IEA ECBCS Annex 36: Energy Concept Adviser for Technical Retrofit Measures – An internet-based Tool on Information, Assessment and Concept Development of Energy-saving Retrofit Strategies

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ABSTRACT

Research partners of 10 different countries are developing a computer tool in the framework of IEA ECBCS Annex 36, which helps decision makers to include the most energy-efficient and economic technical retrofit measures into the retrofit of their educational buildings. The tool, which will be ready for distribution at the end of 2003 consists of several parts such as

A) the problem related recommendation part in which the building owner or care-taker will find solutions to existing problems of his building including detailed information on the retrofit measure, case studies in which the same problems were taken care of and an estimation of the pay-back period of the measure
B) the case study viewer that consists of descriptions, results and lessons learned out of more than 30 retrofits of different educational buildings in different countries
C) the retrofit measure viewer with information on various energy technologies for retrofit measures such as improvement on the building envelope, the heating, the ventilation and the cooling system, the lighting and the electrical power
D) the performance rating part in which the decision maker can rate the energy performance of his building in comparison to national surveys
E) the concept development part. Here the technical staff of the decision maker can assess suitable measures for their building. The input part allows adapting the building geometry, the construction and the heating and ventilation system to the existing state of nearly any school or university building. Additionally various retrofit measures can be evaluated and combined with each other. As result the energy demand and the cost for each combination is given. By that an energy retrofit concept can be developed which will be further refined with the help of regional consultants.

An exemplary application of the tool will be shown with respect on ventilation strategies and their influences on the primary energy demand.

KEYWORDS

IEA ECBCS Annex 36, retrofit, educational buildings, retrofit technologies, energy saving, energy concept adviser.

1. INTRODUCTION

Retrofitting of educational buildings often focuses on renovation and remedy of defects. However several case studies have shown that energy-efficient retrofit can be realised with rather short payback times. During most renovations energy saving measures are not applied

because of a lack of knowledge by the decision makers regarding the investments and the efficiency of potential energy saving measures. Due to the lack of information, in many cases decisions are made that do not accurately take into account energy saving aspects. This is the background for initiating the IEA ECBCS project Annex 36: Retrofitting in Educational Buildings - REDUCE - Energy Concept Adviser for Technical Retrofit Measures.

2. THE ENERGY CONCEPT ADVISER

The Energy Concept Adviser is the main outcome of the IEA ECBCS Annex 36 "Retrofitting in Educational Buildings – REDUCE. It is an internet-based computer tool on information, assessment and concept development of energy-saving retrofit strategies. The title page is shown in figure 1.

Figure 1: Title page of the Energy Concept Adviser tool.

Experts from 10 different countries are now finalizing the work on the simple-use computer tool that should help decision makers in administrations and their staff to take energy saving possibilities into higher account during renovation projects and therefore reduce the energy consumption of the existing building stock. The Energy Concept Adviser consists of several parts, which are summarized in figure 2.

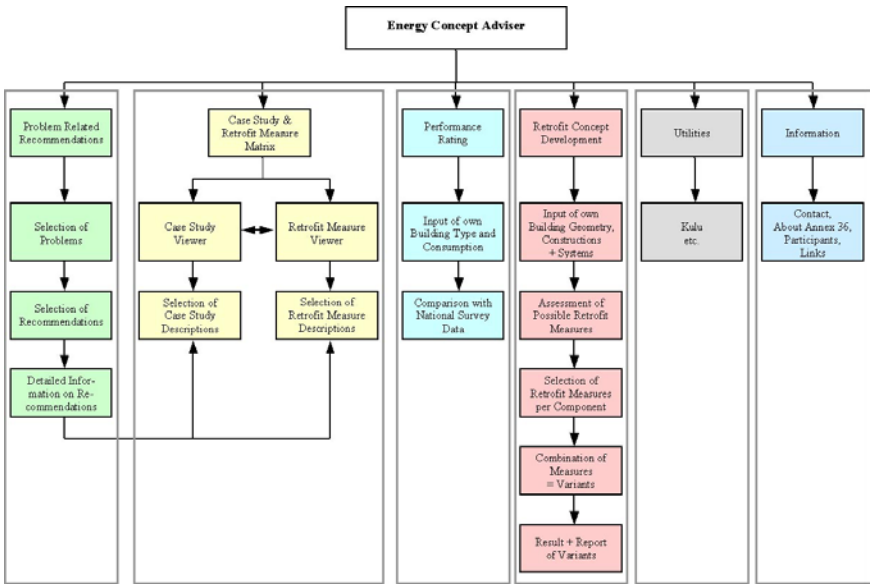

Figure 2: Scheme of the different parts included in the computer tool.

