LCC analysis of a Swedish Net Zero Energy Building – including Co-benefits

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Background

- Climate change
- Are NetZEBs and nZEBs profitable?

Added value in green buildings

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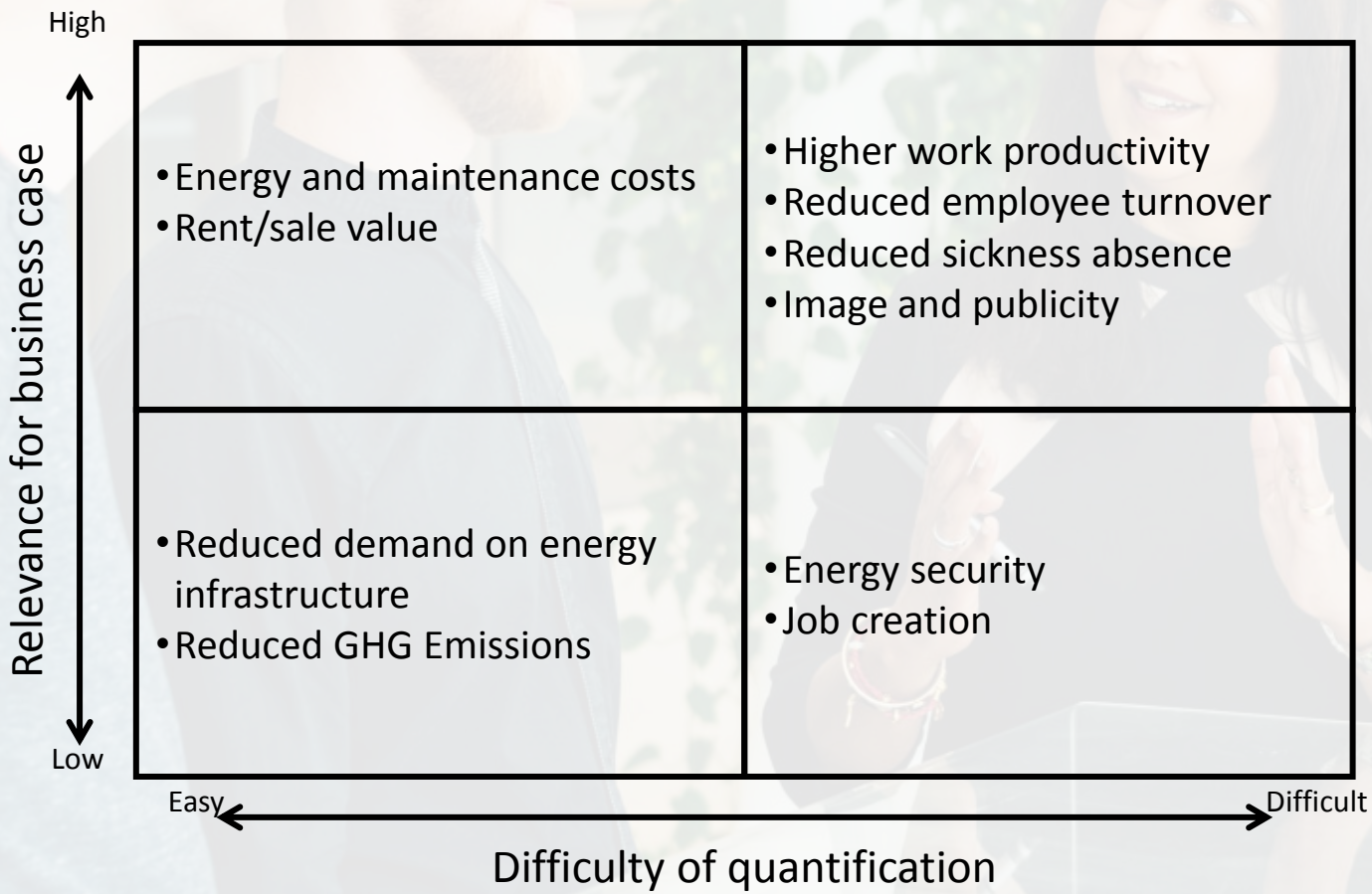
Added value in green buildings



