ENHANCE PROJECT

Why ENHANCE?

METREX is the Network of European Metropolitan Regions and Areas and has Members from some 50 of the Larger Urban Zones (LUZ) of Europe. Europe's urban areas are the main source of dangerous greenhouse gas emissions. They are also the areas of greatest energy wastage but, potentially, areas of very significant renewable energy generation.

In 2006 METREX promoted the use of the GRIP model (www.euco2.eu) to explore greenhouse gas mitigation scenarios to meet the then EU target of an 80% reduction by 2050. The project acronym was EUCO2 80/50 and it was sponsored by Ecomagination, a division of General Electric (GE). GRIP used greenhouse gas inventories for urban areas. However, during the EUCO2 80/50 Project the EU changed its emission reduction target to 80-95%, or substantive decarbonisation.

METREX responded to these changed circumstances by developing the ENHANCE model to explore means of energy saving, sources of renewable energy generation and their costs and benefits. In effect, to explore how substantive urban decarbonisation can be achieved. ENHANCE uses socio-economic, building, transport and energy data for urban areas.

ENHANCE has been piloted but not yet demonstrated. It has been evaluated in practice and optimised in co-operation with the Hamburg Co-ordination Centre for Climate Issues.

The use of the ENHANCE pilot was recommended by Prof. Dr. Walter Leal* from the Hamburg University of Applied Sciences: “Climate change is a problem of global dimensions but with local impacts. This is a tool which will be of great assistance to metropolitan regions and cities worldwide, in helping them to progress towards renewable energy self-sufficiency and decarbonisation, in a cost effective way, with the urgency now required.”

The ENHANCE Project is a joint practitioner/research project, firstly, because the ENHANCE model needs to be widely adopted and used to demonstrate clear and practical routes to substantive decarbonisation, and its financial viability, at the LUZ level and, secondly, because there are very significant implications for EU climate and energy policy which need to be researched and presented through reasoned argument based on practice.

*Professor Walter Leal (BSc, PhD, DSc, DPhil, DL, DEd, DLitt) is a Senior Professor at the Hamburg University of Applied Sciences (Germany) and London Metropolitan University (UK). He is a Review Editor at Working Group II (Impacts, Adaptation and Vulnerability) of the Intergovernmental Panel on Climate Change (IPCC). He is the Chairman of the EU-funded

Hamburg Stakeholder Workshops Using the ENHANCE Pilot

Hamburg has a long tradition of using simulation tools in the political decision processes, especially in urban planning and energy politics.

The ENHANCE pilot was available for the Co-ordination Centre of Climate issues in 2013, at an opportune moment; we were in a situation where we needed an instrument to take adequate decisions for our investment strategy.

From 2007 to 2012, our Centre had at its disposal over €20 million/year to be invested in CO2 saving projects. From 2013 on, this sum was reduced to €13 million/year which made it necessary to reflect even more intensively on which projects should be promoted in the future. At the same moment, the overall Hamburg Climate Action Plan was at a stage where detailed budget programmes had to be designed. For both aims, the ENHANCE pilot was a big help.

Based on the Hamburg emission data, ENHANCE allowed us to run 5 stakeholder workshops from May to September 2013. Every workshop consisted of 7 to 10 participants from administration, public enterprises and private companies.

The participants represented the Departments of Housing, Energy and Urban Planning, Universities, Trade Corporation, Chamber of Commerce and public and private companies from the transport, housing and energy production sector.

The participants had to choose measures and make assumptions in order to reach the highest level of CO2 reduction at lowest costs and shortest amortisation times. The workshops lasted between 4 and 5 hours; they were intensive and took place in a very good atmosphere. Even CEO's of big companies liked this way of modelling the future of the city. At the request of participants, follow-up workshops were held with the whole advisory board of three public enterprises.

