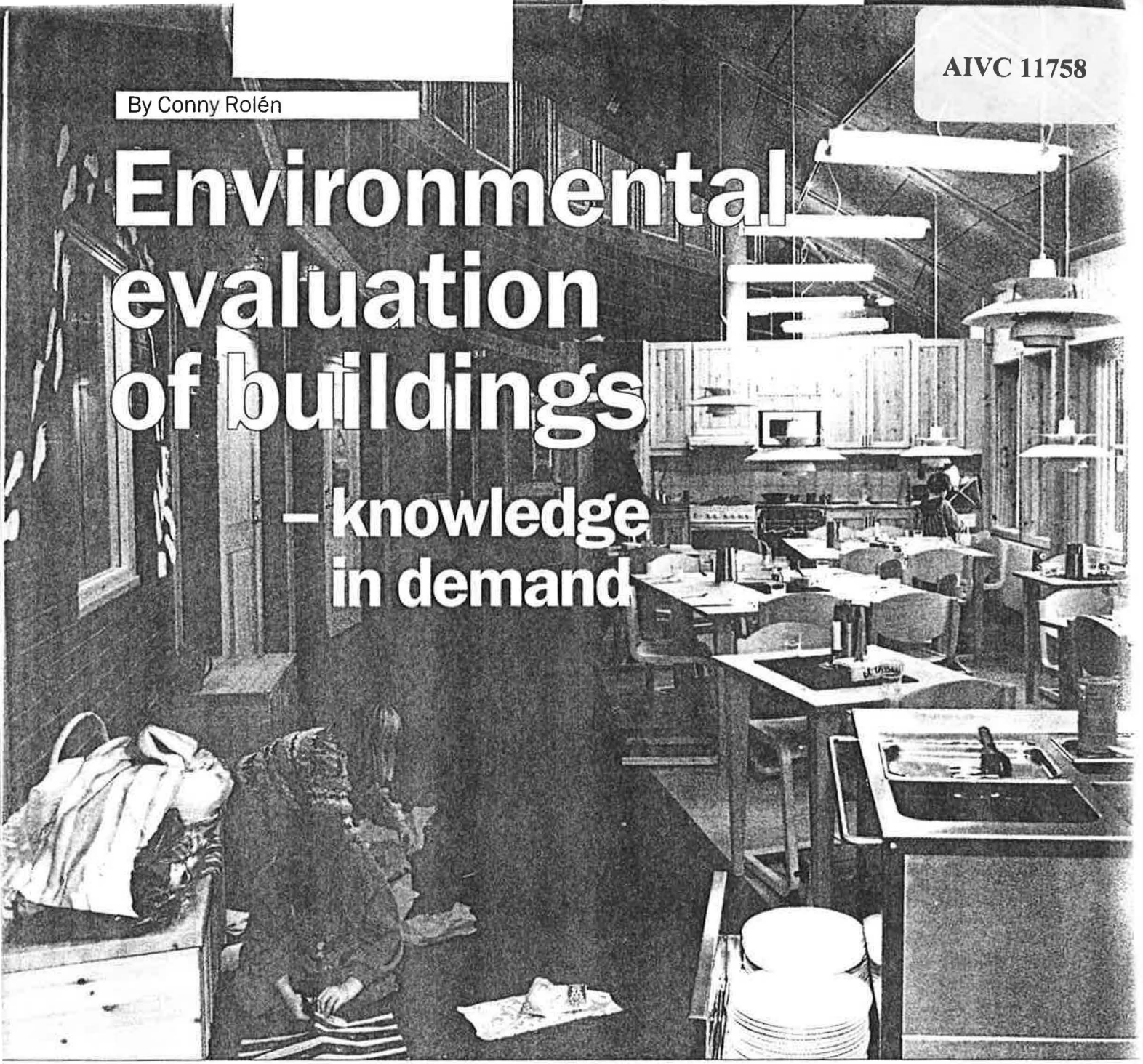


By Conny Rolén

Environmental evaluation of buildings – knowledge in demand

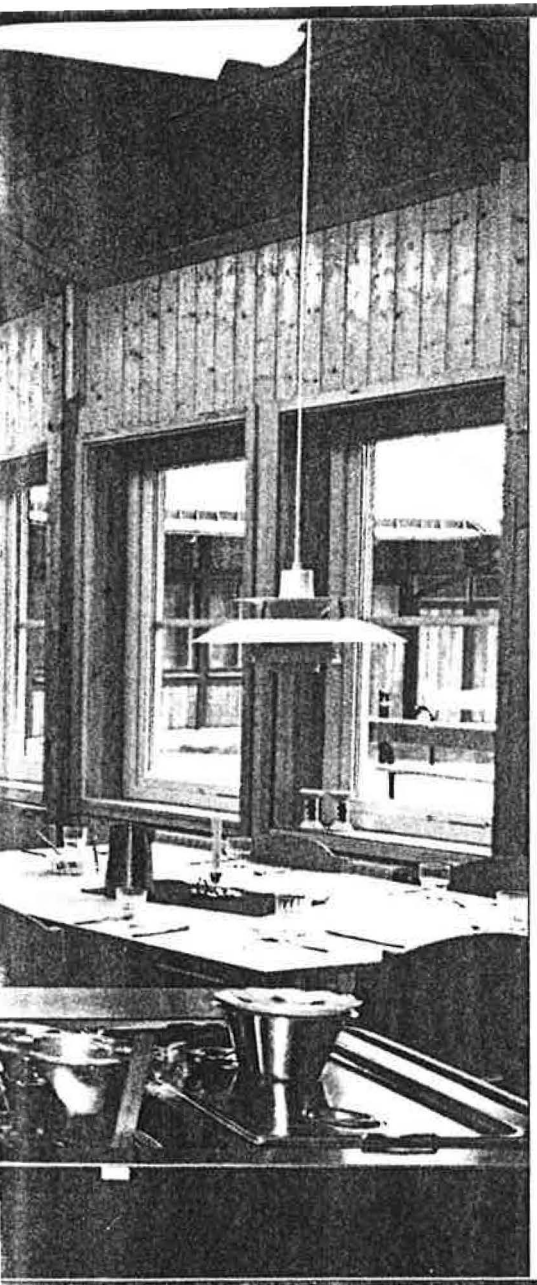
A method for environmental evaluation of buildings that is general, open ended and based on scientific foundations. Such a method is demanded increasingly, both in Sweden and abroad. This is why the Swedish Council for Building Research is financing both national and international projects in this field.

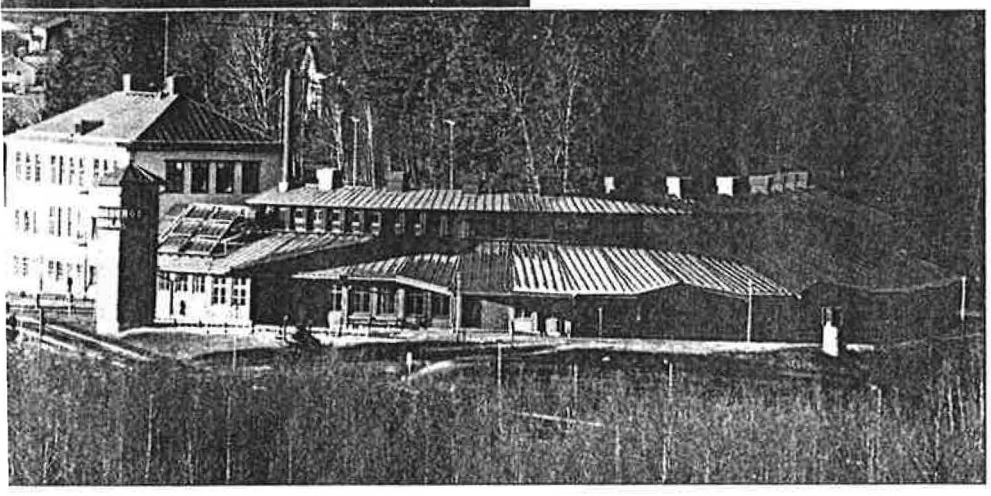
"Environmental", "ecological","green" or "sustainable" construction are terms that are used increasingly. But what do these terms stand for? What is "environmental" construction? How can one decide what environmental impact a building has?

In view of this, interest in the environmental evaluation of buildings has greatly increased in the course of the 90s. Several methods of environmental evaluation have been produced, both in Sweden and internationally. These methods have different levels of definition and different approaches, but they are often company specific, and the underlying structure or principles are not always clear.

