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ECO-EFFICIENCY INDICATORS FOR ACTORS AND PRODUCTS OF BUILDING SECTOR

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Summary

The Finnish REM research project (Häkkinen at al. 2004) developed eco-efficiency indicators and assessment methods both for building processes as well as for products. The project addressed 10 - 15 eco-efficiency indicators for different actors including owners, designers, constructors, designers, suppliers of building management services and manufacturers.

In addition, the REM project collected and formulated guidelines for the assessment of eco-efficiency of products including all end products from materials to buildings and real estate. The results are shown in the web pages of the Confederation of Finnish construction industries. The results include guidelines about the assessment and reporting results. In addition, the result includes the data basis of the environmental aspects of energy, transportation and construction site. This background information is needed as one has to assess the environmental impacts of buildings.

The paper describes the main results of the Finnish REM research project and shows examples about the formulated eco-efficiency indicators both for the actors in building sector and the end products of building sector.

1. Introduction

Building eco-efficiency requires the contribution of all actors involved in the building project. In order to achieve good eco-efficiency, the different actors should not only care for their own environmental management but also to ensure the supply and transfer of all needed information. The eco-efficient decision making within design, building and maintenance is only possible, if the client or the owner states requirements about the environmental performance and building performance of the object and addresses these requirements to be the starting point of the project. On the other hand, the eco-efficient decision making within design, purchase and building management is dependent on the availability of information concerning the environmental performance and service life of all products needed. In addition, the possibilities to achieve good eco-efficiency results depend on the designer's ability to assess and compare service life, environmental performance and energy consumption with regard to different options.

VTT's research project REKOS (Häkkinen et al. 2002) defined the eco-efficiency of buildings by relating the performance and conformity of a building with its environmental pressures: The eco-efficiency of a building was defined as the ratio of the building performance and conformity to the environmental pressures induced by the technical solution that fulfils the client's requirements. These requirements cover both the performance of the building and its conformity in terms of location, spaces and services.

The so-called REM research project (Häkkinen at al. 2004) continued the development of eco-efficiency indicators and assessment methods both for actors in building sector as well as for end products. The project addressed 10 - 15 eco-efficiency indicators for different actors including owners, designers, constructors, designers, suppliers of building management services and manufacturers.

In addition, the REM project collected and formulated guidelines for the assessment of eco-efficiency of products including all end products from materials to buildings and real estate. The results are shown in the web pages of the Confederation of Finnish Construction industries. The results include guidelines for the assessment and reporting results. In addition, the result includes the data base of the environmental aspects of energy, transportation and construction site. This background information is needed as one has to assess the environmental impacts of buildings.

This paper describes the main results of the Finnish REM research project and shows examples about the formulated eco-efficiency indicators both for the actors in building sector and the end products of building sector.

2. Environmental assessment and classification of buildings

2.1 Introduction

European research institutes together with practitioners have developed environmental assessment and classification systems for buildings. These systems are in use for example in the following countries: BREEAM system in the UK, HQE® in France, Økoprofil in Norway and the PromisE system in Finland.

These tools provide a wide coverage of environmental, economic and building performance issues, which are deemed to be relevant to sustainability. Normally certificates or labels are given on the basis of assessment; some require external auditors.

These tools can be used by city authorities as they are acting as building developers or representing owners. Tools are developed for the following purposes

- target setting
- identifying essential sustainability issues and developing sustainable building concepts
- assessing and classification of buildings and using the achieved certificates or labels in marketing

This section introduces the main features of the assessment and classification systems used in Finland.

2.2 PromisE system in Finland

PromisE is an Environmental Assessment and Classification System for residential buildings, office buildings and retail stores. PromisE includes two systems: an assessment and classification system for existing buildings and a corresponding system for new buildings.

The systems were developed in cooperation with VTT Building and Transport, practitioners, representatives of standardisation and building authorities. The systems are used in order to assess the environmental performance of buildings and to set requirements for new buildings.

The PromisE system includes four main categories: Health of users, consumption of natural resources, environmental loadings and environmental risks. The system includes a five-stepped classification. The value of an indicator has to be selected between the E-level, which represents normal level, and the A-level, which represents excellent level. The indicators as well as categories have been weighted in such a way that the final result can be expressed in terms of one class (A, B, C, D or E). The selection of weighting values for different categories and indicators took place in working seminars in cooperation with different actors of building sector.

The following Table introduces the categories and indicators included in the PromisE system for new buildings. Table 1 also shows the weight of different categories and indicators.

Table 1 PromisE system for new buildings

	Weighted value of the indicator		
	Office buildings	***Residential buildings***	***Retail stores***
HEALTH OF USERS	**25**	**25**	**20**
Management of indoor climate	35	40	40
Setting of requirements and level of requirements	35	35	30
Quality of design	25	30	35
Quality of supervision and documentation	20	20	15
Quality of real estate management contract	20	15	20
Indoor air quality	30	30	30
Volume of air ventilation	40	25	20
Purity of incoming air	30	30	25
Surface materials emissions	30	45	55
Management of moist damages	30	30	30
Quality of building-physical design	40	30	25
Quality of moist control on site	45	55	65
Quality of building maintenance manual	15	15	10
Illumination	5	0	0

