Turn-over rate and environmental load for building materials
- checkpoints in design process

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The GLITNE project

”Putting a price on green”

Illustration: Raymond Nilsson (SINTEF Media)

GLITNE

How may environmentally effective buildings be more competitive?

- Monetary weighting of environmental effects
- Extended product responsibility for buildings

Improved building design by joint calculation of buildings costs and environmental costs

Photo: Kristin Holthe

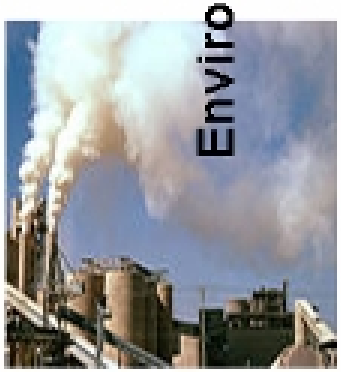
Why focus on turn-over rate and design for disassembly ?

- Rapid changes in buildings
- Huge variety of building materials and additives used in buildings
- Result:
  - Increased waste streams from building sector.
  - Increased environmental load from production of building materials and waste management

Design for Disassembly (DfD)

= *Need for demountable design*

Environmental impact			
High			
Medium			
Low			
Building parts with	Low	Medium	High



Turnover

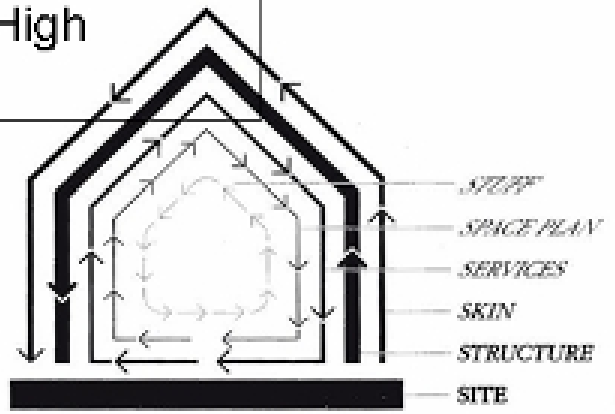


Figure: Nordby et.al, 2006

- **DfD- definition:** Optimization of components and construction methods to facilitate future reuse or recycling of materials.

Main objectives- paper

- Use the model by Nordbye et al to identify:
  - Levels for turn-over rate and environmental impact
  - Materials and components with high turn-over rate and env. impact
  - When in design process is decisions regarding these materials done and who make the decisions ?
  - Is the model suitable for use in design process ?
- Empirical basis:
  - Litterature survey of service life and environmental data
  - Survey and interviews property managers and architects
  - Case: Office buildings

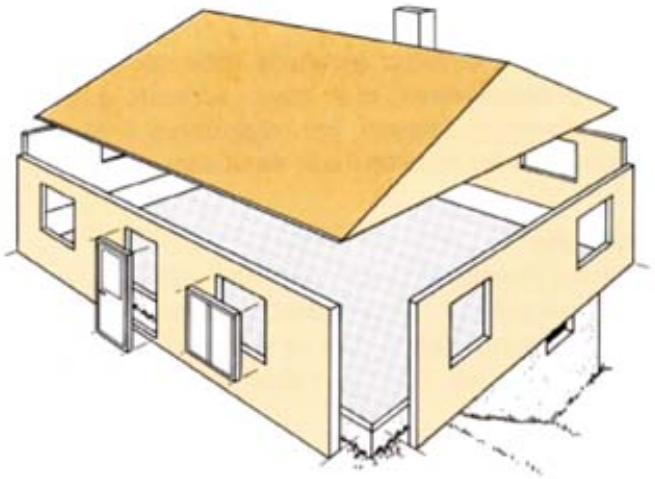


Fig: SINTEF Building research Design Guides 2009

Results

- In Norway there are established data for service- life for materials on national basis.
- These data are most reliable for components with special technical requirements, e.g façade, roofs.
- Property management companies often don’t plan and systemize data for maintenance purposes.
- In maintenance databases there tends to be a lack of historical information, e.g turnover rate.

Result- interviews

- Property management company are mainly responsible for external maintenance, while tenants initiate most changes in interior materials.
- During an interval of 5-15 years most interior materials in office building are changed. This is supported by both architects and property managers.
- ”When you start to make changes on one component it will initiate more changes. Changes in lightening fixture means changes in fixed ceiling”
- A total refurbishment of the building is done after 25 years.

