

The SRV logo is located in the top right corner of the slide. It consists of the letters 'SRV' in a bold, black, sans-serif font. A small yellow triangle is positioned above the letter 'V'.

# Constructing low carbon building and the role of energy

Miimu Airaksinen

Senior Vice President, R&D, SRV Oyj



**Elämäsi  
rakentaja.**



Kuva M. Airaksinen

” We shape our buildings; thereafter they shape us.”

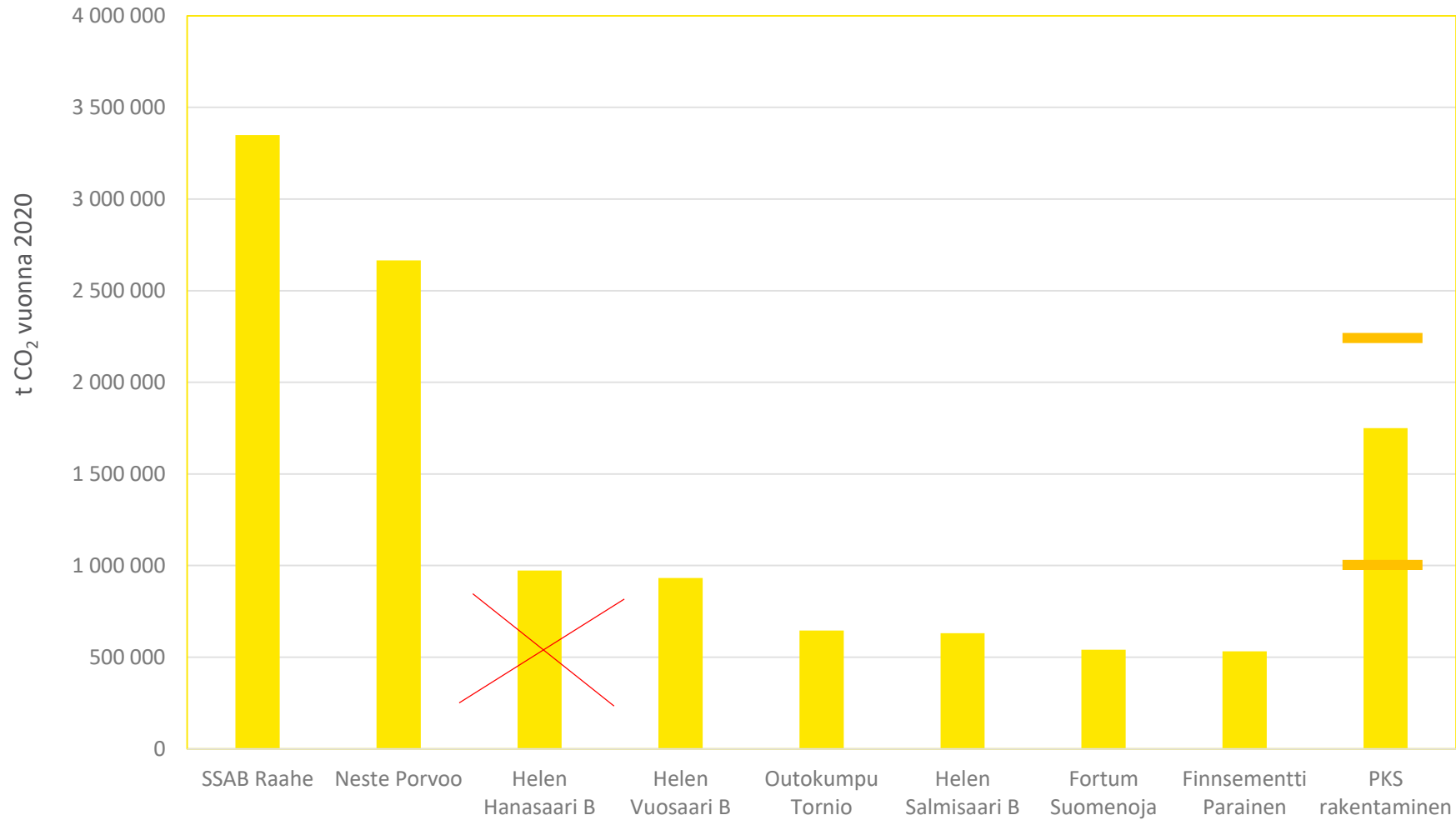
-Winston Churchill



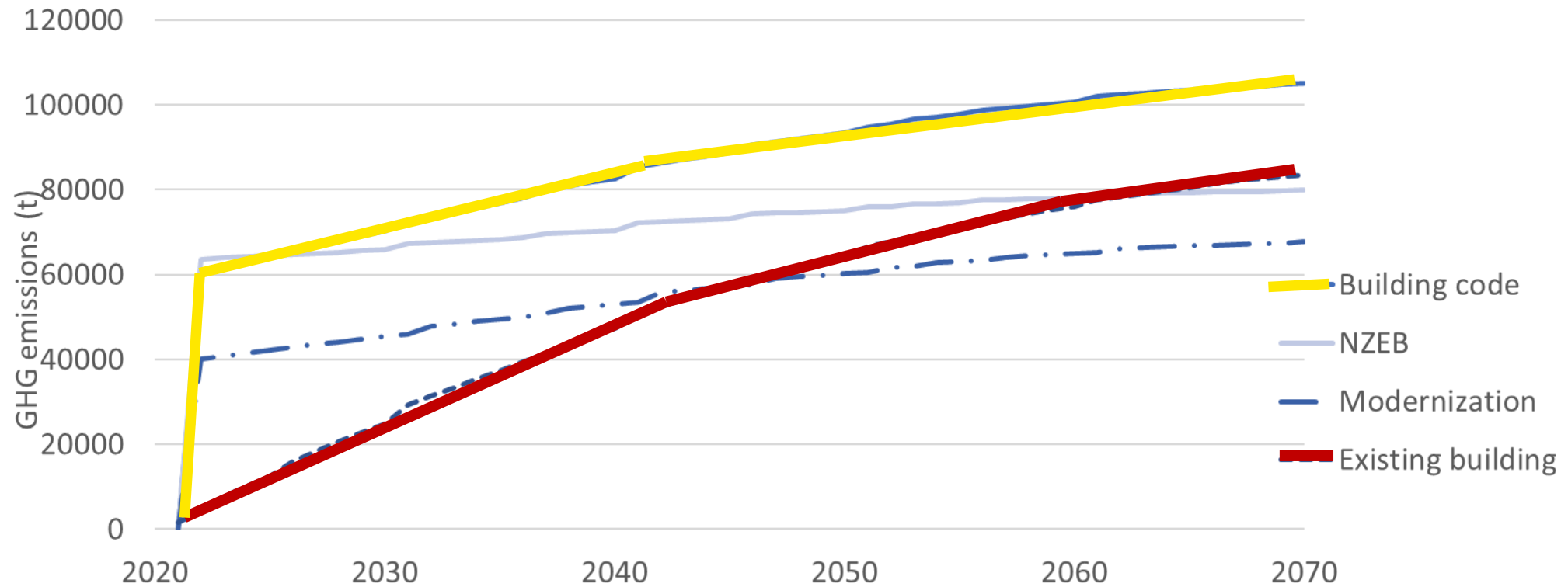
## Real Estate and Construction sector

- 83% National wealth
- 60% Investments
- 15% GDP gross domestic product
- 20% Employment
- 35% Energy Consumption
- 32% CO2 ekv emissions
- 30-50% raw materials (more than any other industry)

