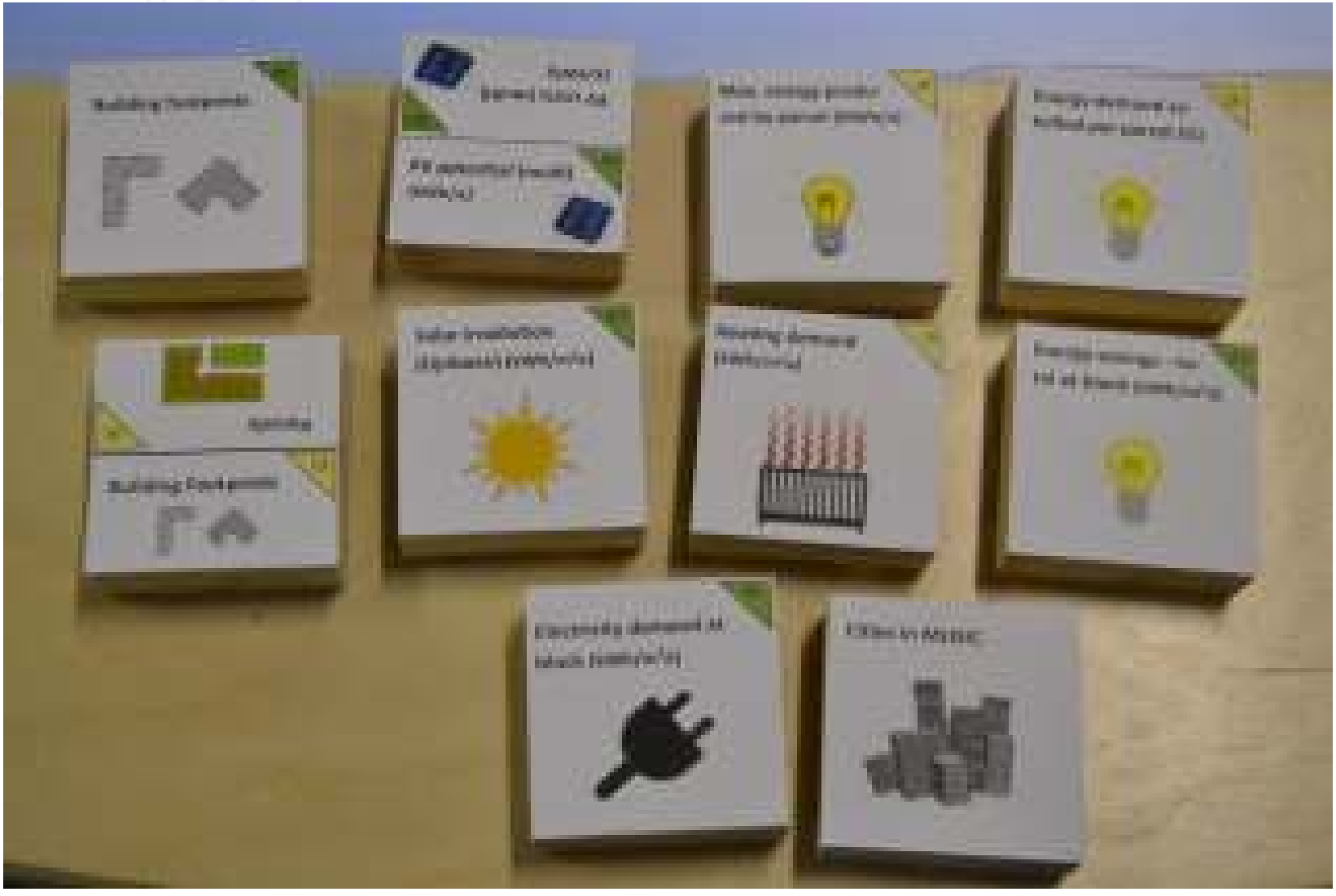
Outline

1. The MUSIC project
   - Overview
   - Objectives
2. iGUESS
   - Objectives
   - Framework
   - Web interface
3. The DEADALUS Project
4. iGUESS for Tangible Tables
5. Conclusions

iGUESS for Tangible Tables

iGUESS Tangible Table – Maps and Objects

iGUESS Tangible Table – Objects



iGUESS Tangible Table – Zoom to map

Outline

1. The MUSIC project
   - Overview
   - Objectives
2. iGUESS
   - Objectives
   - Framework
   - Web interface
3. The DEADALUS Project
4. iGUESS for Tangible Tables
5. Conclusions

iGUESS impacts

- iGUESS can help finding answers to complex questions;
- iGUESS helps municipalities to develop innovative strategies, e.g. open data access, mobile app developments, Solar PV for social housing, strategic CO_2 emission reduction scenarios, link fuel poverty with renewables and energy savings;
- iGUESS provides a flexible framework for integration of other topics, e.g. water management, air quality, transportation;
- iGUESS is looking for new municipalities and new opportunities.

Thank you for your attention!

CONTACT US AT:

Ulrich.Leopold@LIST.lu

www.theMUSICProject.eu