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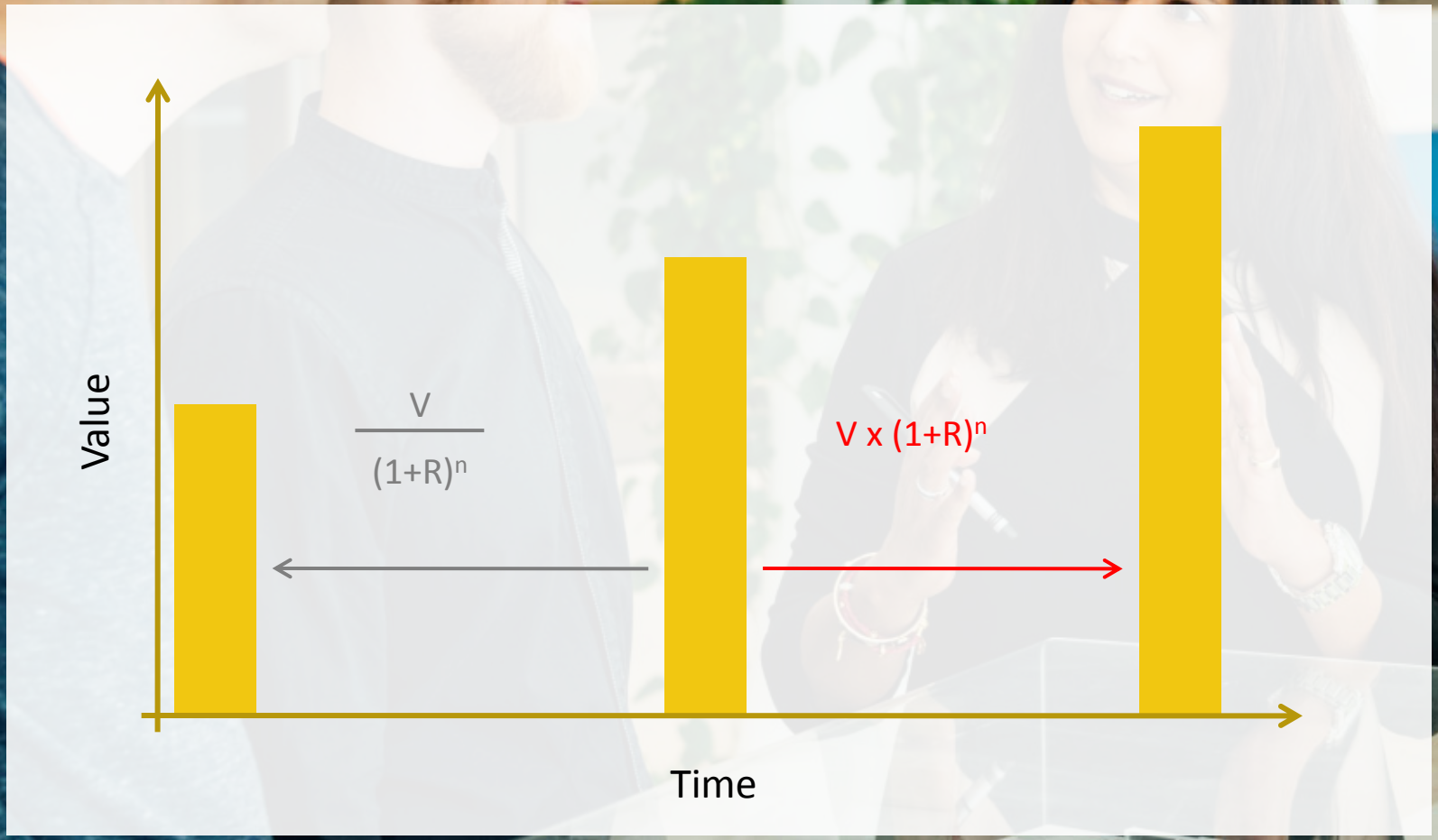
Added value in green buildings



