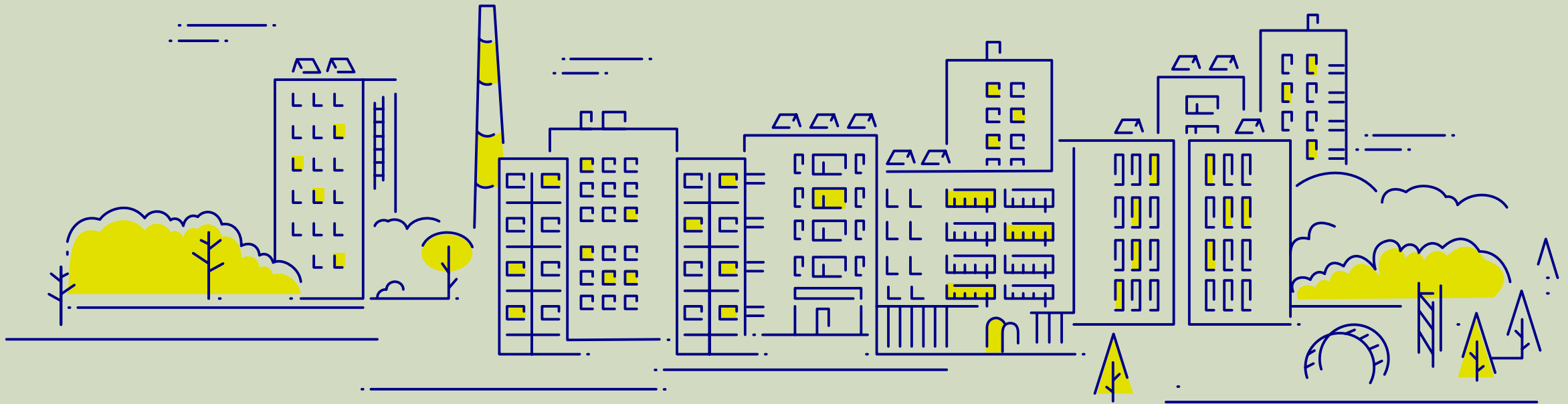


Industrial prefabricated renovation with factory-made elements



Kalle Kuusk

Ettevõtluse ja Innovatsiooni Sihtasutus



Renovation support measures in Estonia

Renovation support measures since 2010, current renovation standard started 2015

- Total of ≈1500 buildings
- Since 2015 ≈900 buildings
- ≈300 mln € for subsidies
- ≈700 mln € total investments

Mainly deep renovation

- Insulation of building envelope
- Replacement of windows
- Renovation of the heating system
- New ventilation system with heat recovery
- PV-panels

On average 50...60% reduction in energy use



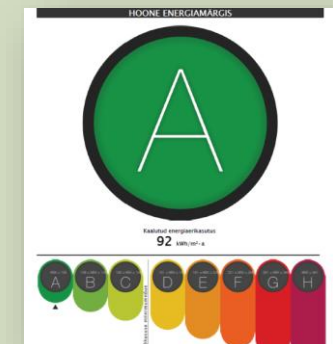
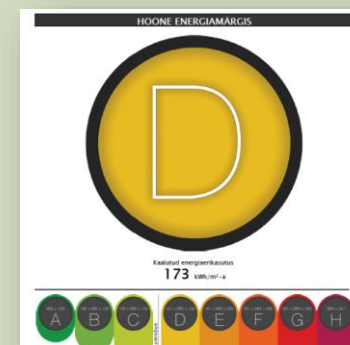
Prefab renovation – first pilots

Renovation of Taltech dormitory - 2018

- **MORE-CONNECT** - prefabricated multifunctional renovation elements
- <https://www.more-connect.eu/>

Renovation of apartment building - 2021

- **DRIVE 0** – modular circular deep renovation
- <https://www.drive0.eu/>





Prefab to mainstream retrofit

The market conditions were favorable for innovation:

