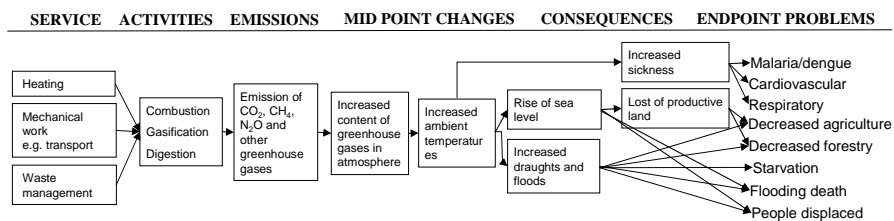


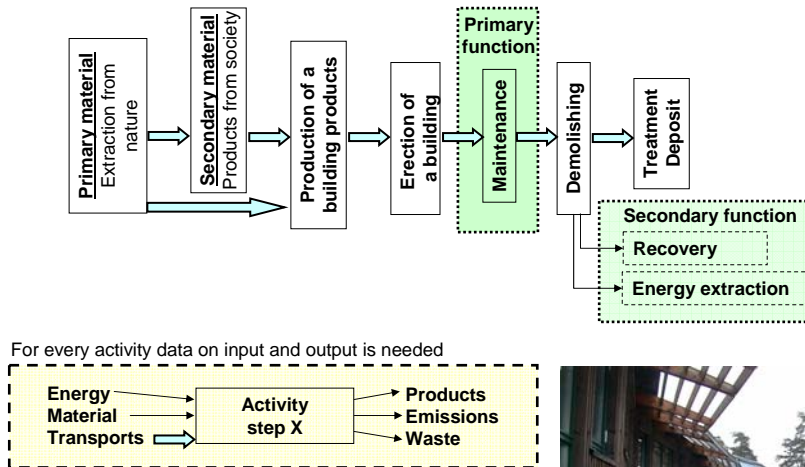


The problem From service to impact

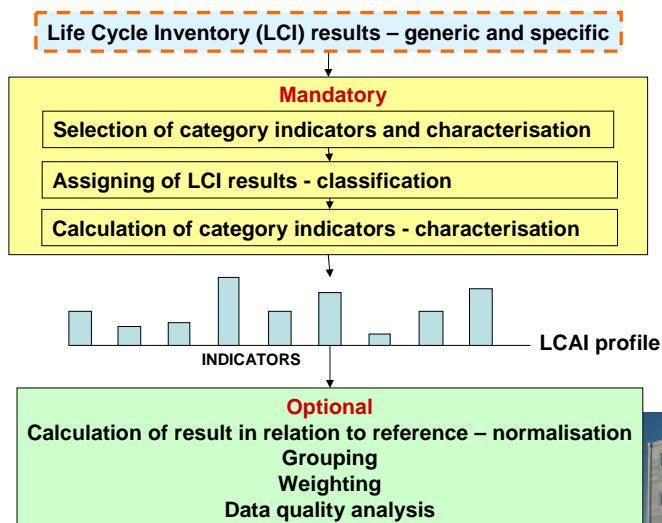
Example: Climate Change



The life cycle of a building



Life Cycle Impact Assessment



ISO 14042



Result interpretaion

To take decision from a number of indicators with different values and units is difficult

Actions to improve understanding of the result are:

- Normalisation – make numbers relative through division by a reference
- Weighting – assign weights according to severity of each aspect (indicator)



Basis for normalisation & weighting

Aim of weighting:
to facilitate addition of indicator values

BASE	EXAMPLE
money	willingness to pay costs for elimination loss of potential production
opinions	panel of experts group of stakeholders public opinion
damages	what nature can sustain estimate damages

Aim of normalisation:

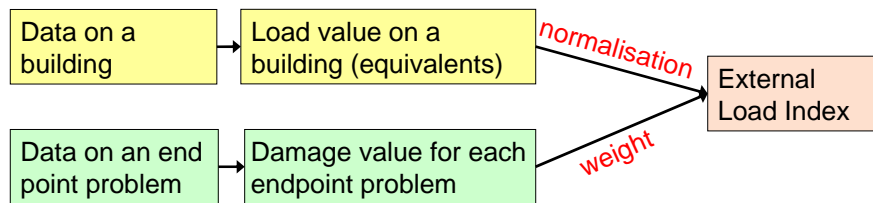
- to get relative values
- to drop units

