

Space Modeler User Guide

Comparative analysis of space models

April 8, 2019



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Year

1957

Building type

Apartment building

Architects

Alvar Aalto, Paul Baumgarten

Location

Klopstockstraße 32, Berlin, Germany

Use

8 floors, 78 apartments

Construction

Concrete/brick hybrid,
Gas concrete façade panels



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Year

1993

Building type

Apartment building

Architects

Morger & Degelo

Location

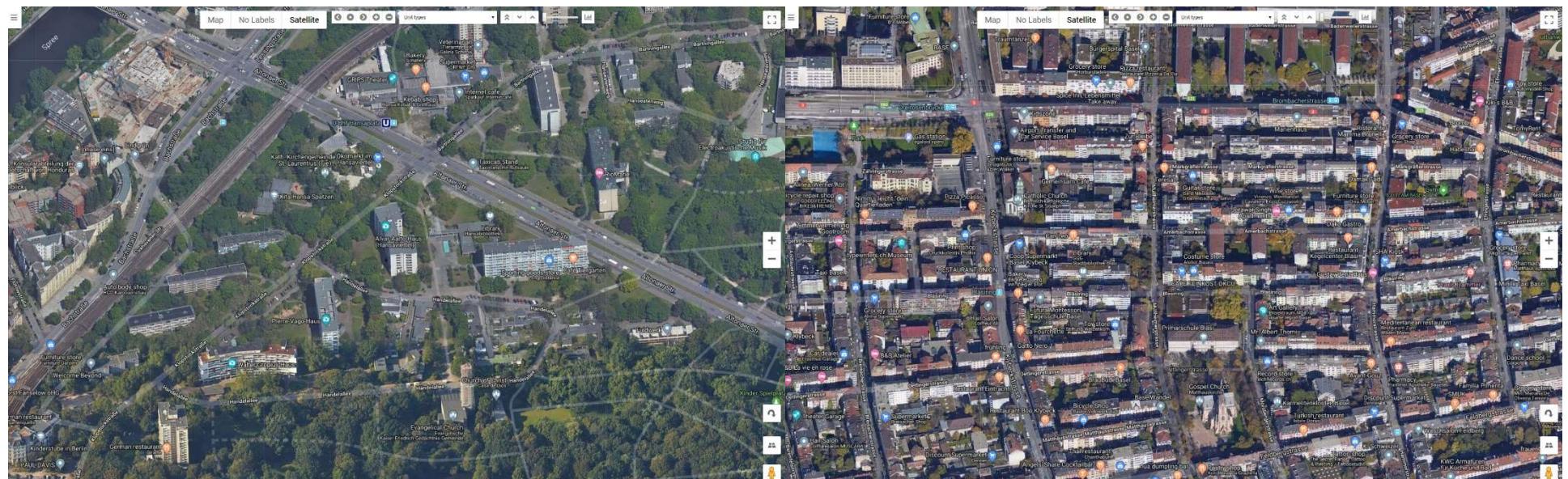
Müllheimerstrasse 140, Basel, Switzerland

Use

5 floors, 26 apartments (social housing), kindergarten

Construction

Concrete load-bearing walls,
Prefab, non-load-bearing façade panels



Berlin, Germany

Basel, Switzerland



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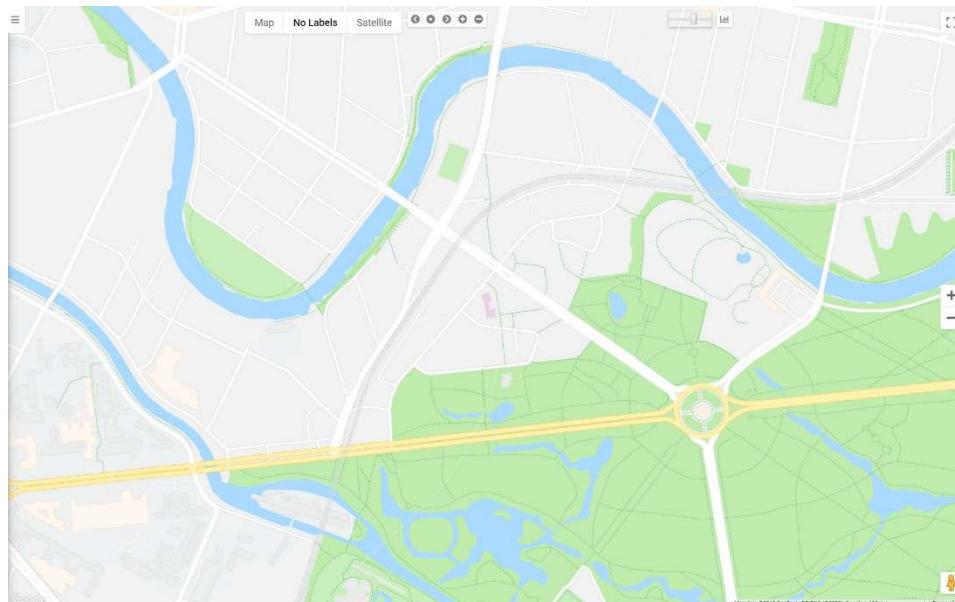