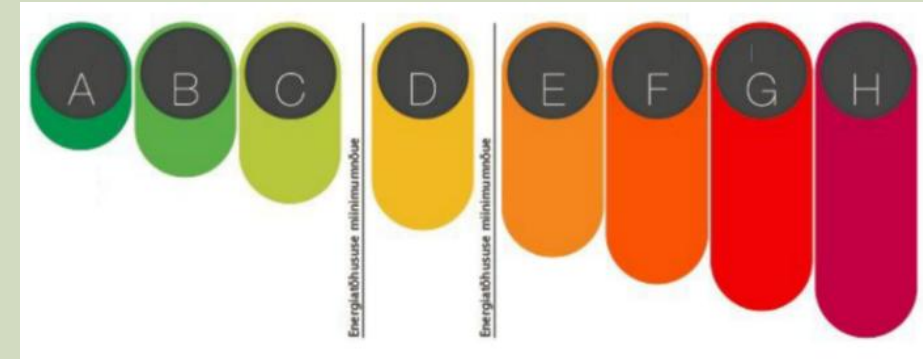
- Over a decade of experience in deep renovation.
- Well-established renovation market, with participation from apartment associations, designers, and main contractors.
- Existing support measures.
- Many apartment buildings are constructed based on standard designs (scalability)
- Two successful pilot renovation projects (an example of why participation in research and innovation projects is beneficial).
- The strong woodhouse industry.

Challenges that need to be addressed:

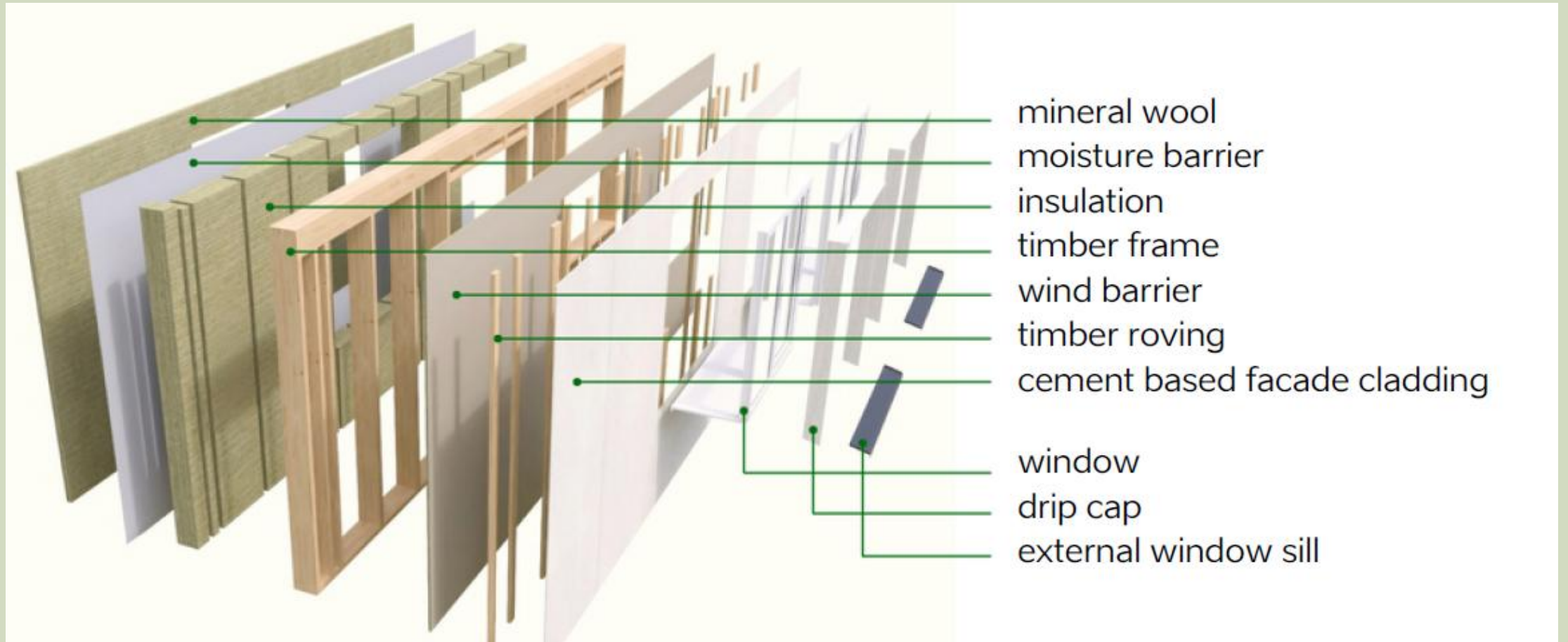
- Marketing materials
- Few experienced companies
- Further research and development.