EXAMPLE
 region
 country
 Europe
 globe



Procedure in EcoEffect overview

Safeguard objects: human health, (natural resources & biodiversity)



$$\text{Normalisation} = \frac{\text{Equivalents per user in the building}}{\text{Equivalents per capita in Sweden}}$$

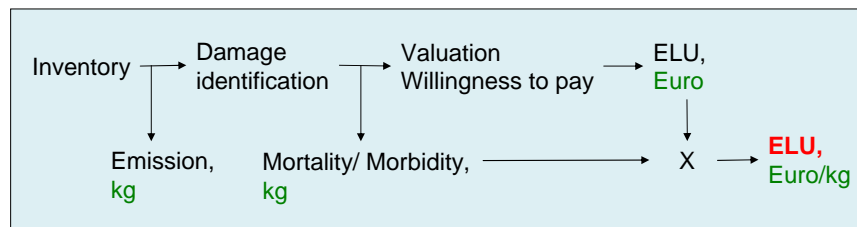
$$\text{Weight} = (\text{number of affected persons}) \times (\text{severity per person})$$



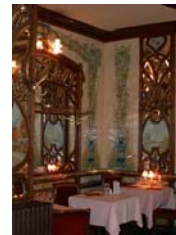
Environmental Priority Strategies, EPS

Safeguard objects: human health, eco systems, natural resources, biodiversity & aesthetic values

Procedure

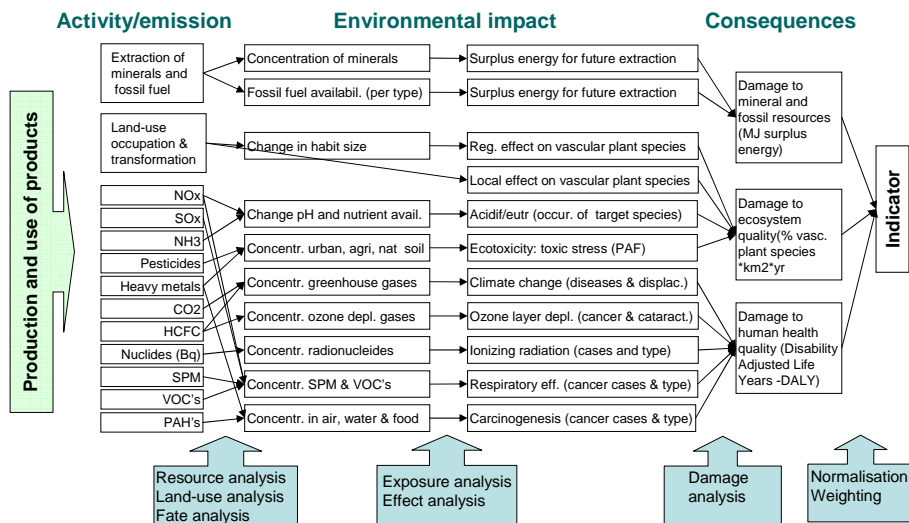


Each emission gets a ELU value per damage
ELU = Environmental Load Unit, Euro/kg



Procedure in Eco-indicator 99

Safeguard objects: human health, natural resources & ecosystem



General LCA methods & databases

Method	Country	Web-address
Ecobilan	FR	http://www.ecobalance.com/uk_contacts.php
GaBi4	DE	http://www.gabi-software.com/
Sima pro	NL	http://www.pre.nl/simapro/default.htm
Umberto	DE	http://www.umberto.de/english/
EPS	S	http://eps.esa.chalmers.se/

Database	Country	Webadress
Ecoinvent	CH	http://www.ecoinvent.ch/
Ecobilan	Fr	http://www.ecobalance.com/uk_contacts.php
Franklin Associates'	US	http://www.fal.com/lifecycle.htm
IVAM database	NL	http://www.ivam.uva.nl/uk/producten/product5.htm
Spine	S	http://www.globalspine.com/
Athena	Cd	http://www.athenasmi.ca/