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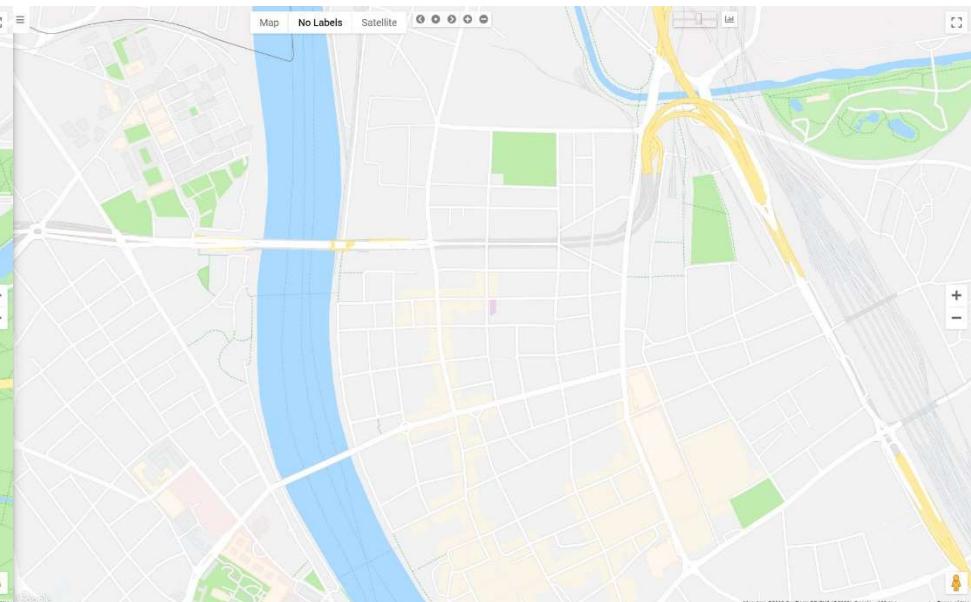