It is therefore considered important that an open ended and generally accessible method should be developed for the environmental evaluation of buildings, based on scientific foundations. The Swedish Council for Building Research is therefore financing a number of projects in this field, both nationally and internationally.

This article mainly describes the Swedish project that is the core of this action area. The project, *Environmental evaluation of buildings (MAB)*, is financed by the Council together with a large number of companies and organisations, and is conducted by *KTH/Built Environment at Gävle with Mauritz Glaumann* as project manager. Apart





Green Building Challenge '98 is a competition and an international collaboration which has the aim of developing environmental evaluation of buildings. The results will be published this month at a conference in Vancouver. The Swedish school building Laggarbergsskolan at Timrå (Sundsvall) is one of the twelve Swedish projects selected for the competition.

from establishing the fundamental principles and structure of the evaluation method, the project shall also develop a practical application model.

The evaluation must be open to scrutiny

The aim of the project "Environmental evaluation of buildings" is to create a method for the determination of the environmental impact of a building in the areas *use of energy, use of materials, indoor environment, outdoor environment and economy.* The method is based on a holistic approach and a life cycle perspective. Development work is carried out in close contact with similar work in several other countries.

The term environmental impact refers to disturbances that affect people's *health* and wellbeing and the *value* of the physical environment of the site with regard to the land, water, vegetation, animals and cultural relics if any. It also refers to the impact on the external environment, i.e. *emissions* to air, soil and water, and *impoverishment* of natural resources due to the energy and materials which the building needs.

The method must have an easily understood structure and be generally available for scrutiny and application. It must be transparent in the sense that underlying data, procedures and attitudes must be readily accessible. It must also be possible for it to be applied for the evaluation of both existing buildings and a future environment.

Different recipients may have different aims or find different applications of an environmental evaluation method. An all-embracing system must therefore be able to deal with different issues. It is envisaged that the MAB system will be able to provide a basis for

- showing how good individual buildings are from the environmental point of view
- comparing the environment related performances of different buildings in regard to indoor climate, energy use, waste disposal etc.
- pinpointing the environmental shortcomings of a building which creates problems today or in the long term
- designing environmental newbuild and rebuild schemes.

Current work is limited to determination of *building related environmental impact.* This means that it is the properties of the building and the site that depend on the physical environment/design which will be environmentally evaluated. Evaluation of the behaviour of the users, the effectiveness of building management etc does not therefore form part of the project. Nor are the aesthetic qualities of the building taken into consideration.

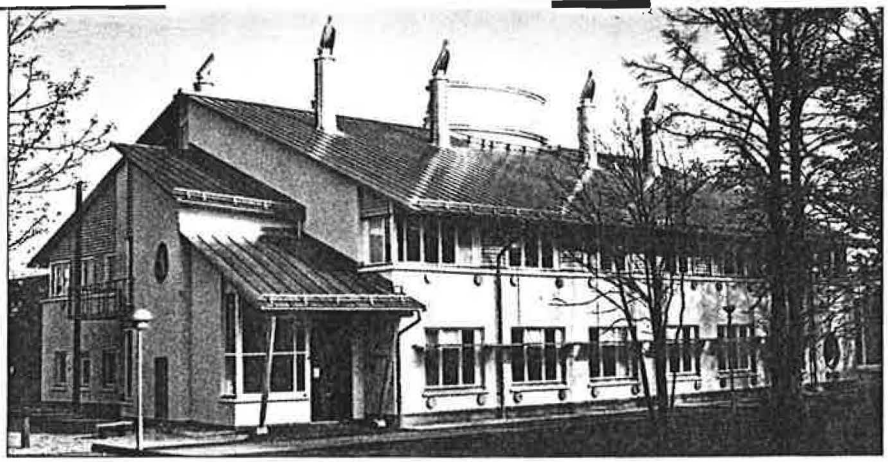
LCA is the point of departure

It is safe to say that all the more advanced methods for the environmental evaluation of buildings are today approaching the methodology of the life cycle analysis (LCA) for the analysis and evaluation of environmental issues. It is beginning to be generally accepted that the entire life cycle should be taken into consideration. The division of life cycle analysis into the safeguarded objects health of humans and ecosystems, conservation of natural resources and economic management of land as the basis of sustainable development has also gained wide acceptance. The way the LCA methodology deals with different local and global environmental effects has also been adopted to a high degree.

