

Quick-scan Retrofitting Leidsekade

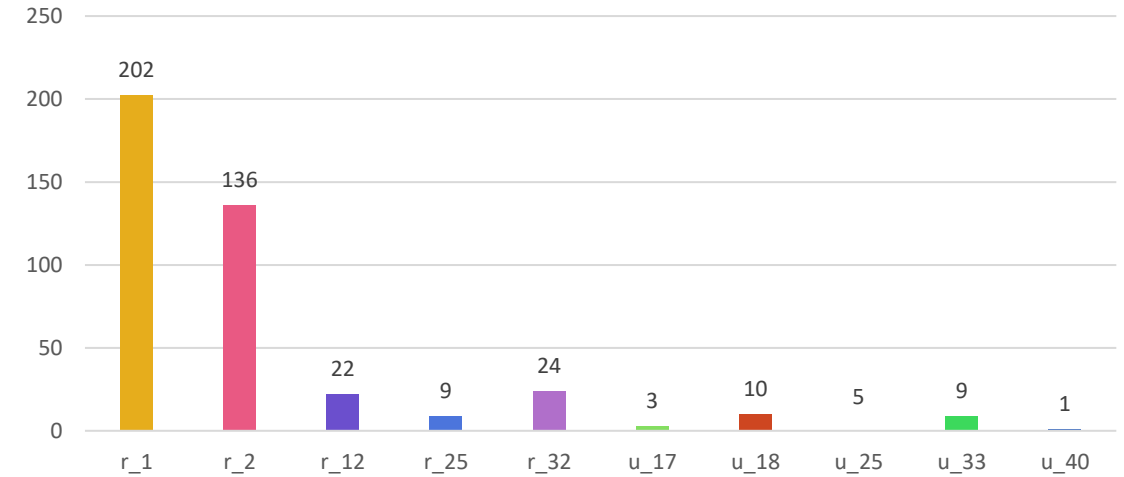
23.05.2024



Archetype diversity

- Energy models cover in total 36 residential archetypes and 46 non-residential archetypes;
- Leidsekade has **11 different archetypes** (5 residential and 6 non-residential).

Diversity of archetypes in the area (address level)



Function	Typology (compactness ratio)	Construction date	Protection level	Id	Count	Surface area
Residential	Apartment (0,3)	<1945	orde 1	r_1	202	8422
			orde 2 and 3	r_2	136	10641
	Semi-detached (0,7)	>1995	no orde	r_12	22	1835
		<1945	orde 1	r_25	9	813
			orde 2 and 3	r_32	24	1985
Utilities (Office)	Row (≤0,5)	<1975	orde 1	u_17	3	1609
			orde 2 and 3	u_18	10	1507
		>1996	no orde	u_25	5	752
Horeca	Row (≤0,5)	<1945	orde 2 and 3	u_33	9	2448
		>1996	no orde	u_40	1	317

- **Gasverbruik:** 15x ingevuld, zeer grote spreiding (17m3-2331 m3/jr)