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Added value in green buildings

$$REC = \sum \frac{EI \cdot \alpha + EE \cdot \beta}{\left(1 + \frac{r - i - \gamma}{1 + i + \gamma}\right)^t}$$

$$RETC = \sum \frac{\varepsilon \cdot Emp(RC + IC + RPC + LI + DC)}{(1 + R)^t}$$

$$RSAC = \sum \frac{Emp \cdot 0.8SC \cdot \phi \cdot \kappa}{(1 + R)^t}$$

$$IPV = \sum \frac{Emp \cdot SC \cdot IP}{(1 + R)^t}$$

$$PPV = \sum AIP \cdot AC$$

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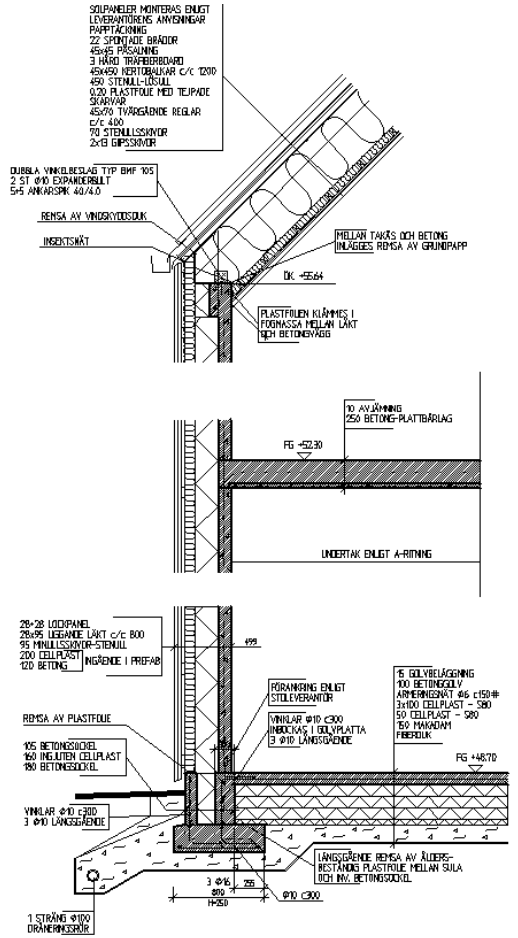
Case study – Väla Gård

- Office building
- 1670 m^2
- Well insulated and air tight
- Balanced ventilation with heat recovery (VAV)
- Ground source heat pump (heating and cooling)
- PV-panels: 67.5 kWp (455 m^2)
- Electricity shut off, off working hours
- Measured energy
  - Energy load 40 kWh/m^2a
  - Energy generation 41 kWh/m^2a



