

LCA-based scenario study of housing maintenance: energy or materials?

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Introduction

The research determines which factors play a significant role in the environmental effects caused by maintenance and the most effective measures to reduce the total yearly environmental effects in a region. The following variables related to maintenance are assessed:

- the use of different materials for building components or during maintenance activities;
- the times at which maintenance activities and replacements take place;
- the transportation of maintenance workers during activities;
- energy used for space heating.

Aim

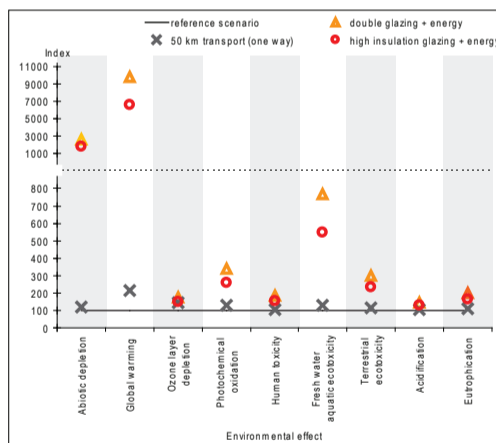
To assess which (combinations) of the variables mentioned above have the greatest potential to lessen the environmental effects related to building maintenance.

Methodology

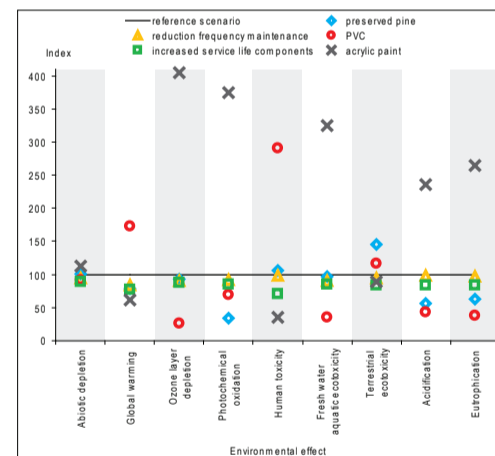
- LCA-based scenario study
- CML 2000 method, IVAM LCA Database 4.0
- Gallery flat reference building, 70 dwellings

Aspect	Reference scenario	Performance-based scenario	Sustainable scenario
Time			
Maintenance frequency [1/year]	1/x	1/(x + 2)	1/x
Service life [year]	y	1,5*y	y
Materials			
Paint products	high solid	high solid	acrylic, alkyd
Timber products	meranti FSC	meranti FSC	pine / meranti
Timber and PVC products	meranti FSC	meranti FSC	PVC
Glazing products	double	double	high-insulation

Results



Comparison of maintenance scenarios after 50 years of maintenance: influence of energy used for space heating and transportation of maintenance workers.



Comparison of maintenance scenarios after 50 years of maintenance, all including transportation of maintenance workers: influence of materials and timing of activities.

Conclusions

- The most effective measure to reduce environmental effects of existing houses (by 10-35%) is to replace building components by components with a higher thermal quality, e.g. replacing plain double glazing by high insulation thermal glazing.
- Reducing effects related to transportation of maintenance workers is an effective measure. This can be done by reducing transport distances or using a more environmentally friendly car and/or fuel.

- Lengthening the service life of building components, as well as decreasing the frequency of maintenance activities, leads to an overall improvement of the environmental effects of existing houses. The benefits increase over time.
- Using different materials for building components leads to both increases and decreases of environmental effects. The changes of the environmental effects are larger than when the service lives of components or maintenance intervals are changed.