1004
m3/yr

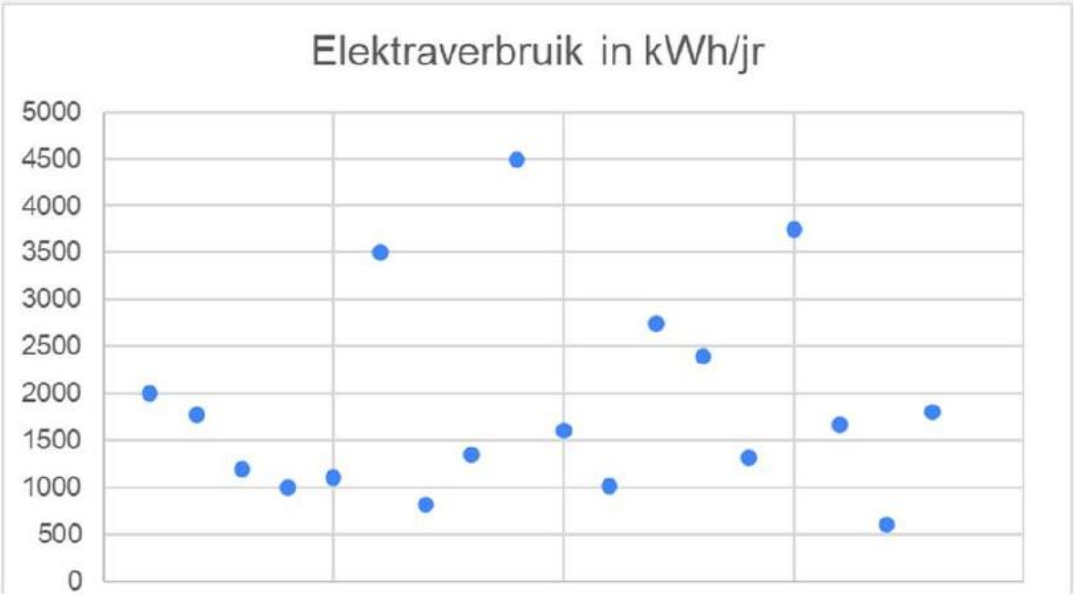
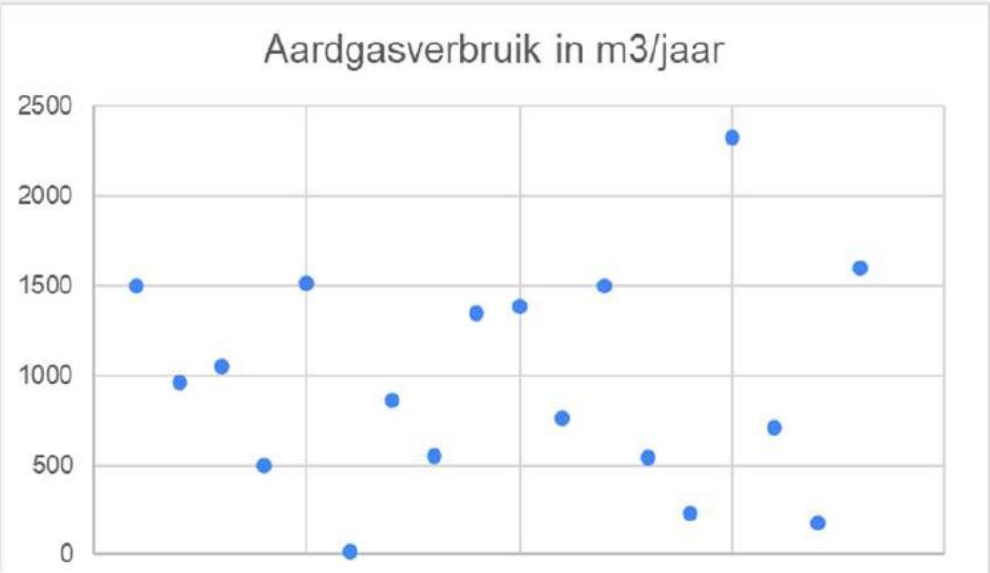
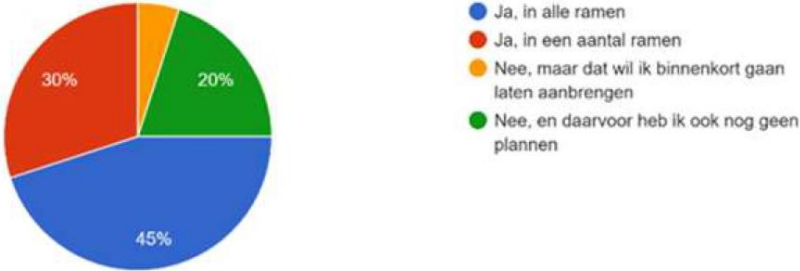
175,7
kWh/m2/yr