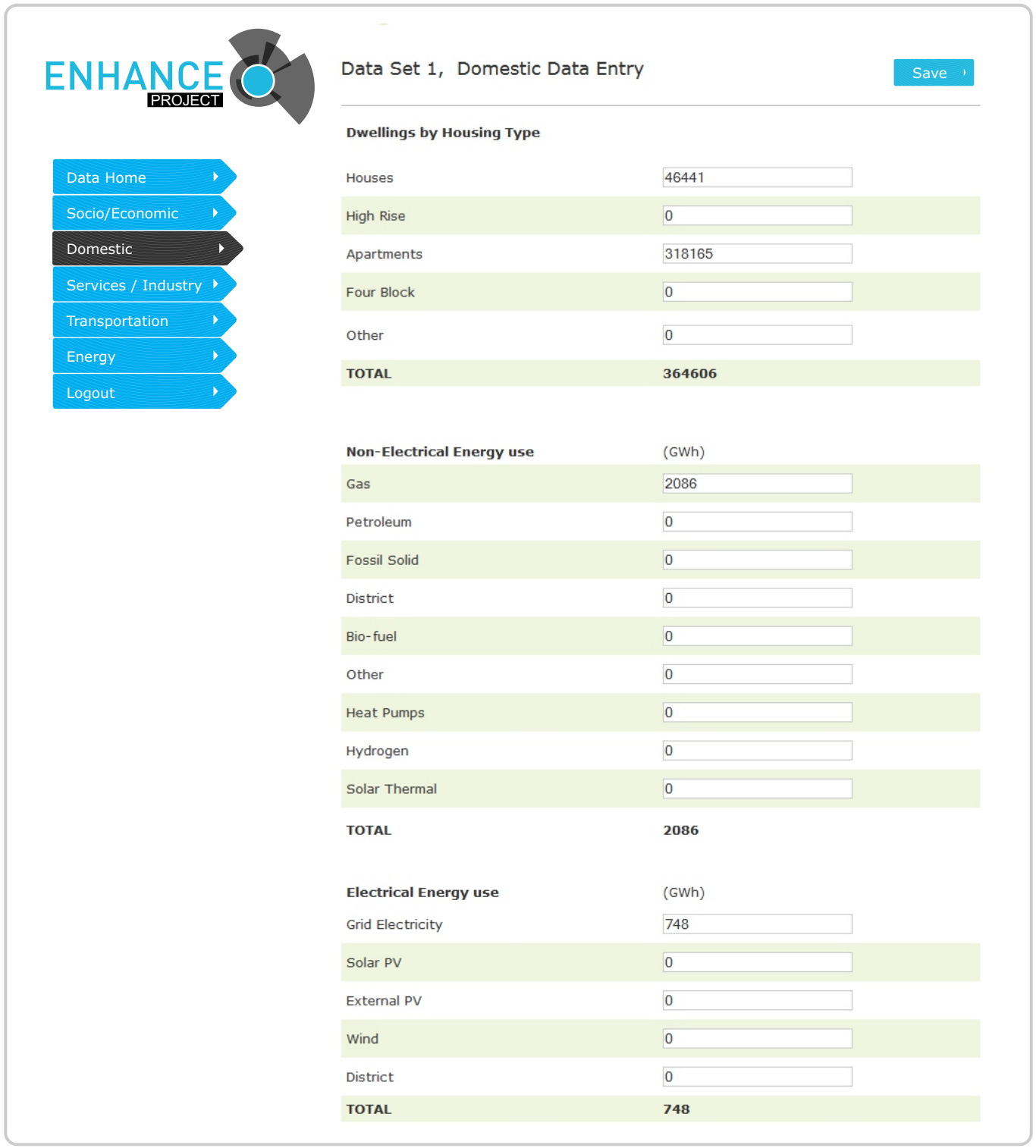
The average CO2 reduction was of 78%, the average amortisation time of 11.5 years. It is self-understanding, that the results could not be converted 1 by 1 into budget lines. Nevertheless, there was no discussion on budget plans that did not recur to the results of the workshops. A second series of workshops is planned for 2016, based on actualized demographic and emission data and current prices.

Rainer Scheppelmann, former Head of the Hamburg Coordination Centre for Climate Issues.

