DST, DECISION SUPPORT TOOL TO FACILITATE ENERGY-EFFICIENT RENOVATION OF BUILDINGS

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1 Background to DST development

The aim of the DEMOHOUSE project is to develop minimum standards and recommendations for energy-efficient and sustainable renovation of social housing estates. Within this, the Decision Support Tool is one of the final results and uses knowledge gathered throughout the DEMOHOUSE project. In many European countries, social housing is owned by housing associations, municipalities or housing co-operations. To facilitate the decision makers in these organisations a simple instrument which helps to select relevant information for making decisions is developed within the DEMOHOUSE project. There are several phases in the process of renovation of dwellings. Main decisions in relation to ambitions of the renovation in energy-efficiency, sustainability, economic feasibility and occupants' participation take place in the first so called *initiative phase.* It is this phase that the DST is focusing on to guide the decision makers, hosing managers and home owners associations alike, through decision making process towards achieving energy-efficient and sustainable renovation of dwellings. As any building renovation is a complex process with many stages, the tool also contains practical information and offers guidance and links to further more in-depth information of relevance to other stakeholders for example: architects, energy experts, building contractors, and building users.

2 DST Content

The Decision Support tool contains examples of best practice renovation including the five pilot renovation projects realised within the DEMOHOUSE project. It also includes overview of different improvement technologies and renewable energy technologies,

information on low cost technical solutions and catalogue of best available technologies. The DST allows access to relevant existing tools such as: the Energy Signature, for evaluation of energy saving measures, the Green Build Quality Process, the Green Build Questionnaire and the Green Diploma as tools for promoting higher ambition level of sustainability in buildings. Indicators to control building construction quality and performance, for example IR-photography and Blower Door Test are also included as well as appropriate financial mechanisms for affordable energy efficient renovation (such as energy service companies, ESCOs) and indicators for tenants participation in the renovation.

The DST is answering two main questions:

- Why an energy-efficient and sustainable renovation?
  and
- How to do an energy-efficient and sustainable renovation?

Why an energy-efficient and sustainable renovation? This question is presented to decision makers with quality indicators as benefits associated with this type of renovation. The benefits can be considered from several points of view. Firstly, a social housing point of view: Property value (financial benefits), Lettability (energy + rent), Improved building energy labelling (EPBD), Comfort (indoor environment). Secondly, from occupants' point of view: Social status (neighbourhood image) and Lower total living costs. Thirdly, from the Environmental point of view (climate protection and conservation of resources). All indicators are described in a concise manner with further information provided as attached reading documents, easily accessible as pdf documents and / or links to other sources.

Beside the benefits, barriers and opportunities for an energy-efficient and sustainable building renovation are also described categorised as architectural, financial, social, technical and legal. Many of the barriers present in itself opportunities, for example, increased height of investment is regarded as a financial barrier, while increased market value of the building after the renovation at the same time can be an opportunity. Similarly, the financial consequences for the tenants as potential rent increase is a barrier while lower living costs due to energy savings is an opportunity.

The second main question: *How to do an energy-efficient and sustainable renovation?* is addressed through three main aspects categorised as Technical, Financial and Social. The Technical aspect for decision making in an energy-efficient renovation includes general guidelines on energy conservation, different improvement techniques and renewable energy technologies, best available technologies and information on low-cost technical solutions. The technical aspect of the DST also makes reference in regards to benefits of employing construction quality control techniques: IR camera, Blower door test; and the Energy Signature for post-occupancy energy performance. Access is provided to relevant existing tools: the Green Build Quality Process, the Green Build Questionnaire and the Green Diploma. Finally, 'lessons learned' are included from the five DEMOHOUSE building renovation projects.

The Financial aspect of the tool provides managers with information on novel financial models i.e. energy service companies or ESCOs. They can be initiated to do engineering, finance and even do the maintenance and financial administration of renovated buildings. By outsourcing energy efficient installations, the housing association need lower

investment and have lower financial risk. Also included is the cost analysis for implementing renovation measures for each of the Demohouse renovation projects, including the energy and CO_2 emission saving potential. Simple pay back time for renovation investments are calculated and compared to pay back times in typical renovations. This analysis was used to identify optimal renovation measures. The Social aspect of the tool promotes to managers advantages of tenants involvement and participation from early stages of renovation and benefits of providing building users with information on proper energy-efficient house use and maintenance.

Where appropriate, the use is made of other DEMOHOUSE project deliverables. Since the DST is aimed at decision makers of housing renovations (managers), it is not an intention of the tool to provide management or organisational information.

2.1 DEMOHOUSE building renovation projects

Throughout the DEMOHOUSE project different buildings in five European countries, Denmark, Austria, Greece, Spain and Hungary, are being renovating under sustainable criteria. In the DST tool all these renovation projects are presented. The design process and selection of renovation measures assessment is described towards achieving best renovation scenario. The life cycle costs and CO_2 emissions have been calculated in renovation case. The analysis included a comparidon to existing building prior renovation and a standard renovation case. The simple pay-back times and CO_2 emission reductions were also calculated and optimal renovation measures in each renovation building identified. This provides decision makers with clear show-cases of energy, CO_2 emissions saved and the cost and pay back times in with renovations.

Figure 1: DEMOHOUSE renovation buildings in Austria, before and after renovation.

Figure 2: DEMOHOUSE renovation buildings in Spain, before and after renovation.

The energy monitoring programmes undertaken in all Demohouse renovation projects is also presented in the DST. The monitoring programme includes blower door and thermography tests as well as measuring the consumption of heat, electricity and water in renovated buildings. Renovation projects with renewable energy technologies have special programmes for monitoring of the energy production from renewable sources in addition to monitoring the actual energy consumption. Since the monitoring is to start after the on-line launch of the DST, monitoring information and analysis of the energy consumption and building function if it is in accordance with expectations and ambition of renovation will be included in the DST at the time they become available.

3 Validation and Translation

It is intended to test the structure, content, usefulness and user-friendliness of the tool by sending the pilot version of the DST accompanied with a short questionnaire to several potentials users internationally within the network of housing associations decision makers and DEMOHOUSE partners. The feedback will be used constructively to improve the tool.

The DST structure and content (in English) is developed by ECN and will be included onto the DEMOHOUSE project website http://www.demohouse.net/publications/decision-support-tool/. In order to reach widespread European audience and potential tool users as well as promote project achievements, the DST will be translated by project partners to their national languages and included on project website with links to related national websites.