# CO2 ekv emissions in Finland



# Carbon peak

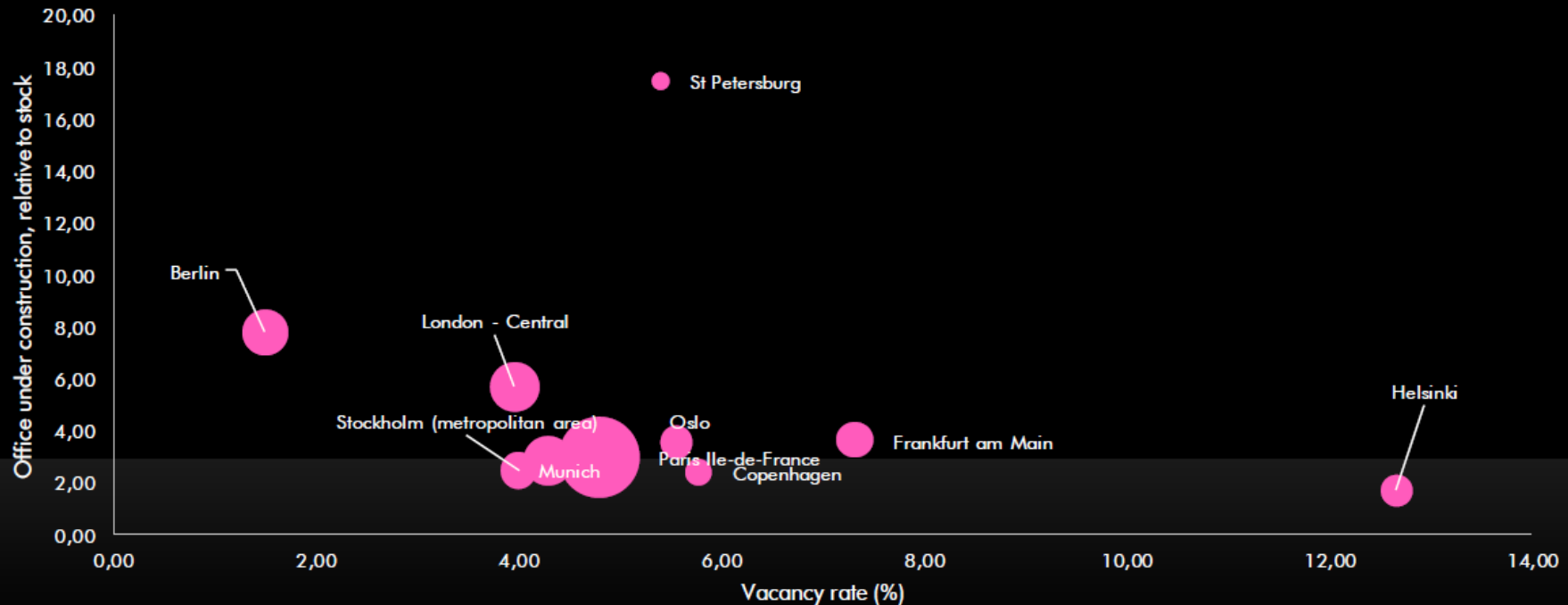


*\*A scenario analysis of the life cycle greenhouse gas emissions of a new residential area  
A Säynäjoki, J Heinonen, S Junnila 2012  
Environmental Research Letters 7 (3), 034037*

# Flexibility of spaces

## EUROPEAN OFFICE MARKETS IN PERSPECTIVE

Office area under construction in relation to vacancy rate (%)  
Size of bubble is the relative size of the city's total office stock