2.1 Problem Related Recommendations

This part is meant for specified problems in the building managed or administered by the users of the computer tool. After entering the recommendation part the user has to define the existing problem by selecting one of the offered possibilities. After that the programme suggests several solutions, mainly retrofit measures and indicates the usually needed payback times (see figure 3). The possible measures are further described and the best carryout time is defined. Additionally a link to case studies in which this retrofit measure was used and to the suitable retrofit measure viewer chapter is offered. Special attention is given to IAQ and ventilation issues.

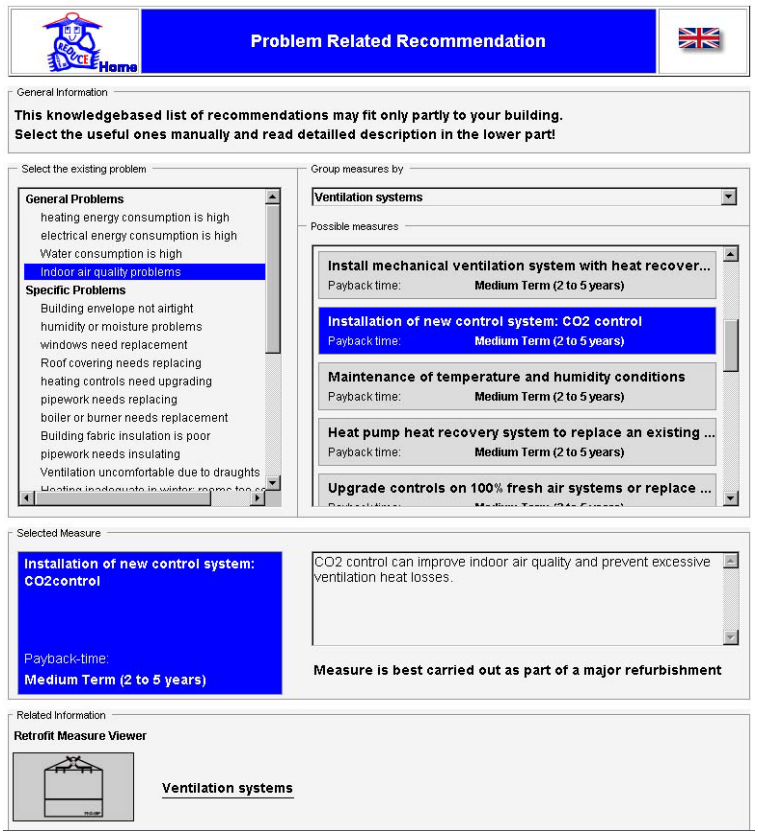

Figure 3: Screenshot of the Problem Related Recommendation programme part. Note: The suite of programme is still in the finalising state; additional problems and measures will be added soon.

2.2 Case Studies and Retrofit Measures Matrix

The tool includes more than 30 case studies of retrofitted educational buildings during the last years in the 10 participating countries of the Annex. On the other hand it contains a comprehensive overview on possible retrofit measures with detailed descriptions. The matrix presents which retrofit technology was used in which case study and allows the user to select either the case study or the retrofit measure he wants to be informed on. The case studies can be sorted by country, by age or by typology. The retrofit measures can be sorted either by energy technologies or by the sub headers building envelope, heating systems, ventilation systems, solar control and cooling systems, lighting and electrical appliances and management.

Figure 4: Screenshot of the Case Studies and Retrofit Measures Matrix.

The case studies and the retrofit measures are described in detail following a defined reporting format summed up in the internet-like computer tool (extract see figure 5) and even more explicit in the downloadable pdf-file.