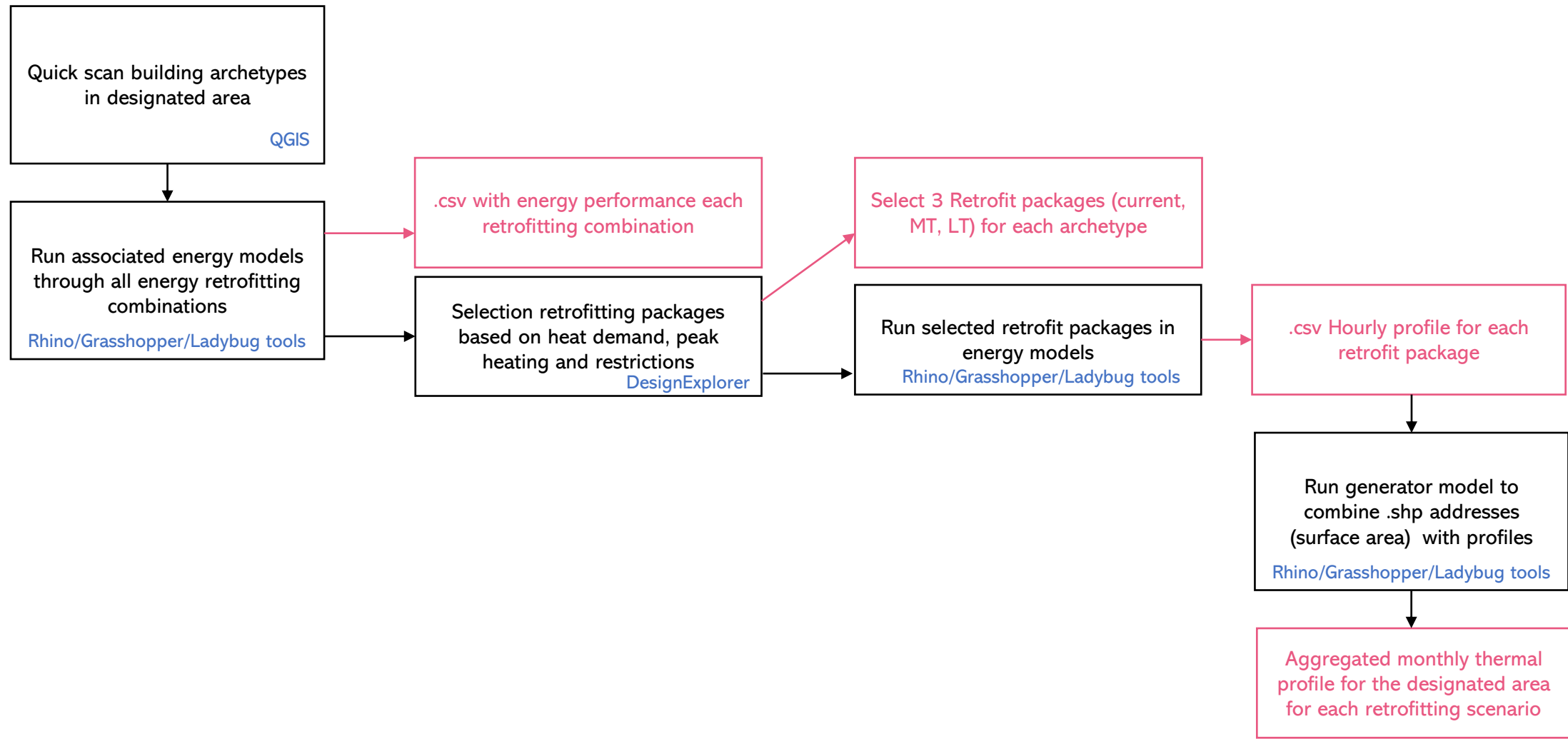
- **Elektriciteitsverbruik:** 15x ingevuld. Gemiddeld 2006 kWh/jr; spreiding 811-3744 kWh/jr.