The ENHANCE model

ENHANCE is a tool that allows the exploration of energy scenarios to be illustrated in a visually understandable way. Alternative assumptions and approaches can be explored and the consequences displayed with visual feedback. The important point is that the quantitative implications and, eventually, the cost implications of energy strategy scenarios can be explored and measured. ENHANCE supports the exploration of energy as an aspect of spatial planning and development on an informed basis.

The ENHANCE model runs on national and LUZ data, assumptions and forecasts. Data is supplied be means of an online inventory which is then transferred to the tool to produce a customised version for metropolitan areas, regions, towns or cities. Calculations based on IPCC (Intergovernmental Panel on Climate Change) emission factors and geographical sunshine hours are also made to calibrate the model for individual situations.



Inventory data

The ENHANCHE inventory utilizes public data, most inventory data can be obtained from published government sources or returns to the IPCC (Intergovernmental Panel on Climate Change). The building stock information is an important factor when calculating the potential of solar energy through the use of building surfaces.

- Socio/Economic data
- Structure of the Building stock (domestic and services/industry)
- Energy consumption data (domestic, services/industry and transportation sectors)
- National grid supply data
- Regional/local energy production

Navigational Structure

Limiting factors

Changes in: population size and demographics, households, building composition, building substitution and the economy.

Energy Consumption Sectors

Assumptions concerning the energy mix, efficiency and demand for both for electrical and non-electrical energy.

Outcomes

Financial and CO2 outputs: Total investment, annual savings, payback time and levels of decarbonisation by consumption sectors and overall.

1

Assumptions
Changes in energy efficiency, demand and the energy mix can be explored for both existing and new structures. Installation variables and available space are also discussed.

2

Further Exploration
Futures can be explored for both electrical and non-electrical energy and also by different sectors by navigation between tabs.

3

Outcomes
All changes in the individual sectors are visually represented by graphs. A running total of energy, emission and financial implications is also displayed to show the overall change associated with actions within each sector.

Assumptions

ENHANCE allows assumptions to be made and the outcomes to be explored. It is important to recognize that forecast change, although numeric, will be in 'orders of magnitude' and of 'directions of travel' for scenario purposes.

An ENHANCE scenario begins by making assumptions on the limiting factors, such as changes in the population, demographic structure, building composition, and economy. These determine the potential change in your total energy consumption but also the potential for energy savings and generation. They also have a direct relationship on the outcomes in terms of financial investment, payback time and CO2 reductions.

Further assumptions are then explored in the domestic, services/industry and transportation sectors. The fuel mix, efficiency and demand for both electrical and non-electrical energy can be modified and changes visualised in terms of total consumption, emissions, financial investments and payback time.

Outcomes

ENHANCE looks to provide evidence for the feasibility and viability of investments in renewable energy by understanding that energy and energy security is a key component of a future competitive economy. Furthermore it also looks to explores to what extent a metropolitan area can become self-sufficient in terms of energy.

Financial calculations are based on the scenario inputs and energy savings and financial investments are calculated and the payback time indicated.

Financial outputs can be further explored, for example, changes in fossil fuel prices, installation costs and modifications due to changes in national feed in Tariffs for renewable energies.

The final stage looks at the level of decarbonisation overall and by sector. This is helpful in giving an appreciation of the win/win outcomes in economic and environmental terms.