Berlin, Germany

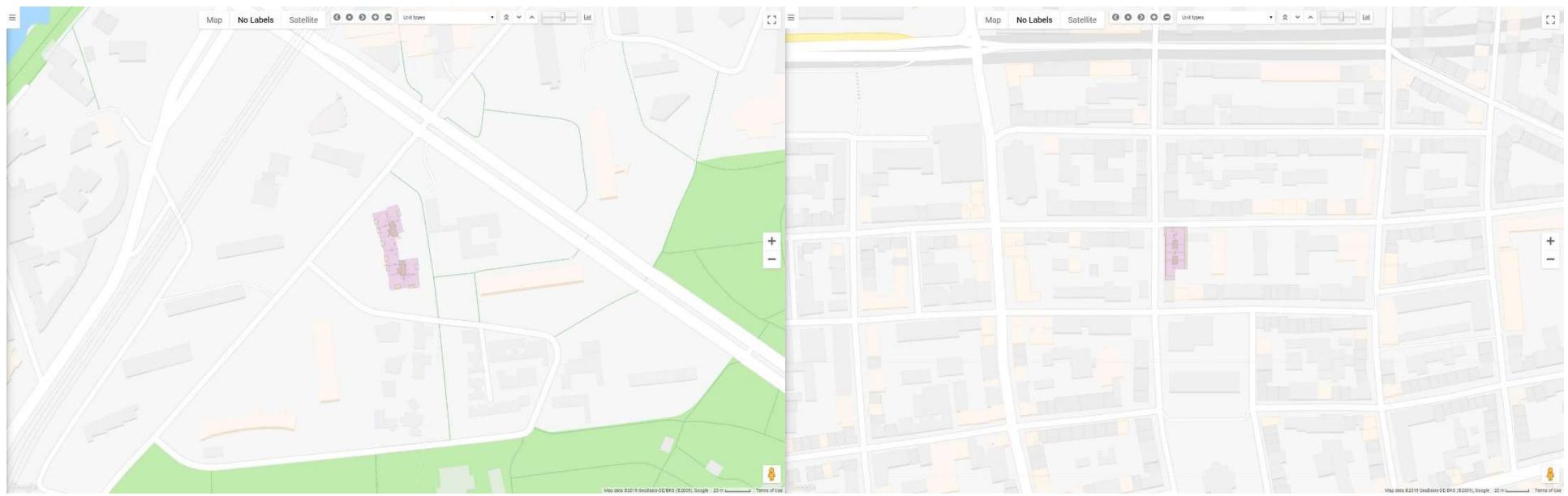
Basel, Switzerland



Berlin, Germany

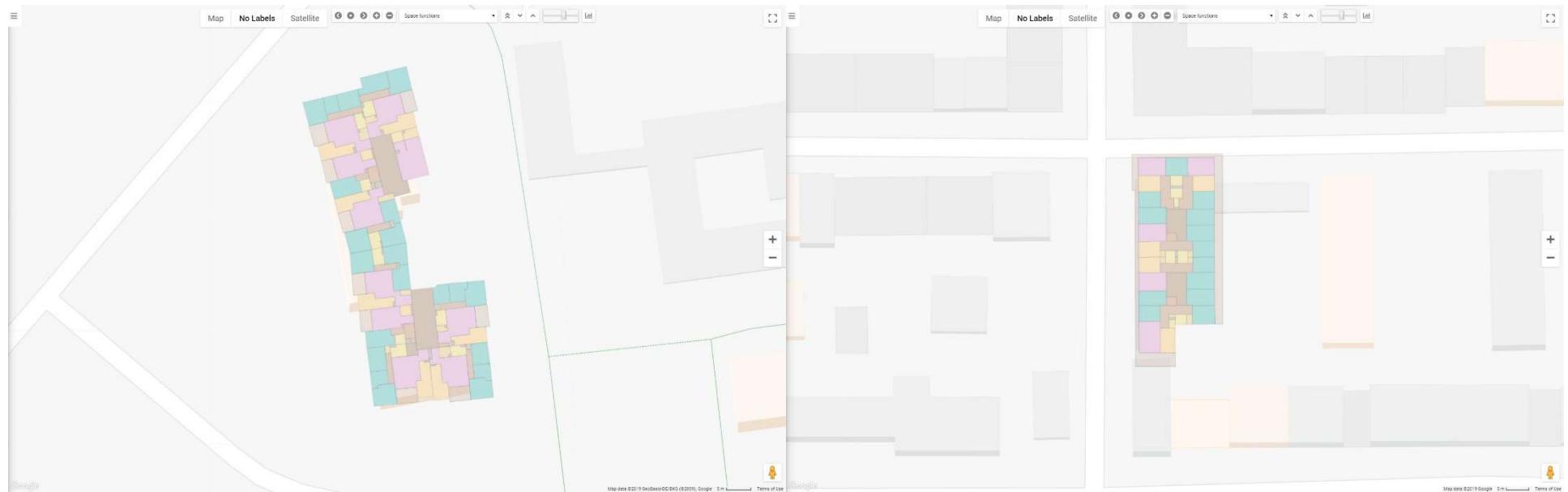


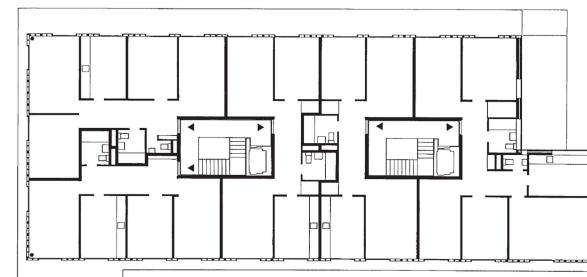
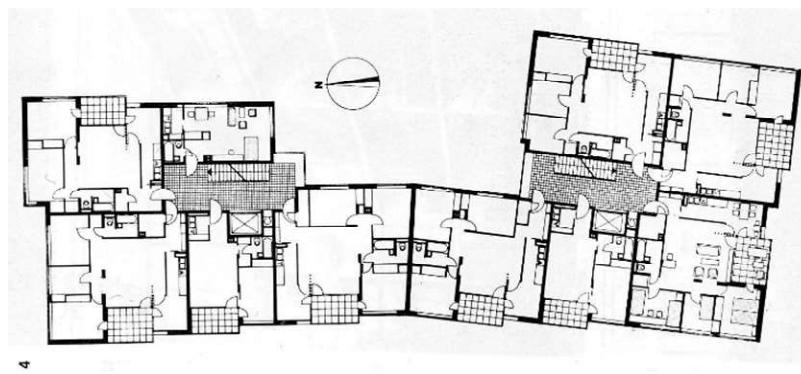
Basel, Switzerland