20006
kWh/yr

331,8
kWh/m2/yr

Heeft u dubbel glas in de woning?
20 antwoorden

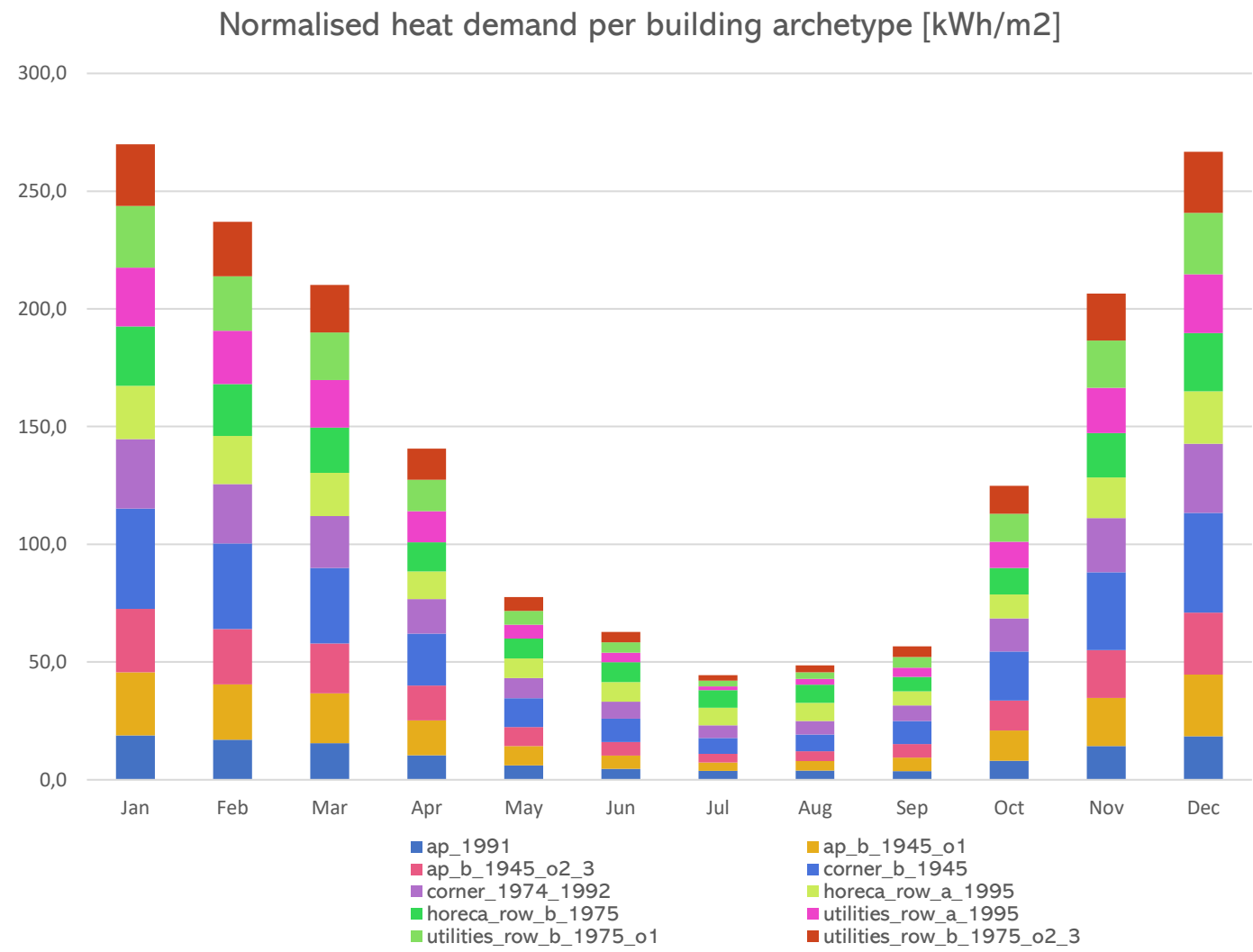