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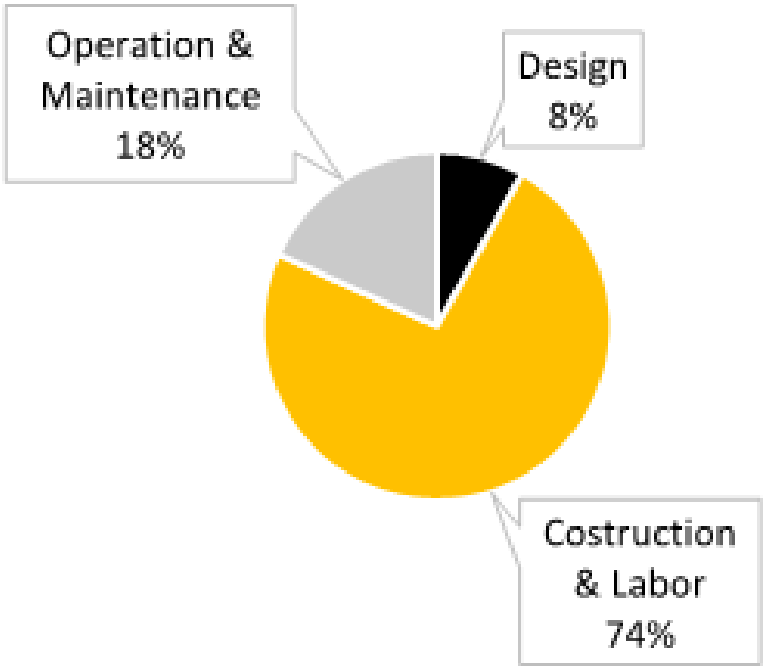
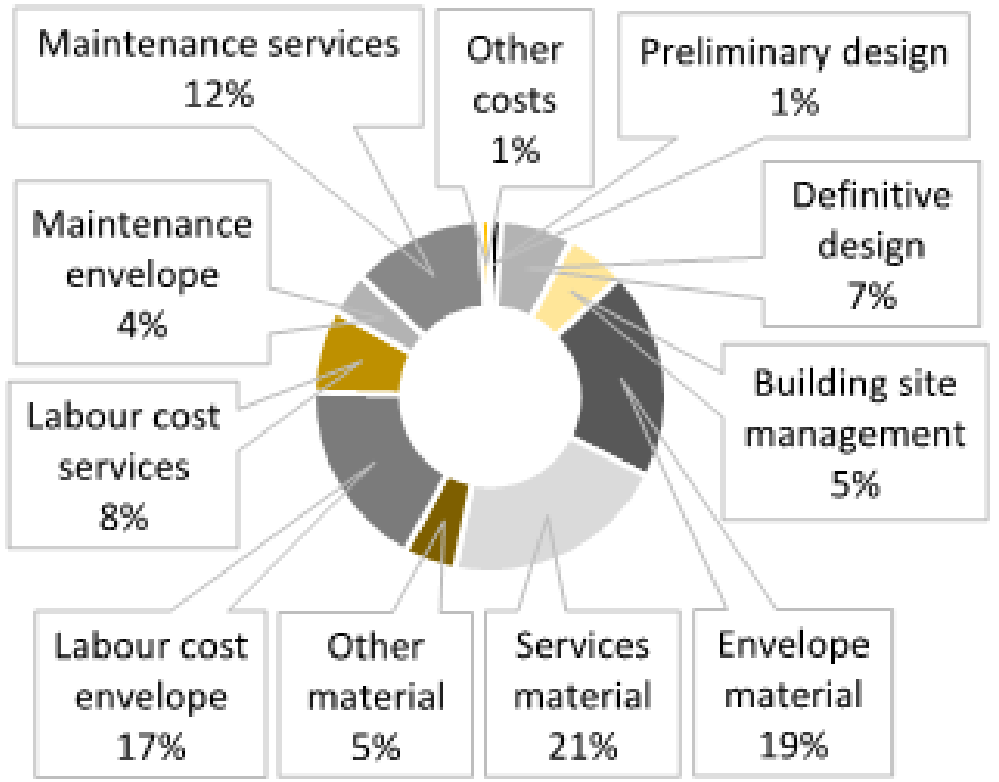
Results and discussion





Results and discussion

Table 4 Basis for quantification of employee turnover costs

Data	Input
Reduced employee turnover, ε [%]	0.5
Recruitment cost, RC [€x10^3/p]	6.5
Introduction course, *IC* [€x10^3/p]	2.0
Reduced productivity cost, *RPC* [€x10^3/p]	15.1
Lost income during vacancy, *LI* [€x10^3/p]	1.3
Decommissioning cost, *DC* [€x10^3/p]	9.5