Berlin, Germany

Basel, Switzerland







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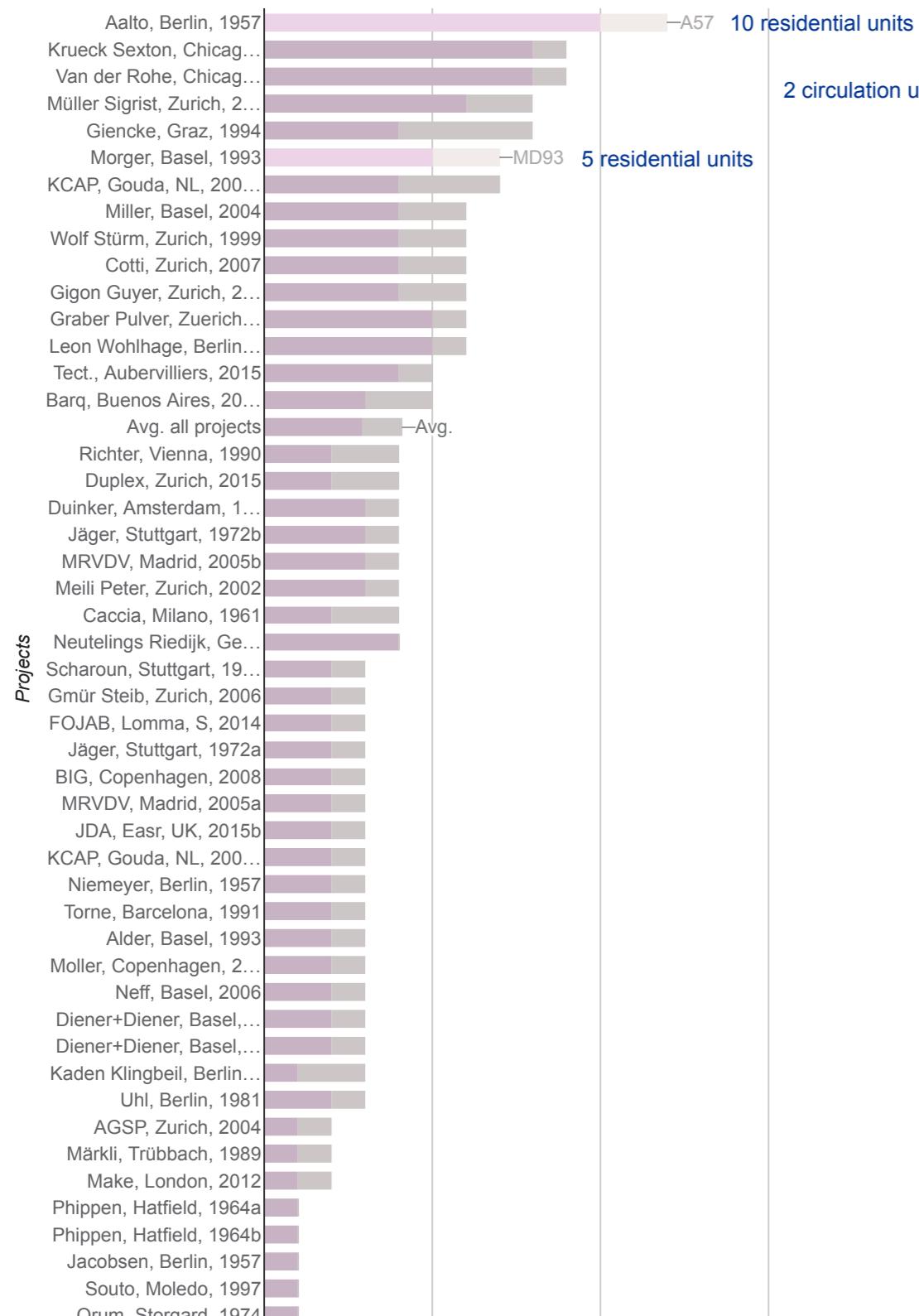
© Ruedi Walti