LCA methods for buildings

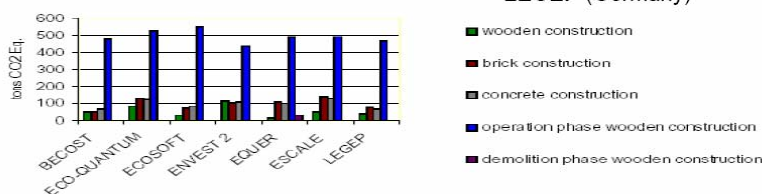
Method	Land	Content	Indoor envi.	Weighting	LCA model	Databas	Web address
Beat	DK	LCA	no	Political goals	EDIP	Own	http://www.sbi.dk/en/research/energy_and_environment/integrating-beat-in-bsim
Bees	US	LCC & LCA	IAQ	Panel	Own	Own	http://www.bfrl.nist.gov/oa/software/bees.html
EcoQuantum	NL	LCA	no	Damage	Ecoindicator	IWAM	http://www.ivambv.uva.nl/uk/producten/product7.htm
Envest	GB	LCA & LCC	no	Panel	Own	Own	http://www.bre.co.uk/service.jsp?id=52
Equer	FR	LCA	comfort daylight	no	Own	Oekoinventare	http://www.cenerg.enscm.fr/english/logiciel/indexequer.html
Legep	DE	LCA & LCC	yes	no	Own	Ecoinvent	http://www.legep.de
LISA	AU	LCA	no	no	Own	Energy	http://www.lisa.au.com/
EcoEffect	SE	LCC & LCA	yes	Damage	EDIP	Own	http://www.ecoeffect.tk
LCAid/ECotect	AU	LCA	yes	no	Own	Own	http://buildlca.rmit.edu.au/casestud/buxton/BuxtonPS_LCAid_use.html



Comparison of LCA results



Futura house, 80 years



OGIP (Switzerland)
Eco-Quantum (Netherlands)
EQUER (France)
ENVEST (England);
BECOST (Finland,
ECOSOFT (Austria);
ESCALE (France),
SIMA-PRO (Netherlands)
LEGEp (Germany)

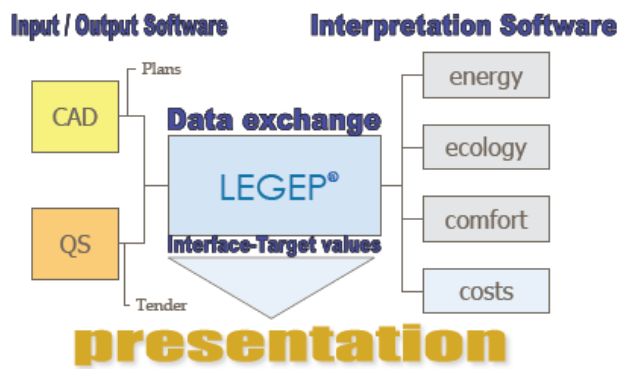
From the PRESCO project: <http://www.etn-presco.net/>

LEGEP (De)

- ❖ Design, construction, quantity surveying and evaluation of existing buildings
- ❖ Databases contains all elements of a building, costs and environmental impact (Ecoinvent)
- ❖ Output: cost, energy, energy- and massflow and environmental indicators
- ❖ Environmental indicators: Climate change, Acidification, Ground ozone, Ozone depletion, Eutrofication, Radioactivity, Primary energy, Renewable/not renewable



LEGEP General layout



LEGE[®]