Lähde: CBRE Spark 2020, Sami Kiehelä, Amanda Welander

# KIRA-growth program

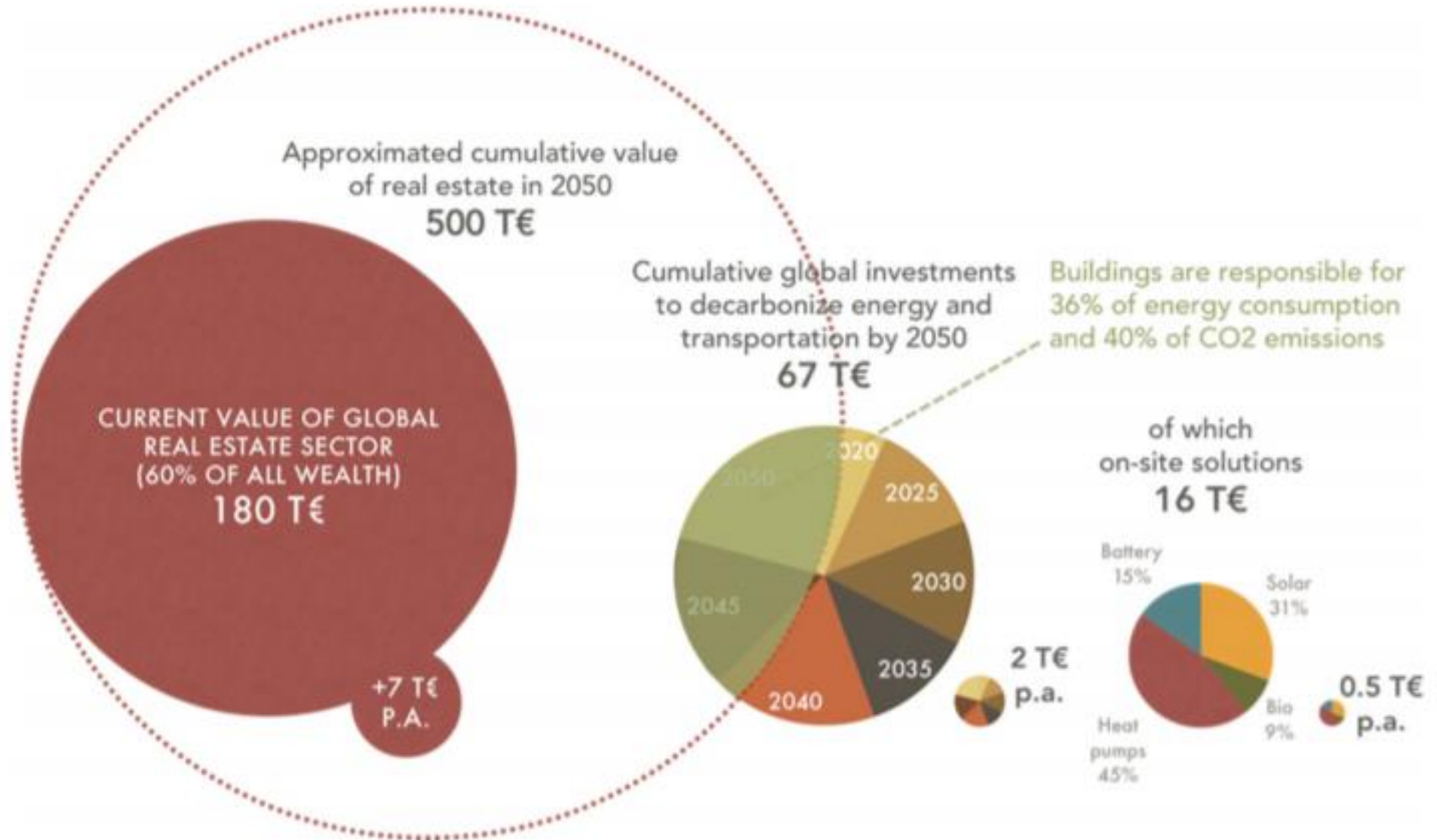
[https://kirafoorumi.fi/wp-content/uploads/2022/03/KIRAfoorumi\\_Kasvuraportti\\_2022\\_ENG.pdf](https://kirafoorumi.fi/wp-content/uploads/2022/03/KIRAfoorumi_Kasvuraportti_2022_ENG.pdf)

## Kasvumahdollisuudet

|  | Kokonais-<br>arvio | Investointi-<br>aikomus |
|--|--------------------|-------------------------|
| 1. Kestävät rakennukset ja infra sekä muuntojoustavat ratkaisut  | 3,3                | 2,2                     |
| 2. Vähähiiliset rakennusmateriaalit  | 2,9                | 2,1                     |
| 3. Energiatehokkaat ratkaisut ja energiakäytön optimointi  | 3,3                | 2,6                     |
| 4. Uusiutuvan energian alueellinen tuotanto, varastointi ja jakelu   | 2,7                | 1,9                     |
| 5. Toimiva kiertotalous  | 2,8                | 2,4                     |
| 6. Kokonaistuottavuutta optimoivat yhteistyömallit sekä vakioidut digitaaliset suunnittelu- ja rakentamisprosessit           | 2,9                | 2,4                     |
| 7. Tuottavuutta parantava modulaarisuus, esivalmistus ja kokoonpanotoiminta  | 2,6                | 2,5                     |
| 8. Uusien teknologioiden mahdollistamat ratkaisut tuottavuuden parantamiseksi  | 2,7                | 2,3                     |
| 9. Yhteiskäyttöinen data ja tiedolla johtamisen palvelut   | 2,8                | 1,5                     |
| 10. Tilat palveluna sekä käyttäjäpalveluiden integrointi kiinteistön yhteyteen   | 2,5                | 1,7                     |
| 11. Omaisuuden hallintapalvelut (reaaliaikainen tilannekuva) sekä kiinteistön hoidon ja ylläpidon optimointi                 | 2,6                | 1,1                     |
| 12. Infrastruktuurin toimivuuden hallintapalvelut (ennakointi ja riskien hallinta) sekä korjausvelan ratkaiseminen palveluna | 2,5                | 1,3                     |
| 13. Resilientit infraratkaisut, jotka kestävät muuttuvia olosuhteita ja ääriolosuhteita sekä torjuvat kyber- ja terveysuhkia | 2,6                | 1,6                     |