Intensity and uniformity	55	0	0
Prevention of reflections and glare	45	0	0
Consumption of natural resources	**30**	**30**	**35**
Energy consumption	45	40	45
Setting of requirements for energy consumption	15	15	15
Heat consumption	25	40	25
Use of real estate electricity	35	20	35
Energy consumption management	15	15	15
Quality of acceptance inspection	10	10	10
Water consumption	5	10	5
Quality of water distribution system	100	40	100
Water consumption monitoring facilities	0	60	0
Land use	10	10	10
Utilization of existing built environment	55	55	55
Utilization of existing networks	45	45	45
Materials consumption	20	20	20
Total use of raw materials (excluding by-products)	70	55	70
Recycling rate of building materials	30	20	30
Savings in space areas with help of common spaces	0	25	0
Service life	20	20	20
Design service life	20	25	20
Level of carefulness and detail of service life design	30	50	30
Level of adaptability	50	25	50
Environmental loadings	**35**	**35**	**35**
Emissions into air	50	50	45
Environmental impact of building products	25	25	25
Environmental impact from energy use	75	75	75
Wastes	20	20	20
Quality of waste management of building	50	50	50
Quality of waste management on building site	50	50	50
Sewage	0	5	0
Utilization of rain water	0	100	0
Bio-diversity	10	10	10
Soil sealing	30	30	30
Removal of soil materials on site	30	30	30
Value of building lot with regard to nature protection	30	30	30
Appearance of rare species on site	10	10	10
Environmental loadings from traffic	20	15	25
Level of public transportation services	50	45	60
Vicinity of pedestrian and bicycle routes	35	25	30
Level of other services needed by users	15	30	10
ENVIRONMENTAL RISKS	**10**	**10**	**10**
Environmental risks of building site	35	35	35
Level of purity of building site	100	100	100
Environmental risks of building	65	65	65
Building materials' risks	40	40	25
Risks of refrigerants	0	0	25
Level of environmental risk management on building site	30	30	25
Level of health risk management on building site	30	30	25

2.3 PromisE internet tool

PromisE environmental assessment can be done using an internet tool (see Fig.1). With this tool user sees the weighted system and can make the assessment by selecting the appropriate categories based on achieved data and supplementary information provided by the system.

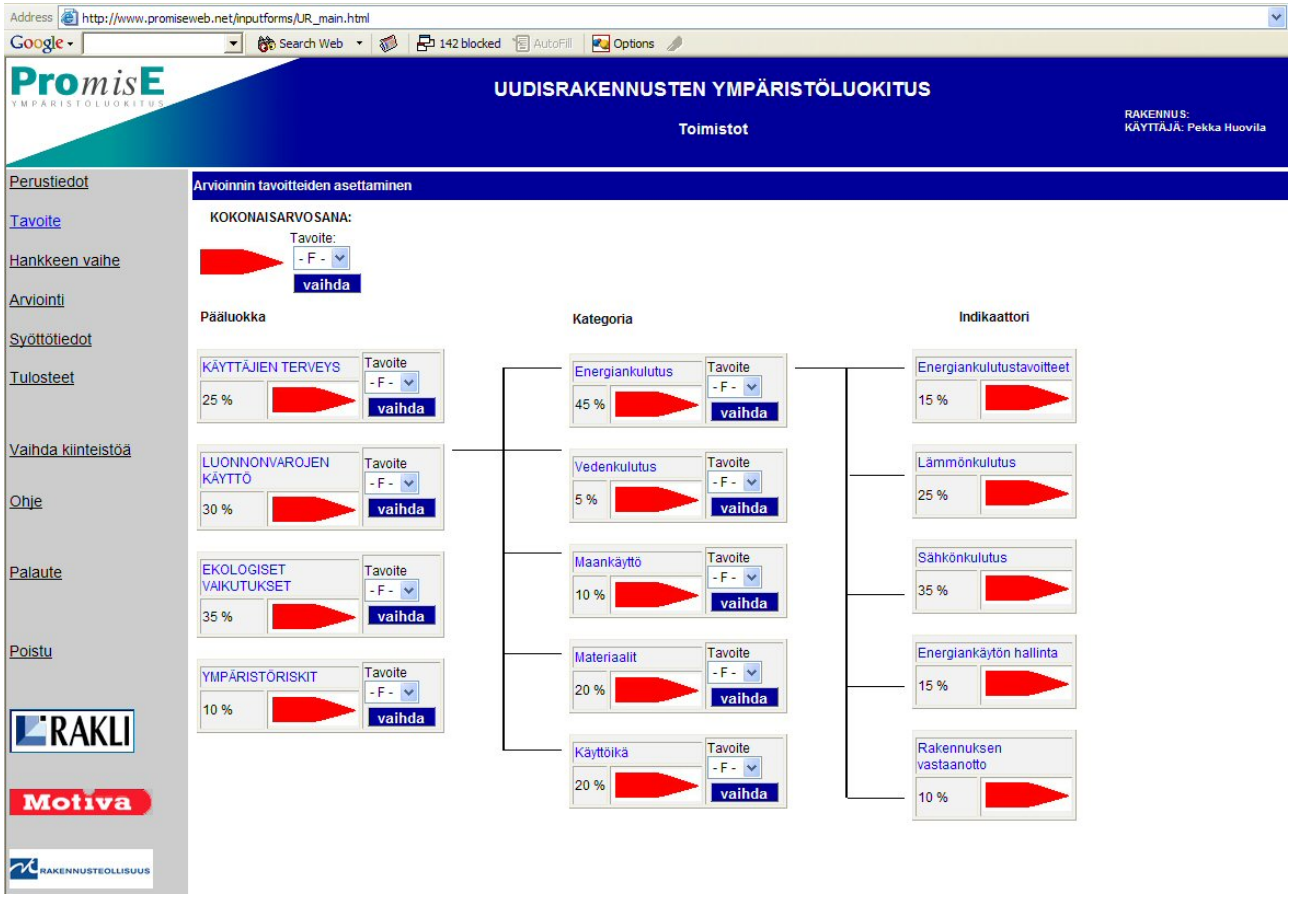

Figure 1 PromisE internet tool.

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