Calculation steps

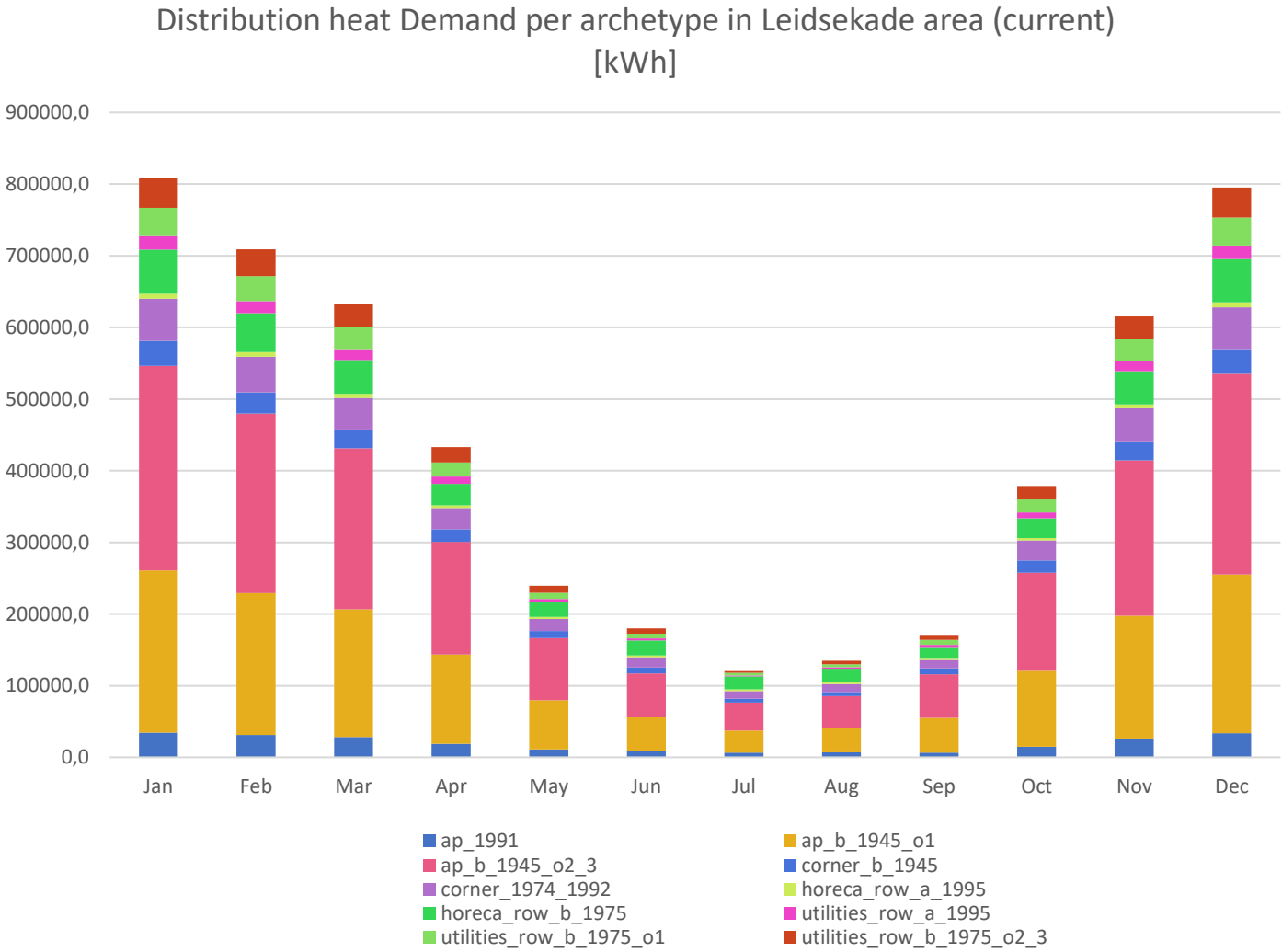


Thermal profiles

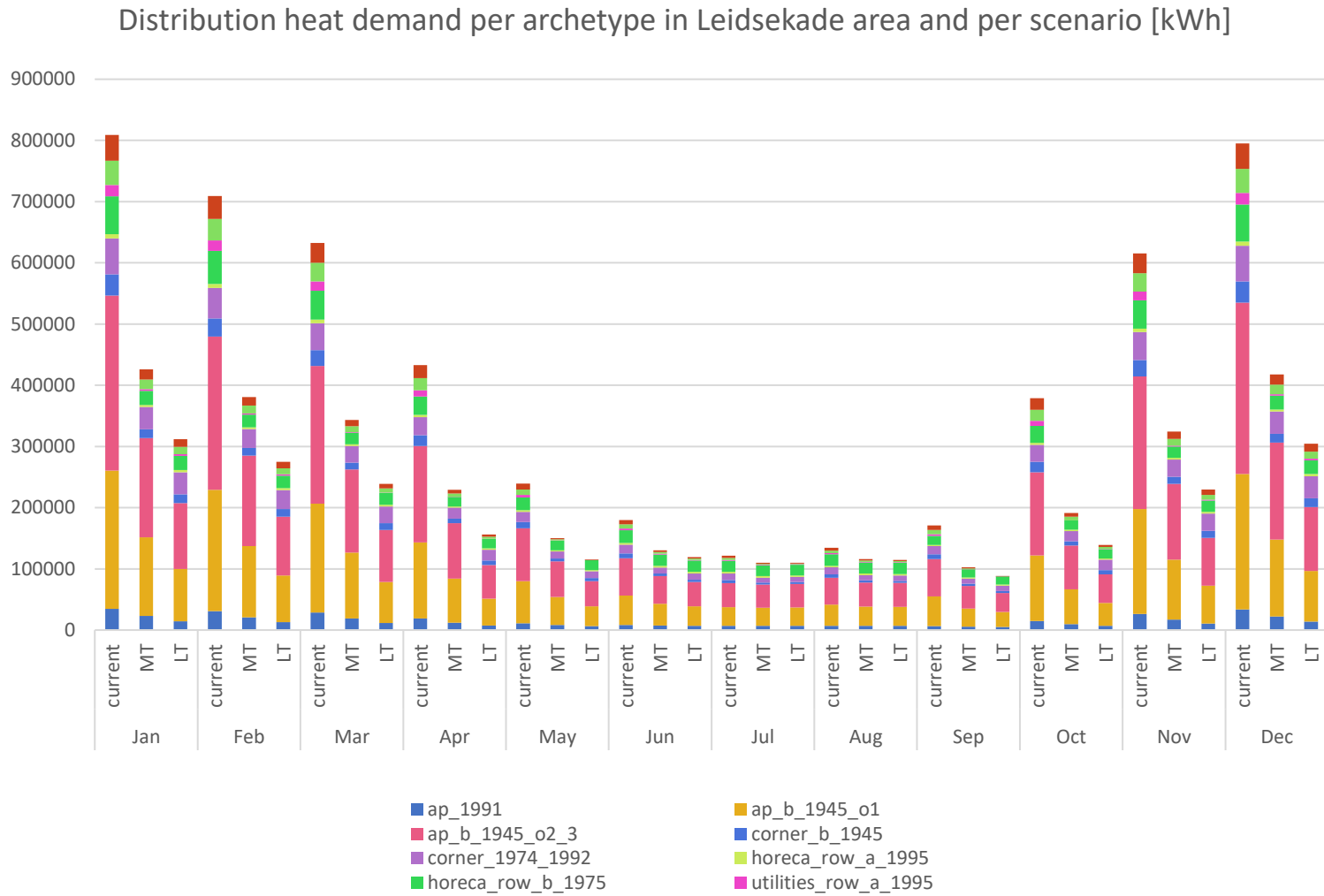




Thermal profiles



Leidsekade community could achieve in total 44% heating savings (with MT retrofit packages) and 58% (with LT retrofit packages)