1

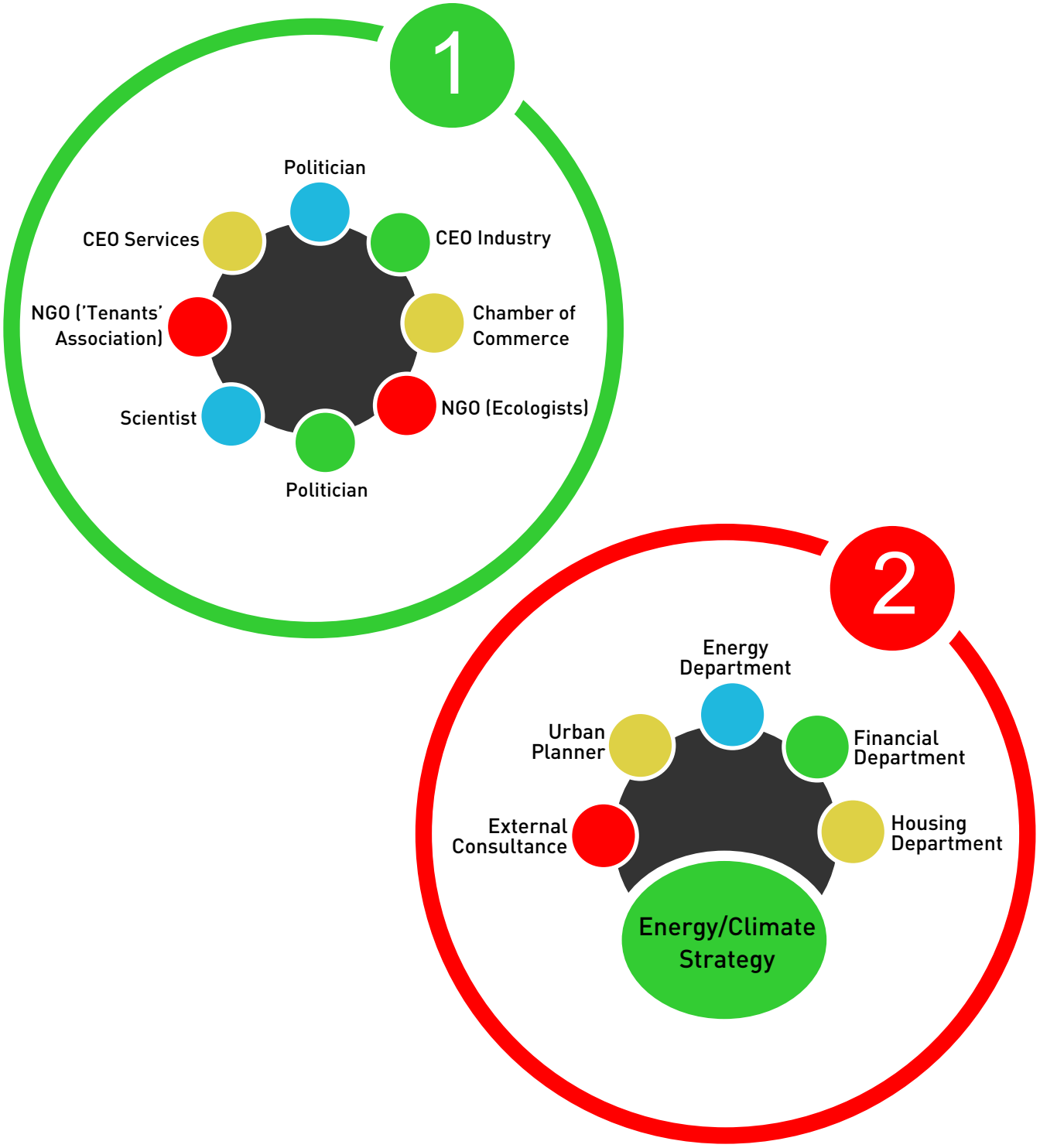
Financial Outcomes
Total investments and savings are calculated based on scenario assumptions and the payback period indicated. Overall savings in energy are displayed by sector.

2

Further Exploration
Financial liabilities can be further tested by modifying potential installation costs and changes in fossil fuel prices.

3

Decarbonisation
Overall reduction in CO2 and reductions by sector are calculated. Self-sufficiency can be modelled by looking at regional energy generation and capacity.



Workshops Scenarios

ENHANCE workshops can be used in one of two ways. Firstly, as an awareness and consensus raising tool, bringing together stakeholders from different sectors to explore energy and environmental futures. This helps to promote metropolitan energy and climate change strategies and improves stakeholder involvement and ownership.

Secondly, you can use ENHANCE to explore the assumptions in your energy and climate change strategies by inviting experts to explore scenarios for energy futures. In this way ENHANCE is an effective tool for day to day working.