<https://kirafoorumi.fi/kiinteisto-ja-rakentamisalan-kasvuohjelma/>

Payback time for energy investments was in average 5 years.  
 For PV panels the ROI was 7% in apartments and 5% in commercial buildings.



LÄHDE:

Vimpari, J. 2020, Financing energy transition with real estate commitments, *Energies* 2020, 13, 4289; doi:10.3390/en13174289

Vimpari, J., Junnila, S., 2019, Estimating the diffusion of rooftop PVs: A real estate economics perspective, *Energy*, Volume 172, <https://doi.org/10.1016/j.energy.2019.02.049>.



# Life cycle wise construction site

All SRV construction sites have been net zero carbon sites from the beginning of the year 2022.

## Zero emission construction site

- Energy efficiency
- Carbon neutral heating and electricity
- Bio fuels

## Circular Economy

- Minimizing raw material use
- Recycling and re-using
- Sorting waste 70%
- Re-using the waste 96%

# Life cycle wise building



- Value of the building and area
- Maintenance
- Flexibility and multiusable buildings
- Predictability
- Cost optimisation
- Biodiversity

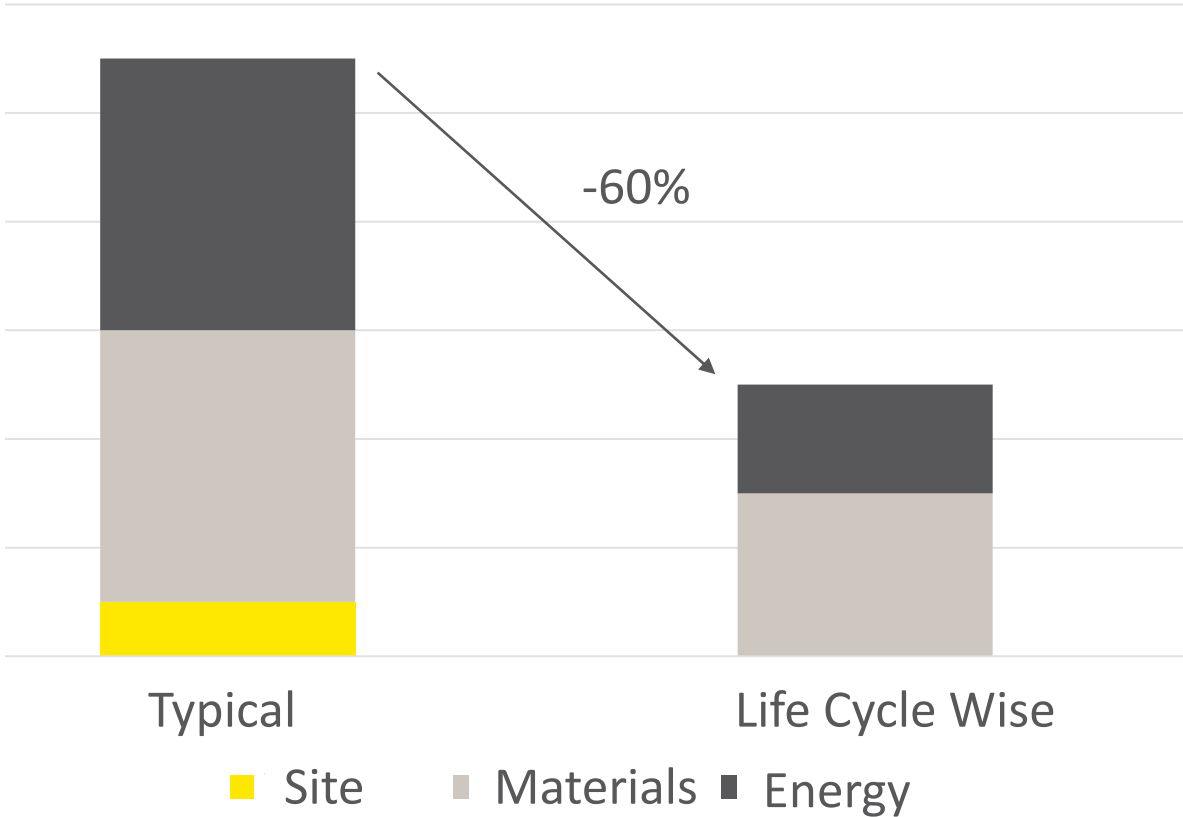


- Renewable energy
- Low carbon materials
- Sustainable materials