Heat profile per retrofitting scenario



RESIDENTIAL			
Archetype id	Current	MT-level	LT-level
r_1	Facade insulation : non-insulated	Facade insulation : 5 cm	Facade insulation : 5 cm
	Roof insulation : non-insulated	Roof insulation : 12.5 cm	Roof insulation : 12.5 cm
	GF insulation : non-insulated	GF insulation : 5 cm	GF insulation : 7.5 cm
	Windows & Doors : Dubble glas	Windows & Doors : Vacuum glas	Windows & Doors : Vacuum glas
	Infiltration : Leaky	Infiltration : Crack sealing	Infiltration : Crack sealing
	Ventilation : Natural	Ventilation : C2	Ventilation : D1 HRV 90%
r_2	Facade insulation : non-insulated	Facade insulation : 5 cm	Facade insulation : 5 cm
	Roof insulation : non-insulated	Roof insulation : 12.5 cm	Roof insulation : 12.5 cm
	GF insulation : non-insulated	GF insulation : 5 cm	GF insulation : 7.5 cm
	Windows & Doors : Dubble glas	Windows & Doors : Vacuum glas	Windows & Doors : Vacuum glas
	Infiltration : Leaky	Infiltration : Crack sealing	Infiltration : Crack sealing
	Ventilation : Natural	Ventilation : C2	Ventilation : D1 HRV 90%
r_12	Facade insulation : non	Facade insulation : 5 cm	Facade insulation : 5 cm
	Roof insulation : non	Roof insulation : 5 cm	Roof insulation : 5 cm
	GF insulation : non	GF insulation : 5 cm	GF insulation : 5 cm
	Windows & Doors : HR++	Windows & Doors : HR++	Windows & Doors : HR++
	Infiltration : Crack sealing	Infiltration : Crack sealing	Infiltration : Crack sealing
	Ventilation : C1	Ventilation : C2	Ventilation : D1 HRV 90%
r_25	Facade insulation : non-insulated	Facade insulation : 5 cm	non-reachable within current restrictions
	Roof insulation : non-insulated	Roof insulation : 12.5 cm	
	GF insulation : non-insulated	GF insulation : 5 cm	
	Windows & Doors : Dubble glas	Windows & Doors : Vacuum glas	
	Infiltration : Leaky	Infiltration : Crack sealing	
	Ventilation : Natural	Ventilation : D1 HRV 90%	
r_32	Facade insulation : non-insulated	Facade insulation : 5 cm	non-reachable within current restrictions
	Roof insulation : non-insulated	Roof insulation : 12.5 cm	
	GF insulation : non-insulated	GF insulation : 5 cm	
	Windows & Doors : HR++	Windows & Doors : Triple glas	
	Infiltration : Crack sealing	Infiltration : Crack sealing	
	Ventilation : C	Ventilation : D1 HRV 90%	