© Ruedi Walti



Number of units, by primary function
 Residential Circulation people



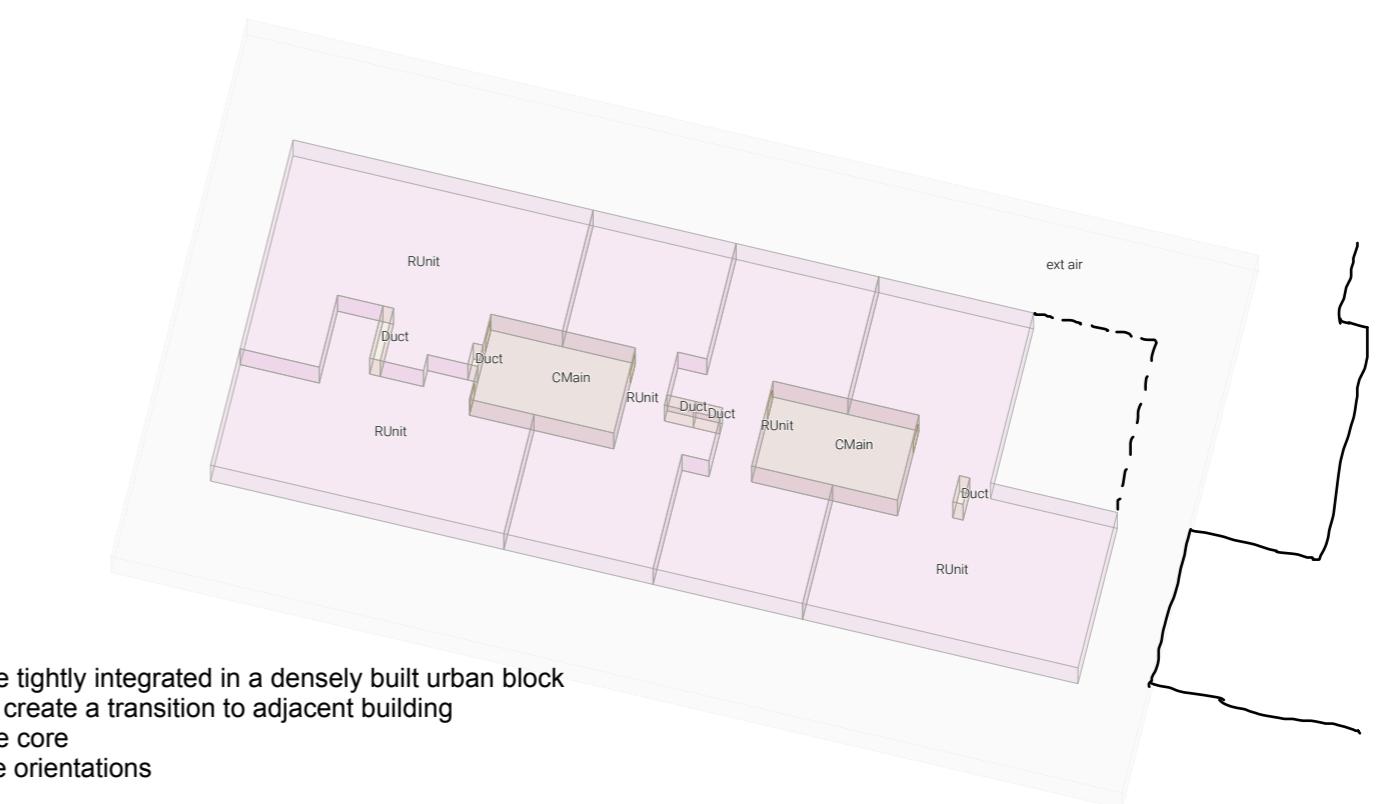