High turn-over-rate in office buildings

Type of material	Material/component	Expected service life
Floor covering	Linoleum	10-15 years
Floor covering	Vinyl (PVC)	10-15 years
Fixed ceiling	Plaster ceiling (t-bar)	10 years
Fixed ceiling	Mineral wool ceiling (t-bar)	10 years
Electrical installations	Lighting fixture	10 years
Interior wall	Solid interior walls- Gypsum with aluminum studs, mineral wool	5-10 years

Environmental assessment

- Two indicators selected- Green house gas emissions (GHG) and Health and environmentally hazardous chemicals (Chemicals)
- Data:
  GHG emissions:
  Environmental product declarations (EPD)
  Chemicals:
  Norwegian observation list for chemicals
  Project data and literature
- Reference levels:
  GHG: Ecoproduct – method and reference to other materials
  Chemicals: No chemicals, low contents/may contain, high contents

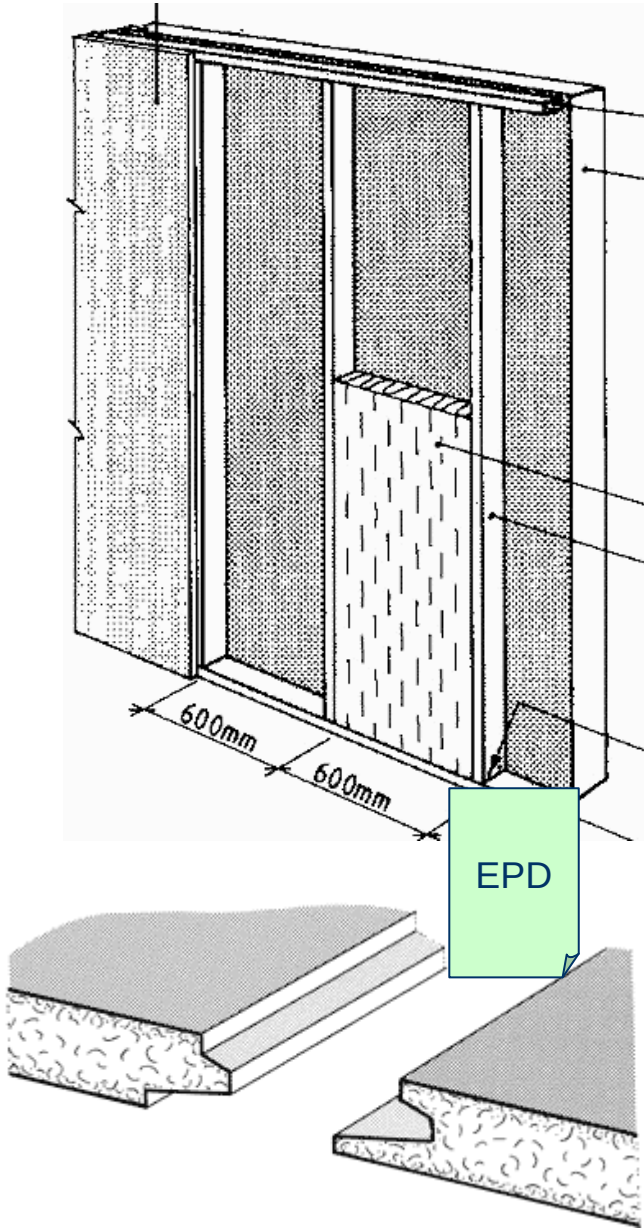
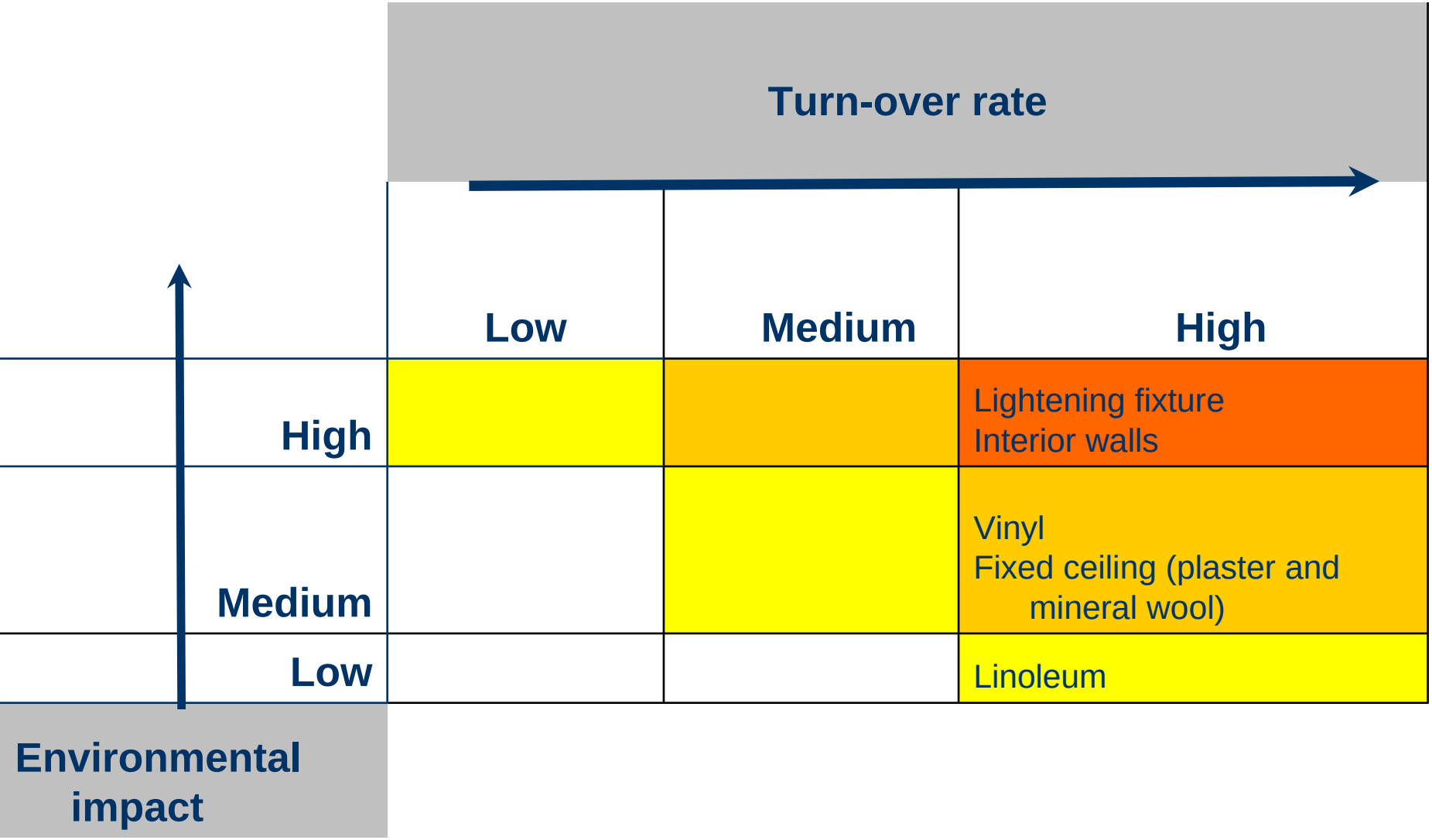
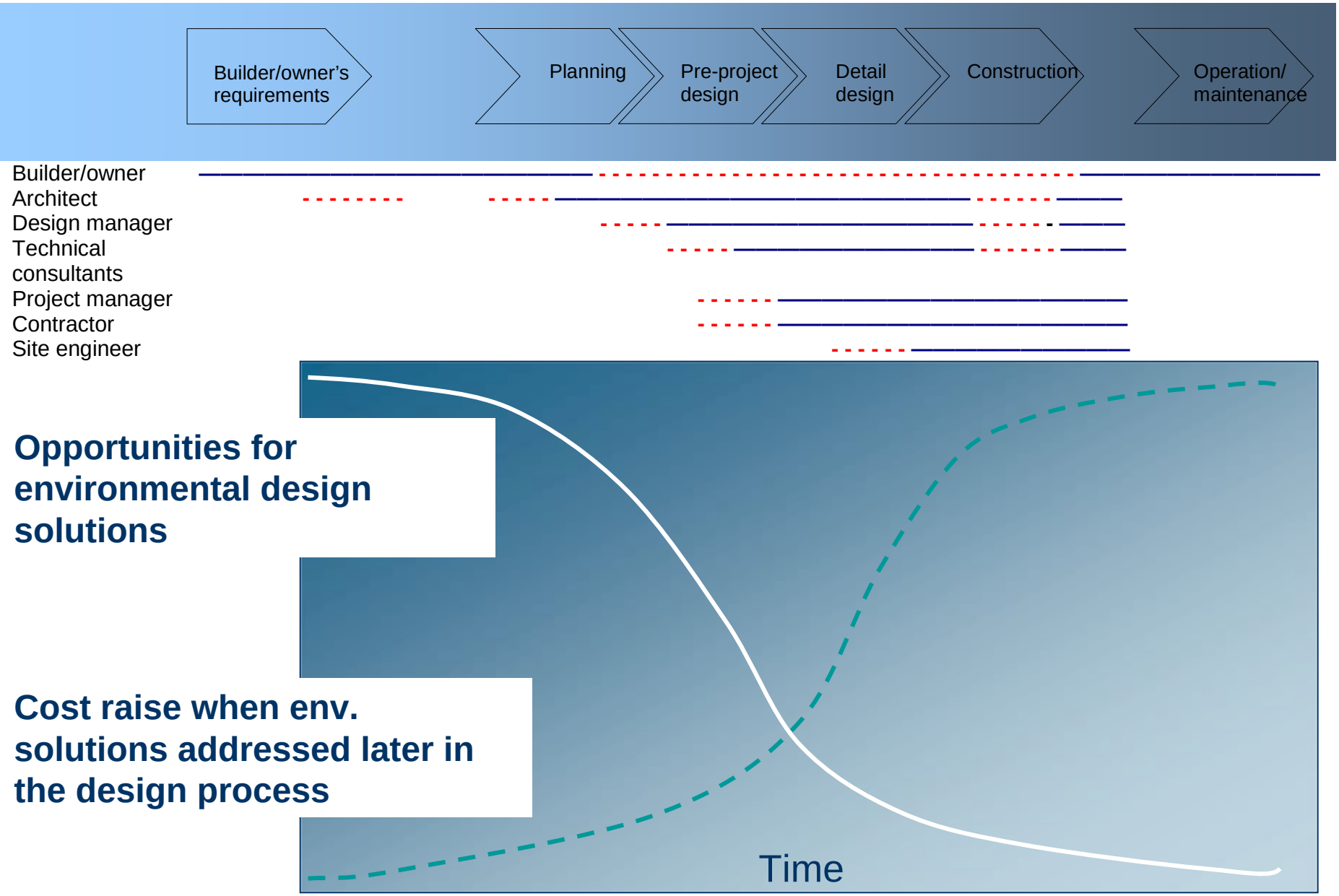