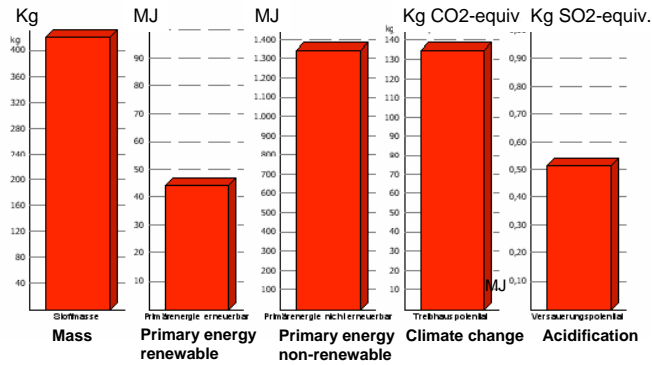
Display of a building material

Overview: Plaster

17.05.2002

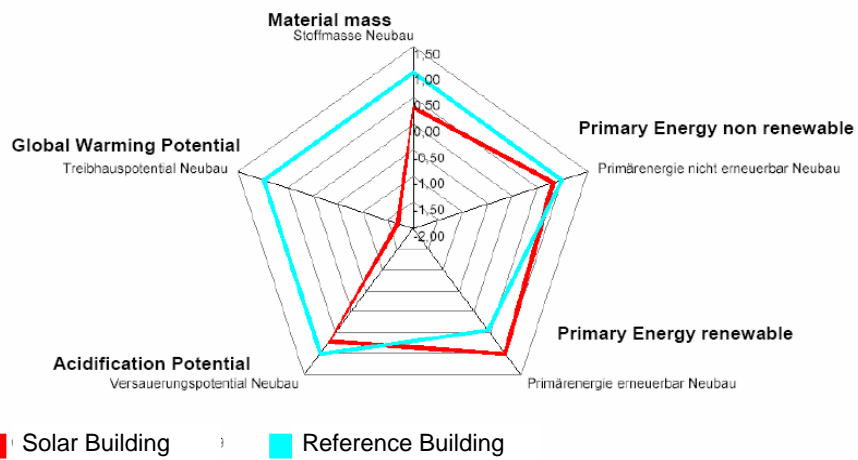


Ökologie



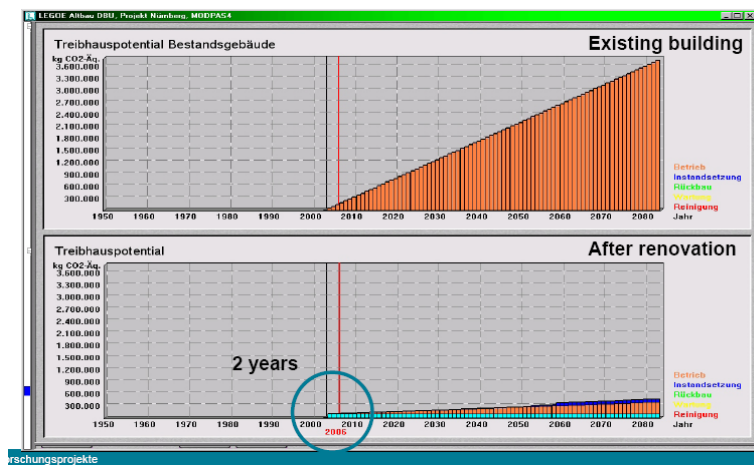
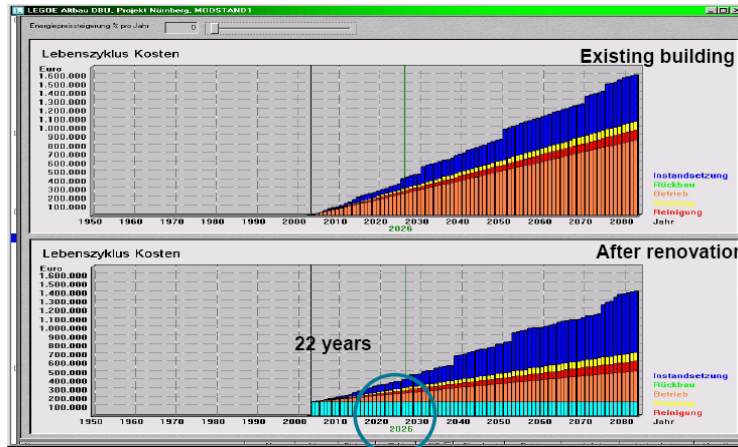
LEGE[®]

Comparison of buildings



LEGEP

Life Cycle Cost



ENVEST (GB)

Envest 2 allows both environmental and financial tradeoffs to be made explicit in the design process, allowing the client to optimise the concept of best value according to their own priorities

Two versions:

Envest 2 estimator uses default environmental and financial data about the whole life performance of the building.

Envest 2 calculator provides default environmental data but allows the user to enter their own capital and lifetime financial cost information.

Environmental result: 12 indicators or one number - ecopoint

Ecopoints are derived so that the annual environmental impact caused by a typical UK citizen creates 100 Ecopoints (includes weighting).