Retrofitting packages residential stock



NON-RESIDENTIAL			
Archetype id	Current	MT-level	LT-level
u_17	Facade insulation : non-insulated	Facade insulation : non-insulated	Facade insulation : non-insulated
	Roof insulation : non-insulated	Roof insulation : 5 cm	Roof insulation : 5 cm
	GF insulation : non-insulated	GF insulation : non-insulated	GF insulation : 5 cm
	Windows & Doors : Dubble glas	Windows & Doors : Dubble glas	Windows & Doors : Vacuum glas
	Infiltration : Leaky	Infiltration : Crack sealing	Infiltration : Crack sealing
	Ventilation : Natural	Ventilation : C2	Ventilation : D1 HRV 90%
u_18	Facade insulation : non-insulated	Facade insulation : non-insulated	Facade insulation : non-insulated
	Roof insulation : non-insulated	Roof insulation : 5 cm	Roof insulation : 5 cm
	GF insulation : non-insulated	GF insulation : non-insulated	GF insulation : 5 cm
	Windows & Doors : Dubble glas	Windows & Doors : Dubble glas	Windows & Doors : Vacuum glas
	Infiltration : Leaky	Infiltration : Crack sealing	Infiltration : Crack sealing
	Ventilation : Natural	Ventilation : C2	Ventilation : D1 HRV 90%
u_25	Facade insulation : non	Facade insulation : non	Facade insulation : non
	Roof insulation : non	Roof insulation : 5 cm	Roof insulation : 5 cm
	GF insulation : non	GF insulation : 5 cm	GF insulation : 5 cm
	Windows & Doors : HR++	Windows & Doors : HR++	Windows & Doors : HR++
	Infiltration : Leaky	Infiltration : Crack sealing	Infiltration : Crack sealing
	Ventilation : C1	Ventilation : D1 HRV 90%	Ventilation : D1 HRV 90%
u_33	Facade insulation : non-insulated	Facade insulation : non-insulated	Facade insulation : non-insulated
	Roof insulation : non-insulated	Roof insulation : 5 cm	Roof insulation : 5 cm
	GF insulation : non-insulated	GF insulation : 5 cm	GF insulation : 5 cm
	Windows & Doors : Dubble glas	Windows & Doors : Vacuum glas	Windows & Doors : Vacuum glas
	Infiltration : Leaky	Infiltration : Crack sealing	Infiltration : Crack sealing
	Ventilation : Natural	Ventilation : D1 HRV 90%	Ventilation : D1 HRV 90%
u_40	Facade insulation : 5 cm	Facade insulation : 5 cm	Facade insulation : 5 cm
	Roof insulation : non	Roof insulation : 5 cm	Roof insulation : 5 cm
	GF insulation : non	GF insulation : 5 cm	GF insulation : 5 cm
	Windows & Doors : HR++	Windows & Doors : HR++	Windows & Doors : HR++
	Infiltration : Leaky	Infiltration : Crack sealing	Infiltration : Crack sealing
	Ventilation : C1	Ventilation : C2	Ventilation : C2

Retrofitting packages non-residential stock

- Most of the heat demand in the neighbourhood come from protected apartment buildings built before 1945. For this building typology, it is recommended to:
 - For MT-level (~47% space heating savings):
C2 ventilation, vacuum glas, roof insulation to 12,5 cm, ground floor insulation to 5 cm and façade insulation to 5 cm;
 - For LT-level (~67% space heating savings):
D1 ventilation, vacuum glas, roof insulation to 12,5cm, ground floor insulation to 7,5 cm and façade insulation to 5 cm;
- Highest cooling demand is coming from the 10 Horeca addresses (cooling demand: 6-7 kWh/m²), followed by 18 Utility addresses (cooling demand: 3 kWh/m²) and 393 residential addresses (1-4 kWh/m²). Results suggest that the cooling demand is not significantly influenced by the retrofitting packages compared to the original state.
- Transition to LTH is challenging but possible within monumental regulations for all studied building archetypes, except for corner houses built before 1945 (e.g. Leidsekade 49-50, Marnixstraat 344) which can only be upgraded to MT-level (e.g. 66% space heating savings) while respecting current regulations;
- Interior roof insulation (between 5-12,5 cm), Crack sealing and good ventilation (C2 and D2 HRV90%) are always a good measures when transitioning to MT and LT-level;
- Most of the building stock is protected (e.g. orde 1,2 or 3), making vacuum glas a key measure to upgrade the buildings. For non-protected buildings (built after 1995), having HR++ is sufficient to transition to MT or LT level.
- Leidsekade community could achieve in total 44% heating savings (with MT retrofit packages) and 58% (with LT retrofit packages)

Key findings

- When calculating based on archetypes, one should expect more variations in the building population (such as geometry and original state). The worst-case scenario is considered, but some renovations may have happened at some addresses.
- House boats did not fit any archetypes of the energy models, therefore were not included in the calculation.
- Large deviations can be observed between the theoretical and actual demands, especially for buildings with low energy labels,
- Retrofit packages must adhere to monumental restrictions, such as a maximum interior insulation $R_c 2$ and no changes to the exterior appearance of the buildings. However, other challenges may arise with certain solutions, such as installing ducts for new ventilation systems or interior roof insulation.
- Additional savings could be expected when changing heating delivery to LT systems or more performant HVAC systems.

Limitations

Thank you for your interest!

Questions or suggestions?

Dr. Maéva Dang

M.K.Dang@tudelft.nl