Support measure for prefab renovation

- Total grant budget ~18 million euros
- 50% grant
- Deep renovation (at least EPC label C)
 - insulation of façade $U \leq 0,18 \text{ W}/(\text{m}^2 \cdot \text{K})$
 - insulation of the roof $U \leq 0,12 \text{ W}/(\text{m}^2 \cdot \text{K})$
 - replacement of windows $U \leq 1,1 \text{ W}/(\text{m}^2 \cdot \text{K})$;
 - new heating system
 - new ventilation system with heat recovery
 - PV panels
 - water and sewage
 - electrical systems
- Facade insulation with prefab external wall elements
- Apartment buildings with up to 5 floors

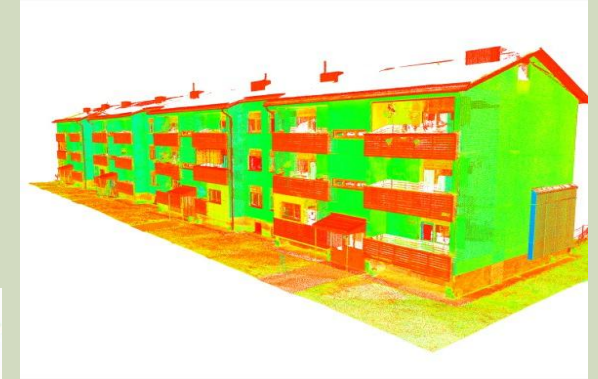


Prefabricated timber frame elements



Process description

- **Laserscanning** - existing building is scanned in 3D producing a detailed 3D point cloud that captures the building's dimensions.
- **Modeling and design** - BIM model is generated from the 3D point cloud.
- **Production** - prefabricated elements are produced in a controlled factory environment.
- **Installation** - prefabricated elements are transported to the site and installed, reducing disruption to occupants and shortening the renovation timeline.



*Woodhouse Estonia

Buildings - standard projects (scalability)