2 circulation units each

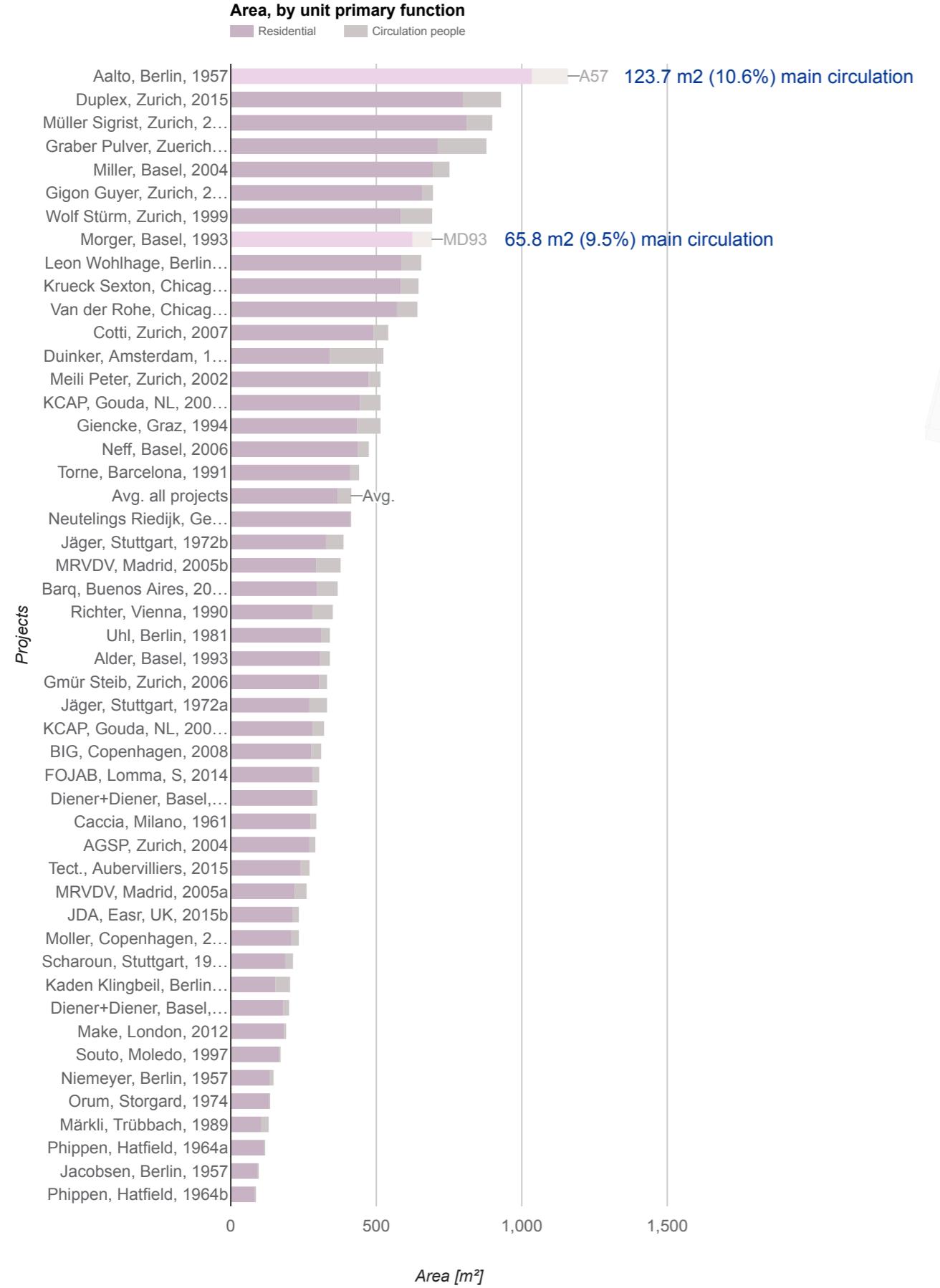
A57 10 residential units

MD93 5 residential units

Avg.