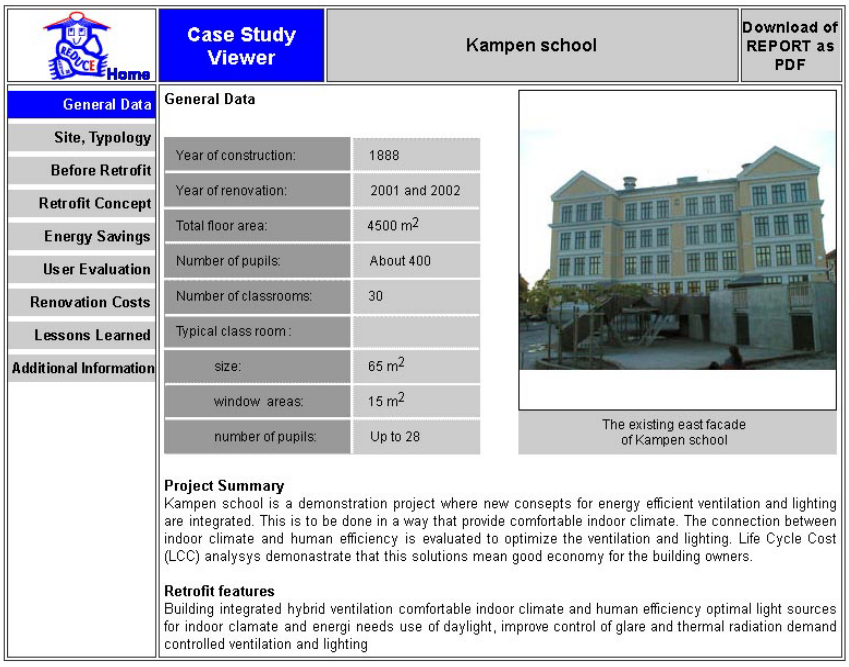

Figure 5: Screenshot of the Case Study Viewer with the example of the Norwegian Kampen School retrofit project, which concentrated on hybrid ventilation.

2.3 Performance Rating

This part should help the user to classify the energy consumption of his building in comparison to a national survey. All participating countries have collected data on the consumption of educational buildings concerning heating, electrical energy and water. The rating tells the user if the specified building is in deep need of an energy-efficient retrofit or not. An example for the execution of the performance rating is given in figure 6.

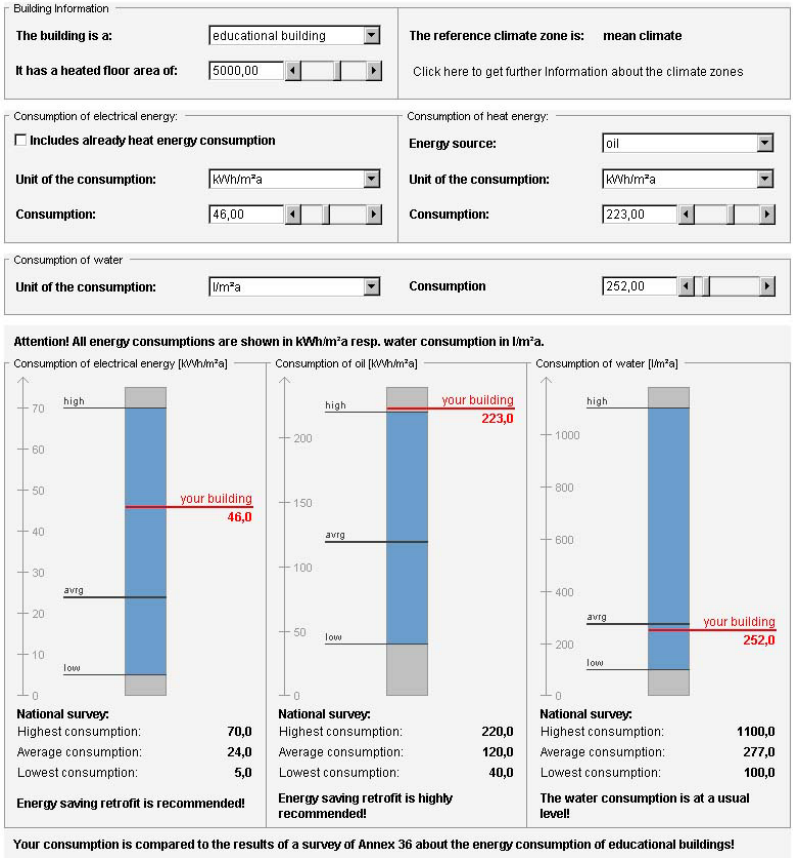

Figure 6: Screenshot of the Performance Rating possible with the Energy Concept Adviser tool.