1-317



1-464



111-121



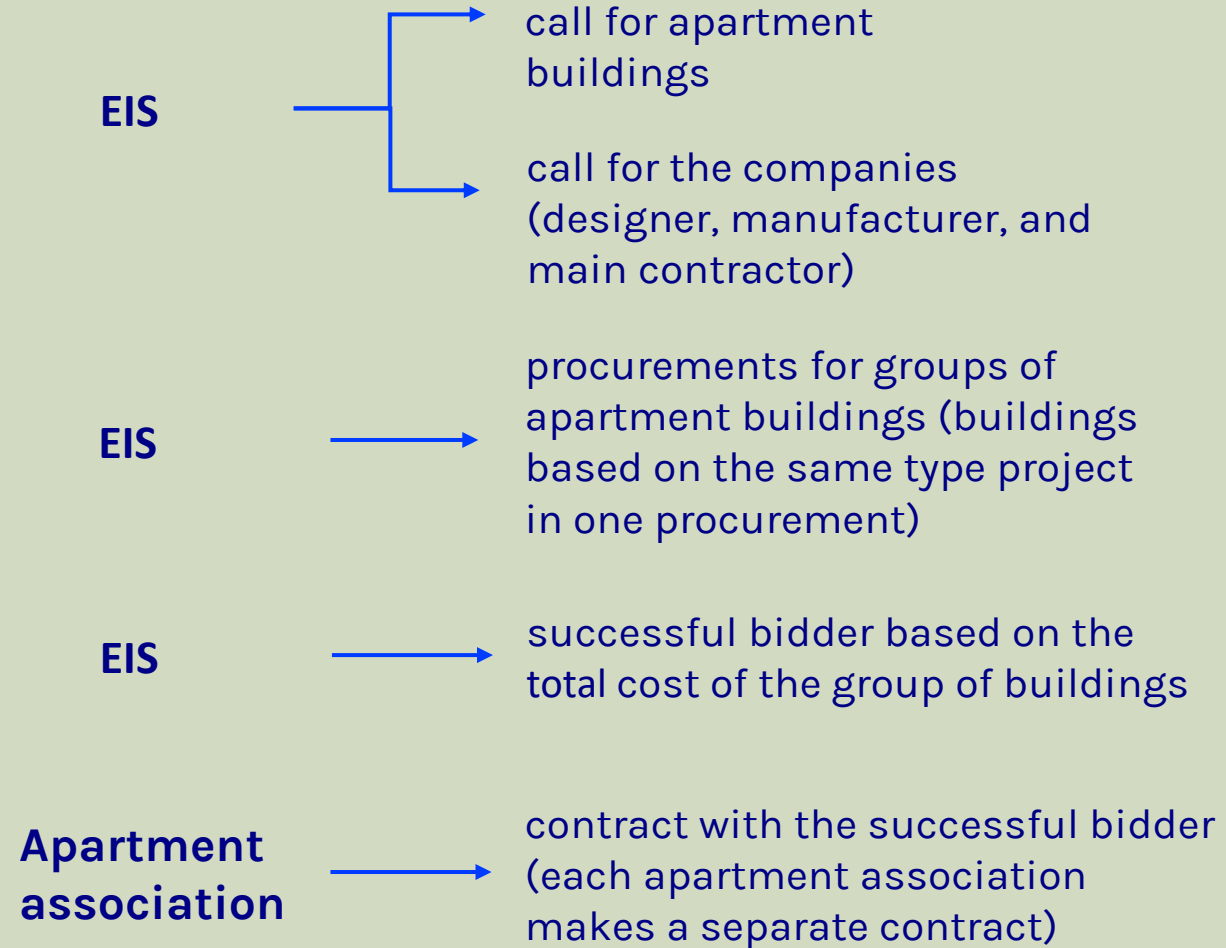
111-133



Procurements

EIS took a leading role:

- The beneficiary of the subsidy is the apartment association
- EIS and the tenderer qualified in the public competition have a cooperative contractual relationship.
- EIS conducted a mini-competition among its partners for a group of apartment buildings (4-5 buildings in one tender) corresponding to a specific standard project type.



Results

- Call for apartment buildings at the end of 2020, a total of 37 grant applications.
- Based on estimated cost (~400 €/net m²), procurements were made for 29 buildings.
- Tenders were made in the 2nd and 3rd quarter of 2021
- Actual average cost was 640 €/net m²
- 19 apartment associations decided to proceed with the renovation
- The tenders were won by two groups of companies (designer, manufacturer, and main contractor as one group)

Statistics: Construction prices up by 17.8 percent on year to 2022

NEWS

ERR News
23.01.2023 09:05



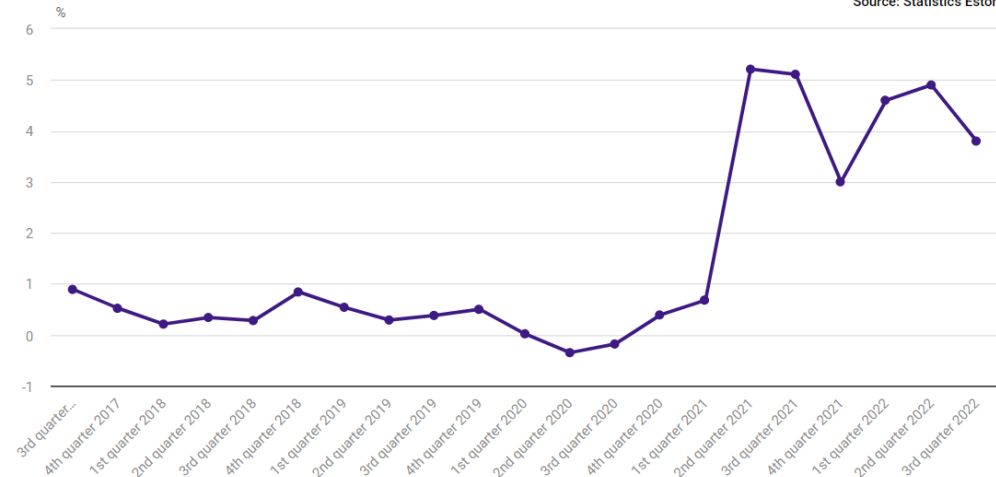
Under-construction Mustamäe State High School in Tallinn. Source: Ken Mürk/ERR

The construction price index rose by 17.8 percent in 2022, compared with the average for the previous year.

The index for the fourth quarter (Q4 2022) was up 16.1 percent in 2022, compared with Q4 2021.