- Biodiversity



- Good indoor environment
- Health and safety
- Usability and flexibility of spaces
- Green areas and gardens

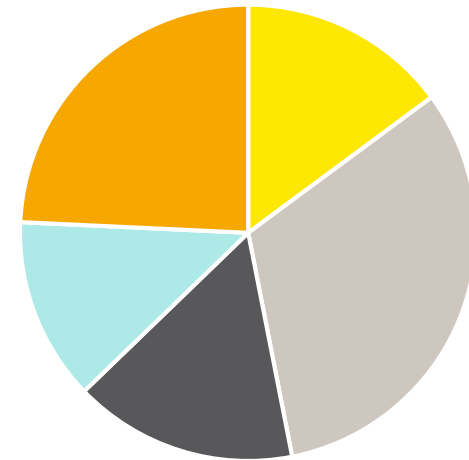
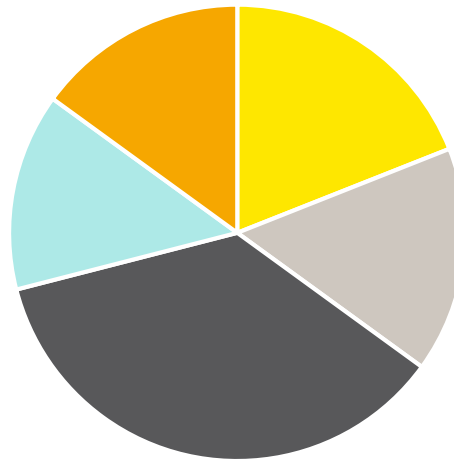
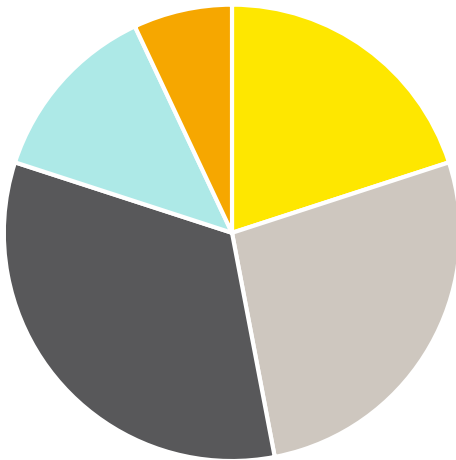
# CO<sub>2</sub> ekv emissions



# Embodied CO2

## Reducing Embodied CO2:

1. Design
2. Reduced need and circular economy
3. Low carbon materials



■ Perustukset ■ Pystyrakenteet ■ Vaakarakenteet ■ Muut rakenteet ■ Talotekniikka ■ Perustukset ■ Pystyrakenteet ■ Vaakarakenteet ■ Muut rakenteet ■ Talotekniikka ■ Perustukset ■ Pystyrakenteet ■ Vaakarakenteet ■ Muut rakenteet ■ Talotekniikka

# Esimerkki, Carbon negative concrete

- Carbon negative concrete by combining an efficient carbonation process with low-carbon binders.
- Carbonation of steel industry slags and side-streams from the paper industry.
- Carbon footprint is negative:  $-60 \text{ kg CO}_2$  per  $1 \text{ m}^3$  concrete. In a typical concrete the carbon footprint is  $250\text{--}300 \text{ kg CO}_2/\text{m}^3$
- VTT Spin-off



<https://www.vttresearch.com/en/news-and-ideas/carbonaide-aims-carbon-negative-concrete-technology>