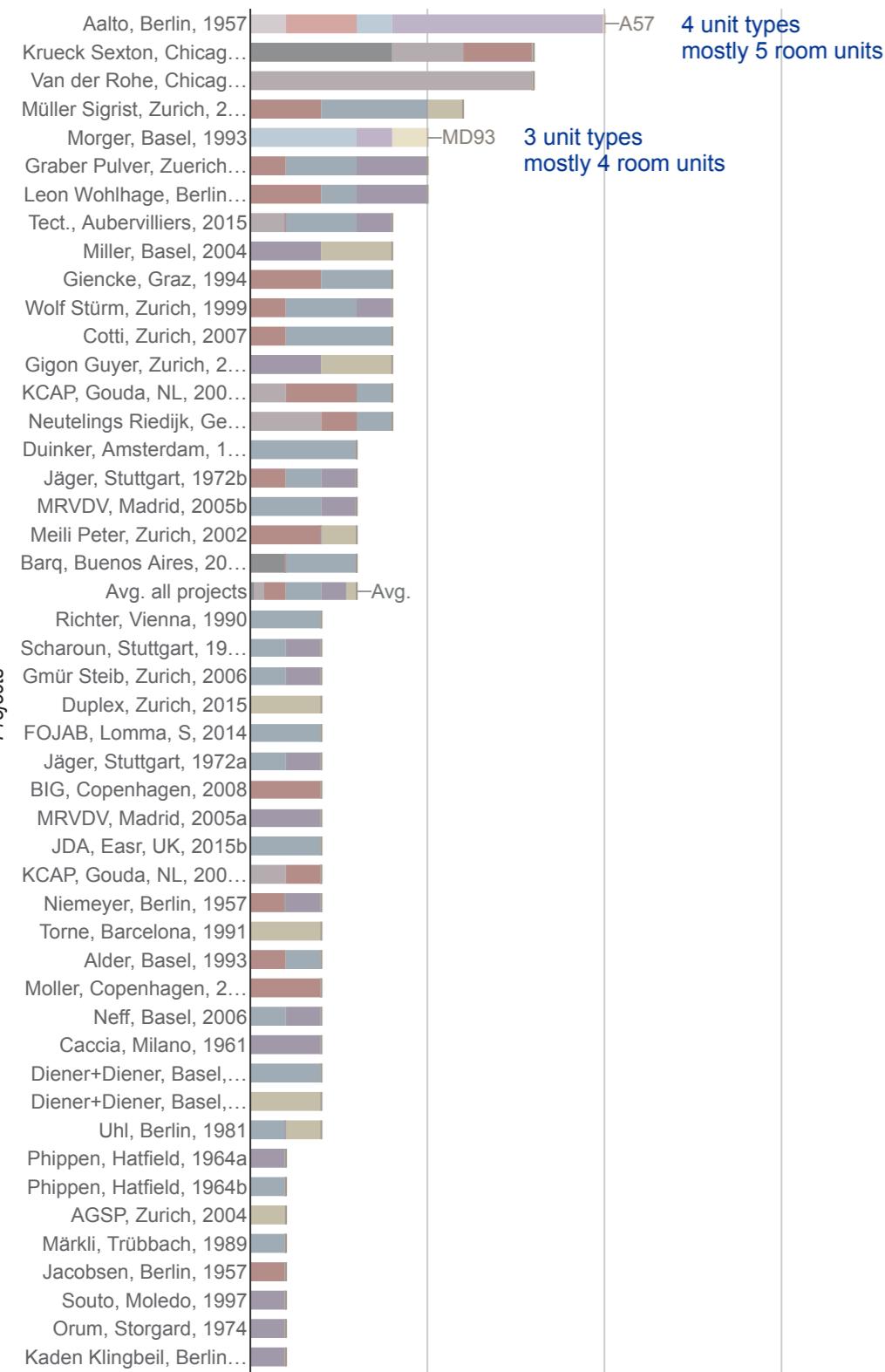
Projects

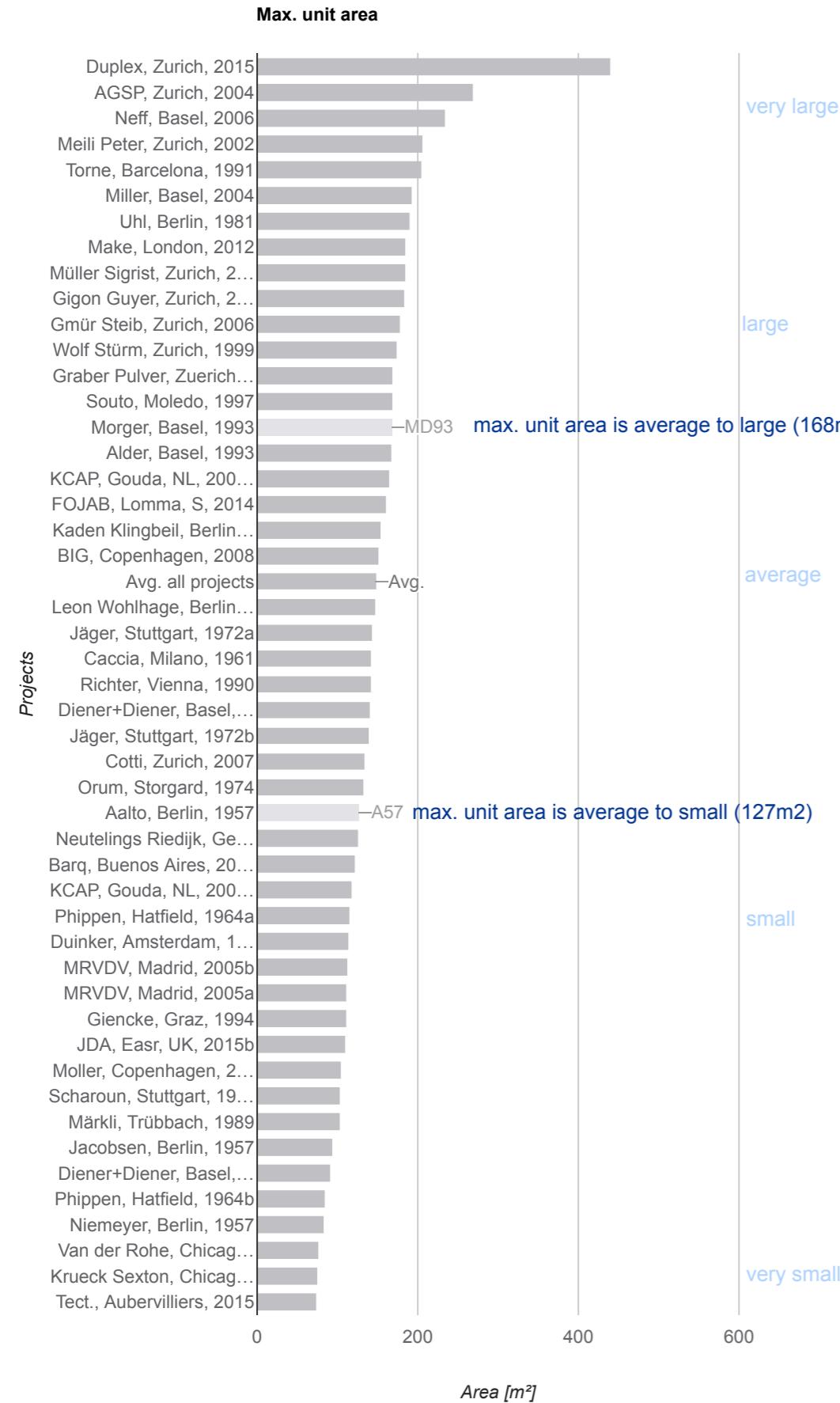




