Building eco-design at competition stage: a case study

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Context, goal and scope
Tekhnê Architectes made a proposal during an architectural design competition for the construction of a secondary school.

Tekhnê included a Life Cycle Assessment (LCA) in their proposal.

Cycleco took over this LCA and decided to deepen the interpretation phase in order to use it as of a case study for training purposes.
Goal

• Tekhnê’s objectives:
  – Meet building owner’s requirement: assess embodied energy
  – Stand out from the competitors by going one step further and providing a comparison of 2 scenarios on primary energy and climate change impacts

• Cycleco’s objectives:
  – Validate Tekhne’s conclusions by extending the analysis to a more complete set of indicators
  – Adjust design according to impacts results
Scope

• Functional unit: “Provide an enclosed and insulated space of 1544m$^2$ floor area, with an energy consumption <120kWhep/m$^2$/year, for use as a secondary school during 60 years.”

• Scenarios:
  – a wood-framed building (favourite scenario)
  – a shuttered concrete building

• System boundaries:
  – Structure, interior & finishing work packages
  – Included processes: manufacture, transport, installation, deconstruction and landfill of building products (construction and replacements)
Eco-design process
Firsts results

Climate change

Non-renewable primary energy
Extended set of indicators

- Human tox (non-carci)
- Mineral & fossil res. deplet°
- Climate change
- Terrestrial and aquatic acid.
- Respiratory inorganics
- Land use
- Water depletion
- Human tox (carci)
- Fresh water eutroph.
- Fresh water ecotox.
- Ionizing radiation - HH

- Wood-framed building
- Shuttered concrete building
Wood-framed building hot spots analysis

- Human toxicity (non-carcinogens)
- Fresh water eutrophication
- Ionizing radiations (HH)
- Terrestrial and aquatic acidification
- Resources depletion

- Mineral insulation
- Glazing
- Studs and tracks
- Other
- Bio-sourced insulation boards
Comparison with a third alternative

- Human toxicity - non-carcinogens
- Mineral & fossil resources depletion
- Climate change
- Terrestrial and aquatic acidification
- Respiratory inorganics
- Land use
- Water depletion
- Human toxicity - carcinogens
- Fresh water eutrophication
- Fresh water ecotoxicity
- Ionizing radiation - HH

- Wood-framed building
- Shuttered concrete building
- Wood-framed building with wood beams
Conclusions and perspectives
Study outcomes

• It is of main importance to study the whole system
• Hot spots analysis is a valuable tool for eco-design
• It is of main importance to enlarge the scope of indicators
• Hot spots analysis should be conducted on indicators for which the “a priori” favourite scenario is not the best
• Eco-design is accessible to building professionals at competition stage
Thank you

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