2.4 Retrofit Concept Development

The core of the Energy Concept Adviser tool enables the user to develop one or several possible retrofit concepts for a specific educational building. After adapting default values for the building geometry, the constructions and the systems to his building, the tool calculates the energy savings and costs for various possible retrofit measures for the different building parts and the heating, ventilation and lighting system. The user can now go on and define several combinations of measures, which are compared by their final and primary energy savings, their CO_2-reduction rates, their costs and their net-present values. Here the influence of the replacement of a natural by a mechanical ventilation system on the heating and electrical energy demand can be identified. A comprehensive report is created as the final outcome of the retrofit concept development. Figure 7 shows the input part of the Retrofit Concept Development Part.

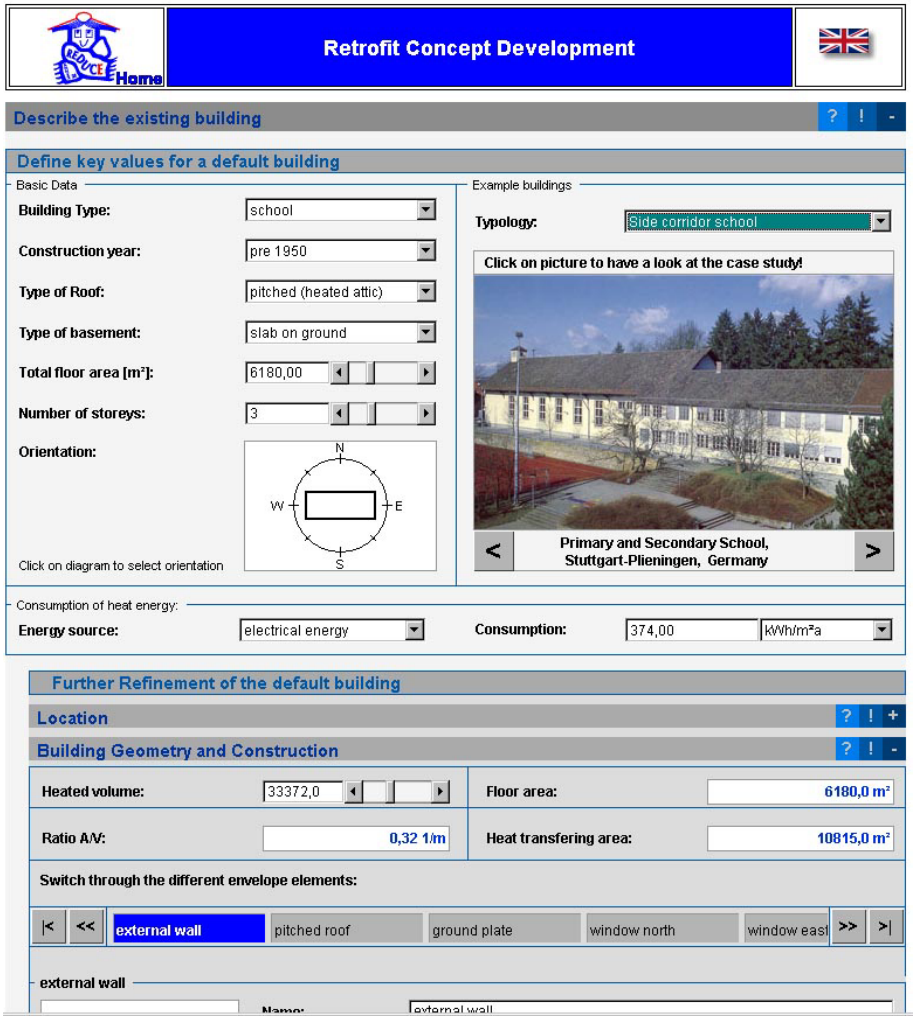

Figure 7: Input part of the Retrofit Concept Development programme included in the Energy Concept Adviser Tool of IEA ECBCS Annex 36.

3. CONCLUSION

The Energy Concept Adviser tool is a suite of programmes created for the decision makers in the administrations dealing with retrofits of educational buildings. It contains several instruments to help the executives to solve energy-related problems in their own buildings, to assess the energy demand of the buildings, to develop energy-efficient retrofit concepts and to have a look at already realised energy saving retrofits in their own and in other countries. The overall aim of the tool is to reduce the energy consumption of educational buildings by promoting energy efficient retrofit strategies such as for example hybrid ventilation.

4. REFERENCES

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