Table 5 Basis for quantification of sick absence costs

Data	Input
Average sickness absence, ϕ [d]	6.0
Reduced sickness absence, κ [%]	10

Results and discussion

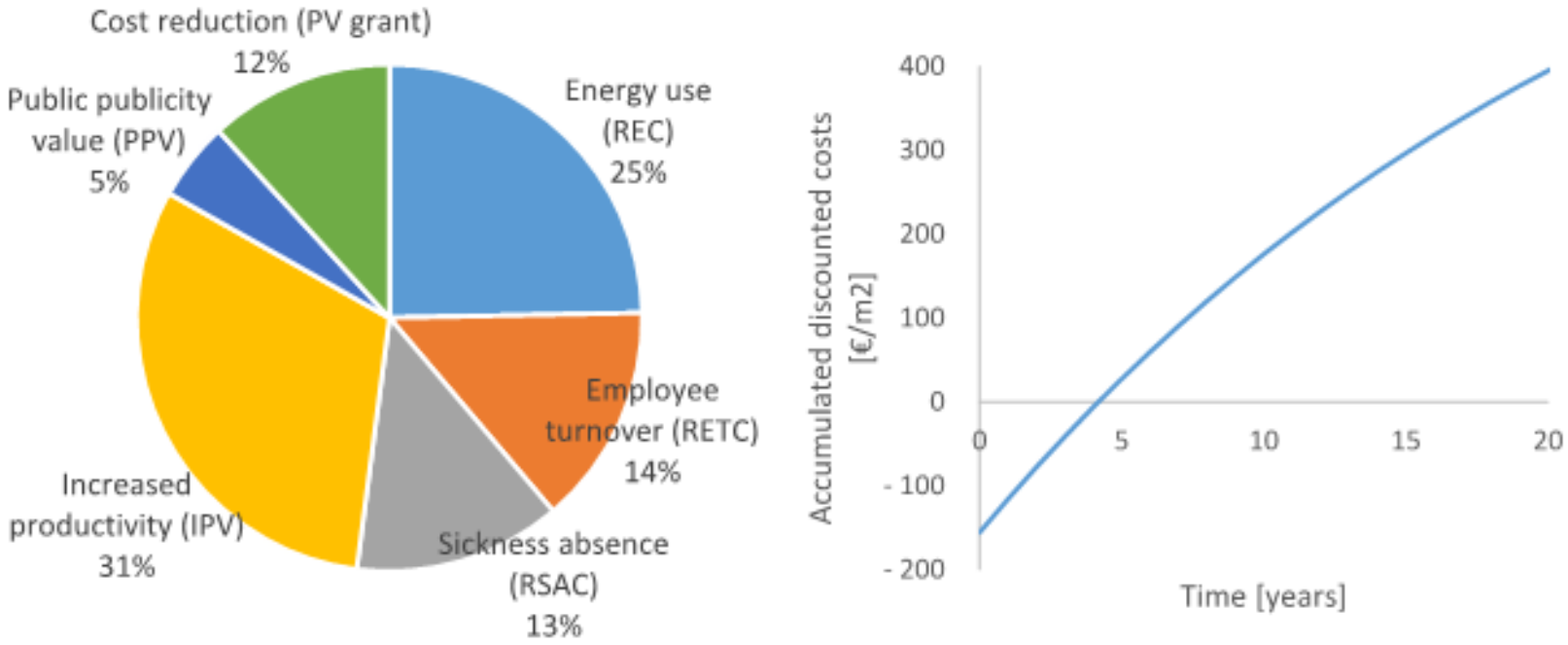


Figure 4 Left: Distribution of summarised green values for ten years.
Right: Accumulated costs for investments and for green values

Conclusions

- It´s possible to quantify co-benefits
- Green buildings (nZEB, NetZEBs, etc.) may be very profitable
- More research is needed

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Thank you – questions?

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