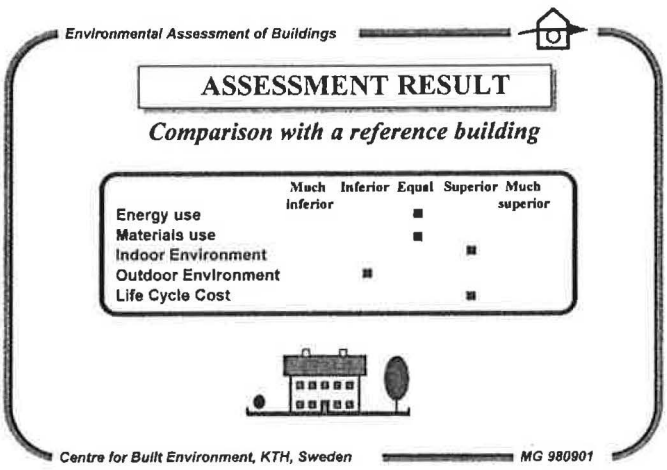
The MAB project is therefore also using the LCA method as its point of departure in analysing the impact of buildings on the external environment. At the same time, it is evident that complete life cycle analyses for buildings are far beyond what is feasible at present, and extensive simplifications must therefore be made in order to accomplish the aims of the project.

Model for energy and materials

The environmental impact due to the use of energy and materials is evaluated in the project with reference to the impoverishment of na-



Hansahuset, a school in Visby, was constructed and converted with an express ecological aim. The school is exhibited at Vancouver as a good example.



The final verdict has been arrived at by overall consideration of the environmental impacts in each of the subareas below. The results set out are based on a weighting of the relative importance of each environmental effect.

tural resources and the emissions to soil, air and water. The quantities of energy and materials used for the building over its life are estimated and converted in accordance with the LCA method into environmental impact in effect categories (greenhouse effect, depletion of ozone, acidification, eutrophication).

Model for indoor and outdoor environment

For the area *indoor environment*, it is the impact on the health and wellbeing of people indoors that is to be evaluated. *Health effects* can be subdivided into sick building syndrome (SBS), allergies, cancer etc, the relationship of which with the properties of the building must be assessed and evaluated. For an existing building, evaluation is based on a combination of a questionnaire, a few measurements and a description of the building. For planned buildings, what is instead evaluated is the risk that the health and wellbeing of people will be unfavourably affected by the proposed design.

For the *outdoor environment*, an evaluation is made of the *state of the ecosystems.*

Model for life cycle economy

If a technical solution that has a higher investment cost but is more environmentally friendly is selected for a building, it must be possible for this to be justified. The most common argument is that it will pay for itself in the long term. However, in order that such a claim may be made, there must be available a method which can easily calculate the sum of all future inward and outward payments over the assumed life of the building. This means calculation of the aggregate value of the building over the calculation period.

Final evaluation result

The final consideration of the environmental effects of a building provides both an environmental profile and a verdict for each and every one of the subareas, i.e. energy use, material use, indoor environment, outdoor environment and life cycle economy (see the figure).

The project has now been going on for a year and a half, and at the end of 1998 a finished method is to be presented. A practical application model based on the principles outlined above will also be available. Parallel with development of the method, this will be tested in a number of existing buildings. ■

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Canada 26–28 October **Green Building Challenge**

This month, the 26–28 October researchers from different countries will meet in a conference and competition in Vancouver, Canada: "Green Building Challenge '98". This is the first large international experiment to evaluate buildings from the environmental standpoint. In the competition projects from 14 different countries will be compared and judged by international experts. Sweden is among the competitors. The aim of Green Building Challenge is to agree on the way the environmental characteristics of buildings are to be judged and measured and to show good examples. ■

Information about GBC '98 can be obtained from the Conference secretariat, Canmet Energy, Technology Center/CETC, Natural Resources Canada, 580 Booth Street, 13th floor, Ottowa ON, K1A OE4 Canada.
Fax 613 996-9909.
E-mail gbc98@nrcan.gc.ca

See also GBCs home page on the Internet: http://greenbuilding.ca/gbc98.html

Information about the **Swedish engagement** in GBC'98:
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