# Power demand

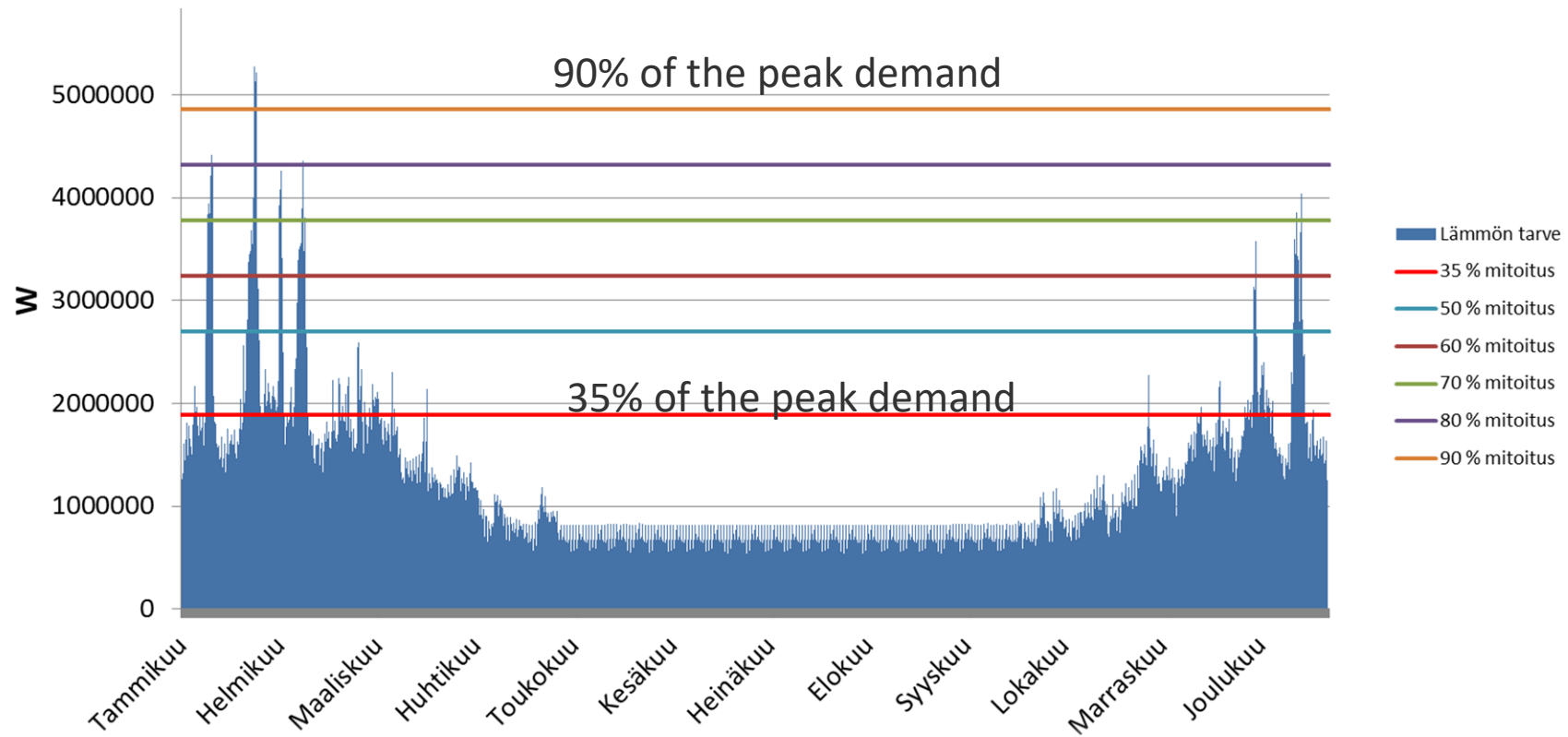
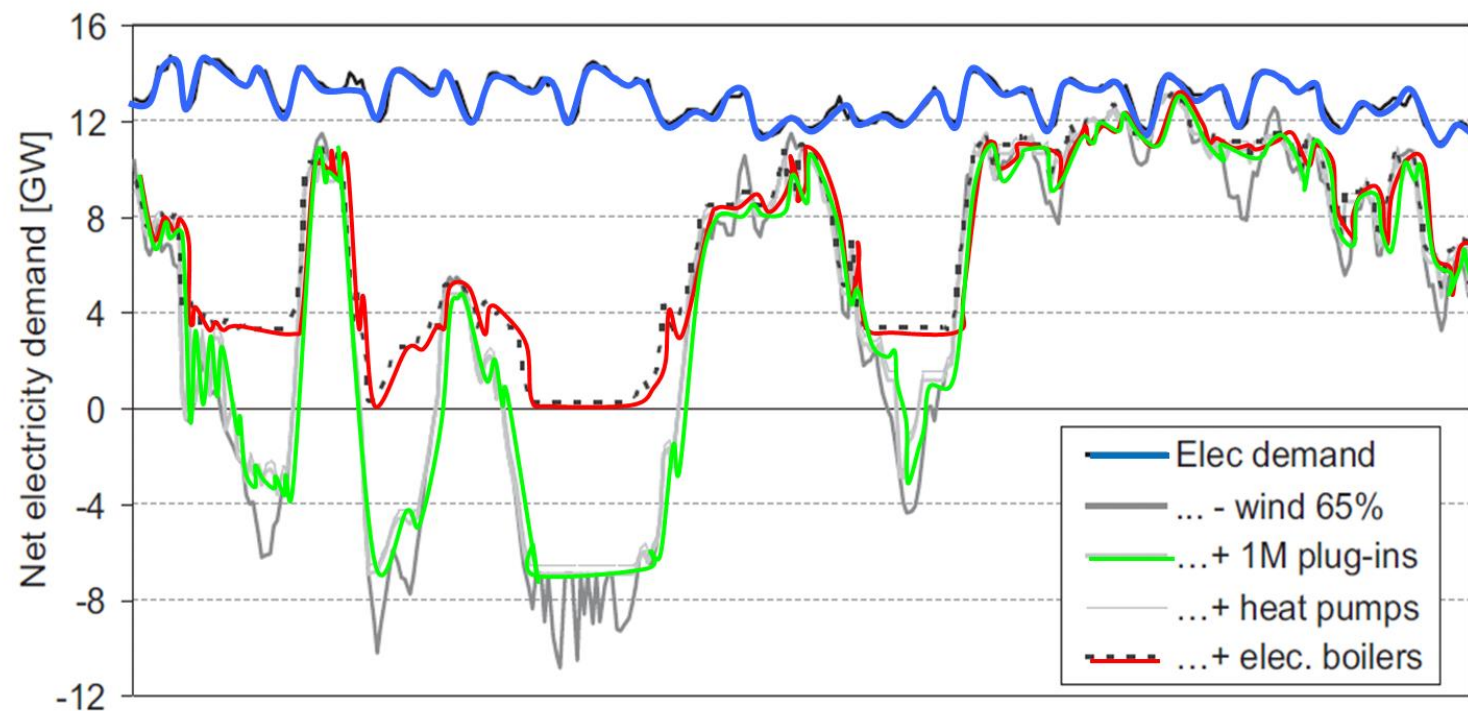