ENVEST Display of services

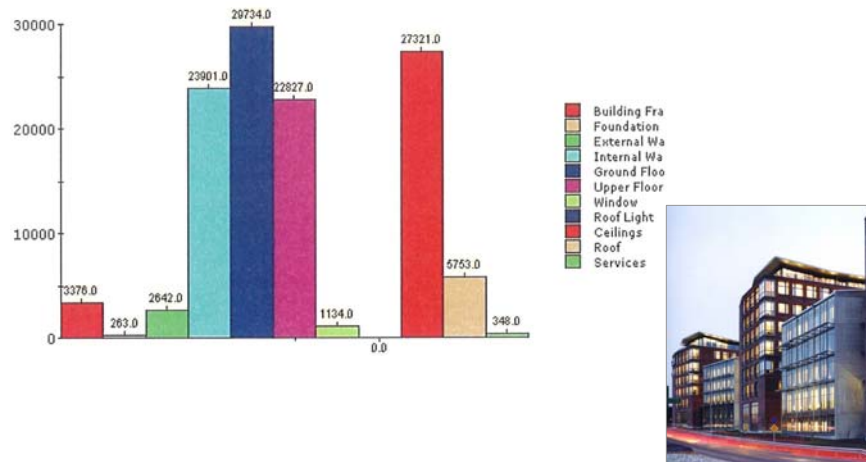
Services		
	Ecopoints	Whole Life Cost (£)
Heating	164593	11035451
Lighting	160530	4473560
Water	9072	123282
Ventilation	30340	800056
Cooling	33773	11417433
Lifts	0	0
Catering	86162	695523
Office Equipment	667487	3957345
Humidification	72816	431704
<hr/>		
Operational	1224425	20599881
Embodied	348	12334473
Total	1224773	32934354



ENVEST

Environmental impact of building parts

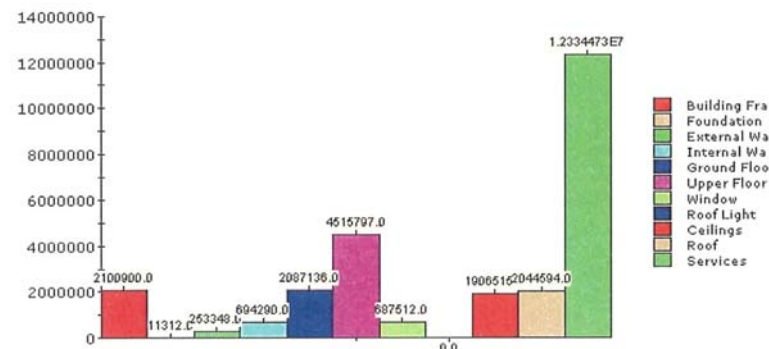
Breakdown of Embodied Impact by Element (Ecopoints)



ENVEST

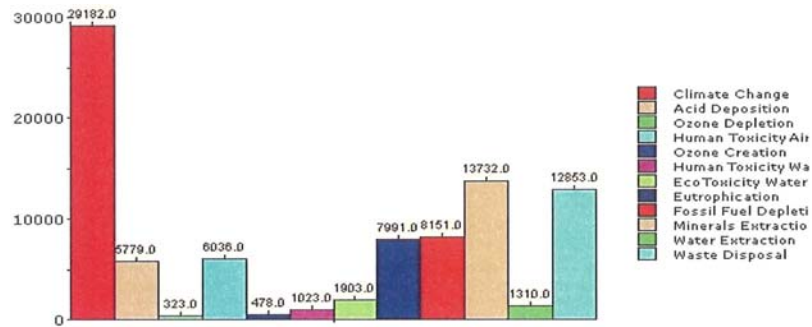
Life cycle cost of building parts

Breakdown of Total Whole Life Cost by Ecopoints (£NPV)



ENVEST Environmental impact profile

Breakdown of Embodied Impact by Environmental Issue (Ecopoints)



EcoEffect (S)

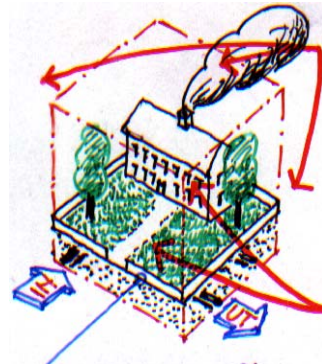
The aim was to:

- quantify environmental problems caused by building properties
- recalculate environmental impact into dimensions that are comparable
- become a tool for environmental design and managing of building estates