Quarterly change in the construction price index and its components compared to previous quarter, 2017–2022

Source: Statistics Estonia

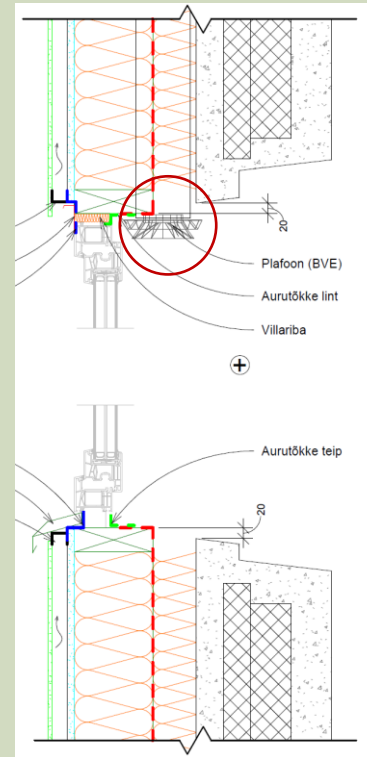


Key selling points

- One-stop shop approach
- EIS handled the procurements
- One partner for renovation - designer, manufacturer, and main contractor
 - Innovative solution
 - Quality and durability
 - Speed of renovation
 - Less disturbance (no scaffolding)
 - Clean construction site



Technical innovation



New solution for installation of ventilation ducts:

- Ventilation ducts and inlets are in the prefabricated wall element.
- It eliminates the need to drill through the wall to install a ventilation supply air valve.

Technical challenges



Challenges with windows:

- It is common that existing buildings can be off-level in various directions.
- Ensuring that the location of window openings in an existing building (which is off-level) and in prefab wall elements (which are straight) match perfectly can be challenging.
- In certain types of buildings, windows may become smaller, which can be disliked by the inhabitants.



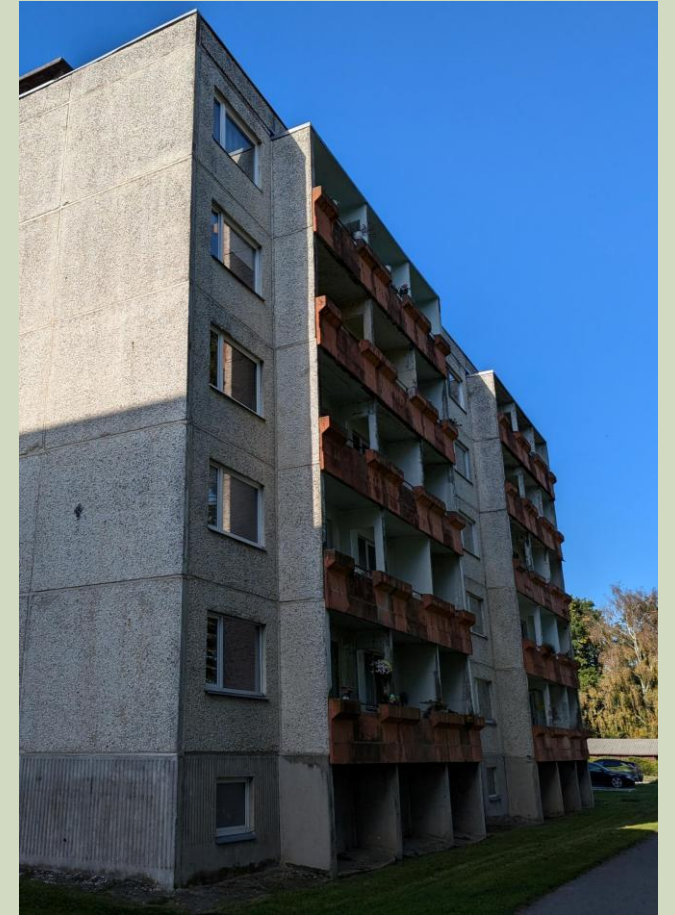
Examples of completed renovations



Examples of completed renovations



Examples of completed renovations





Conclusions and future plans

In summary

- The main obstacles are not related to technical issues.
- Companies are more likely to follow when they see a clear business case (the product must be financially feasible for homeowners).



Plans for prefab renovation

- There were 19 buildings included in the dedicated program for renovating with prefabricated elements.
- Prefab renovation is included in the state's renovation subsidy program, with a specific budget allocated to scale up the process.
- The current higher subsidy rate for prefab renovation is intended to stimulate market growth and promote product innovation. The subsidy rate will be reduced in the future.



Additional information

Subsidy for prefab renovation

- <https://www.kredex.ee/en/element>

Animations and videos

- https://www.youtube.com/watch?v=USTB3u1WnEI&ab_channel=WoodhouseEstonia
- https://www.youtube.com/watch?v=TX0k50oSuJU&ab_channel=WoodhouseEstonia
- https://www.youtube.com/watch?v=XOeTnDXHCuk&ab_channel=TimbecoWoodhouse