Figure: VTT Co-ZED-project

# Energy system

- *Fingrid estimates that in the year 2027 wind power will produce more than nuclear power. In addition, the solar power is estimated to increase at the same level as the hydropower*

=>resiliency and demand side management is needed, as well as all other components



Source: Kiviluoma J, 2013, VTT  
<http://www.vtt.fi/inf/pdf/science/2013/S35.pdf>

# We need smart HVAC systems, predictive systems and cyper security



- According to recent research 40% of reserve power can be avoided
- Peak power deamend can be reduced at least 10-25% in offices and commercial buildings
- Predictive and adaptive systems can save 10-30% energy without compromising wellbeing (VTT Human Thermal Model)
- The amount and quality of cyper attacts is increasing



$$\text{Sustainability} = \frac{\text{Quality of Life}}{\text{Environmental impact} * \text{Resources} * \text{Cost}}$$



An aerial photograph of a modern university campus during sunset. The sky is a vibrant orange and yellow, with the sun low on the horizon. The campus features several large, multi-story buildings with a mix of red brick and light-colored concrete. The buildings have large glass windows and balconies. In the foreground, there is a paved plaza with some trees and a few people walking. The background shows a dense urban area with many smaller buildings and trees.

**Buildings and infrastructures have a long life span.  
We are building for the generations which are not yet born.**