Beyond operational

towards circularity and a life-cycle approach in today's energy discourse

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Finnish residential buildings

... play a key role in Finland's energy transition targets.

The largest potential for the reduction

... of operational energy can be found in these older Finnish apartment buildings.

Hirvonen, J., Jokisalo, J., Heljo, J., Kosonen, R. (2019). Towards the EU emissions targets of 2050: optimal energy renovation measures of Finnish apartment buildings.







Operational and embodied energy



The share of operational energy is typically 80-90% of a residential building's life cycle energy.

Ramesh, T., Prakash, R., Shukla, K.K. (2010). Life cycle energy analysis of buildings: An overview.



HOWEVER

Operational and embodied energy



Shift of focus towards increased efficiency in operational energy

1A

Buildings demolished in Tampere between 2000 and 2018 reached an average life of 50 years

Huuhka, S. & Kolkwitz, M. (2021). Stocks and flows of buildings: Analysis of existing, demolished, and constructed buildings in Tampere, Finland, 2000–2018



Our overall target must be an architecture of <u>endurance</u>*

*Hassler, U. (2011). Langfriststabilität: Towards a Sustainable Development of the Built Environment.



Building stocks should be considered not only as deposits of raw materials but also reserves of space.





Kolkwitz, M. (2020). Tampere Urban Mine: An Analysis of Building Stock, Construction and Demolition 2000 – 2018.





Kolkwitz, M. (2020). Tampere Urban Mine: An Analysis of Building Stock, Construction and Demolition 2000 – 2018.



Buildings demolished in Kaleva, Tampere | 2000 - 2018



Kolkwitz, M. (2020). Tampere Urban Mine: An Analysis of Building Stock, Construction and Demolition 2000 – 2018.







From short life cycle, high embodied and significant operational energy to...

... Extended Building Life Cycles...



Former headquarters of the GDR toll. Renovation and extension by PETERSENARCHITEKTEN



...Low Embodied Energy...

Sundby School in Guldborgsund by Henning Larsen Architects

...Low to No Operational Energy!

existing facade (partial frost damage)

approx. 0,36 W/m²*K



keep the existing concrete core

renovated facade (prefab balloon frame elements)

approx. 0,14 W/m²*K





THE GREENEST BUILDING... ...IS THE ONE ALREADY BUILT!

Carl Elefante, former president of the American Institute of Architects