EcoEffect

- System Boundary



Property border =
System boundary

EXTERNAL IMPACT
- *emissions and depletion*-

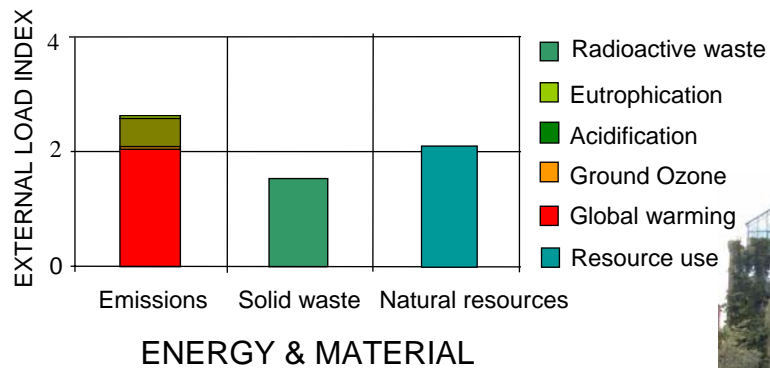
- ★ Energy use
- ★ Materials use

INTERNAL IMPACT
- *health and biodiversity*-

- ☆ Indoor environment
- ☆ Outdoor environment

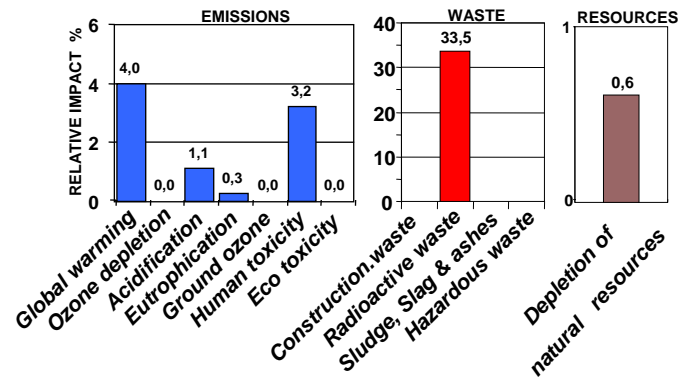
EcoEffect

Environmental load numbers



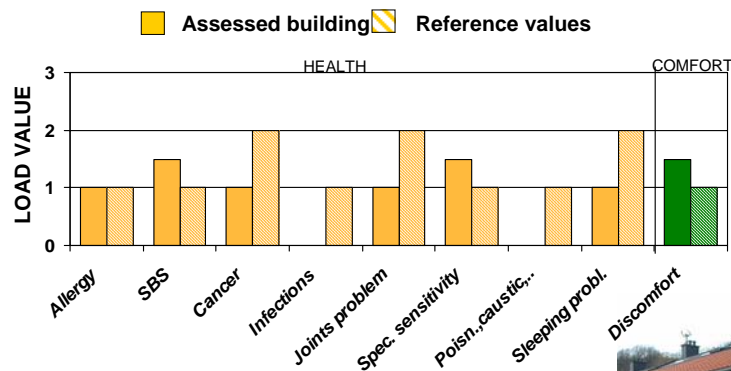
Environmental profile

Energy and materials use

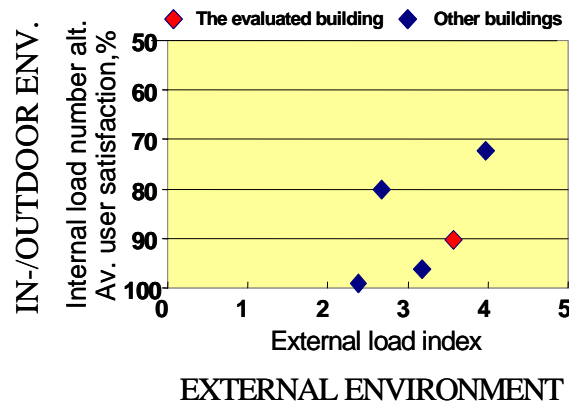


EcoEffect

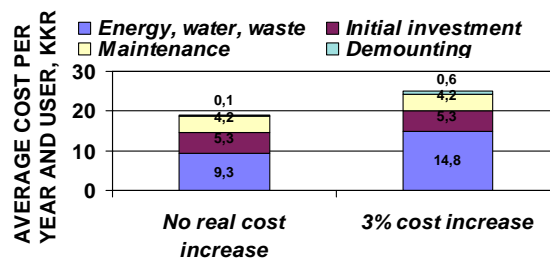
- Indoor profile health effects



EcoEffect Ecoefficiency



EcoEffect Environmental related life cycle costs no and 3 % real price increase



EcoEffect