Fig: SINTEF Building research Design Guides 2009

Need for demountable design





Opportunities for environmental design solutions

Cost raise when env. solutions addressed later in the design process

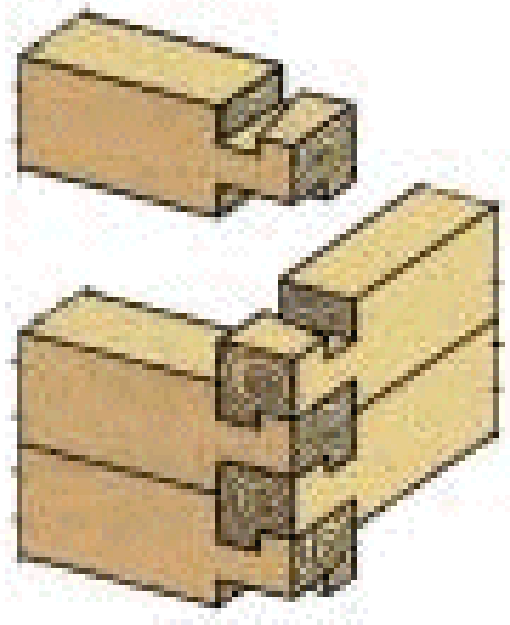
Pictures based on SINTEF Byggforsk, Norconsult

Result interviews, design process

- The building owner has a high focus on exterior materials, and less on the quality of interior materials.
- Tenants often engage their own architect for interior materials.
- Architects play an important role in the design for future material salvage, because they participate in all parts of the design process. Design for disassembly is scarcely focused by architects
- Building owners and contractors have a great influence on material choice, and often in a late phase.

What do we gain and further work

- A model including both turn-over rate and environmental impact gives opportunity to prioritize and can simplify a design for future material salvage.
- Addition of further environmental indicators could give a more overall result
- There is a lack of environmental data available for decision makers in design process.
- Result of this paper will be included in the method and tool developed in the project GLITNE
- GLITNE focus on extended product responsibility (EPR) for buildings



Thank you for your attention!

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