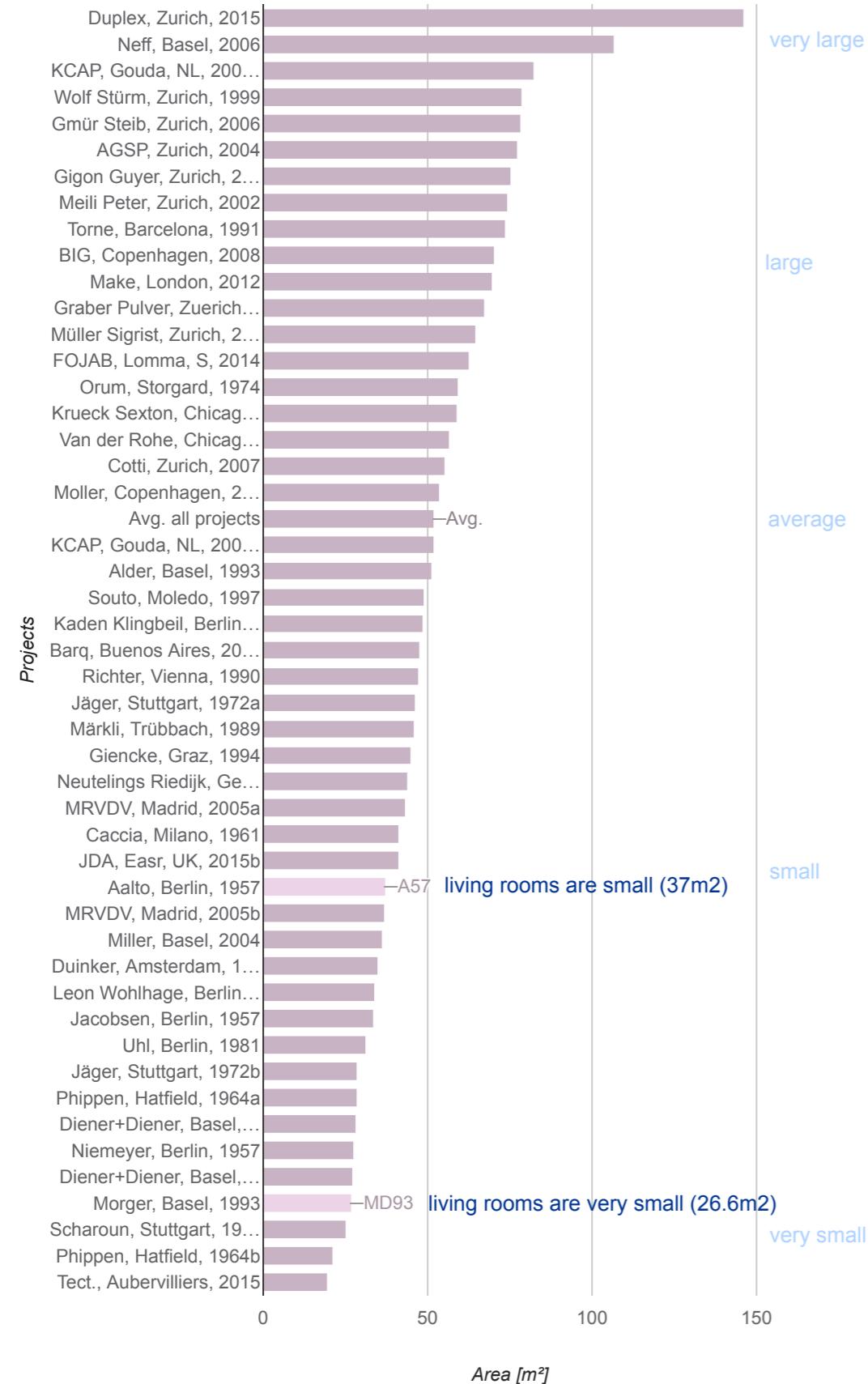
Residential: unit size, by number of spaces

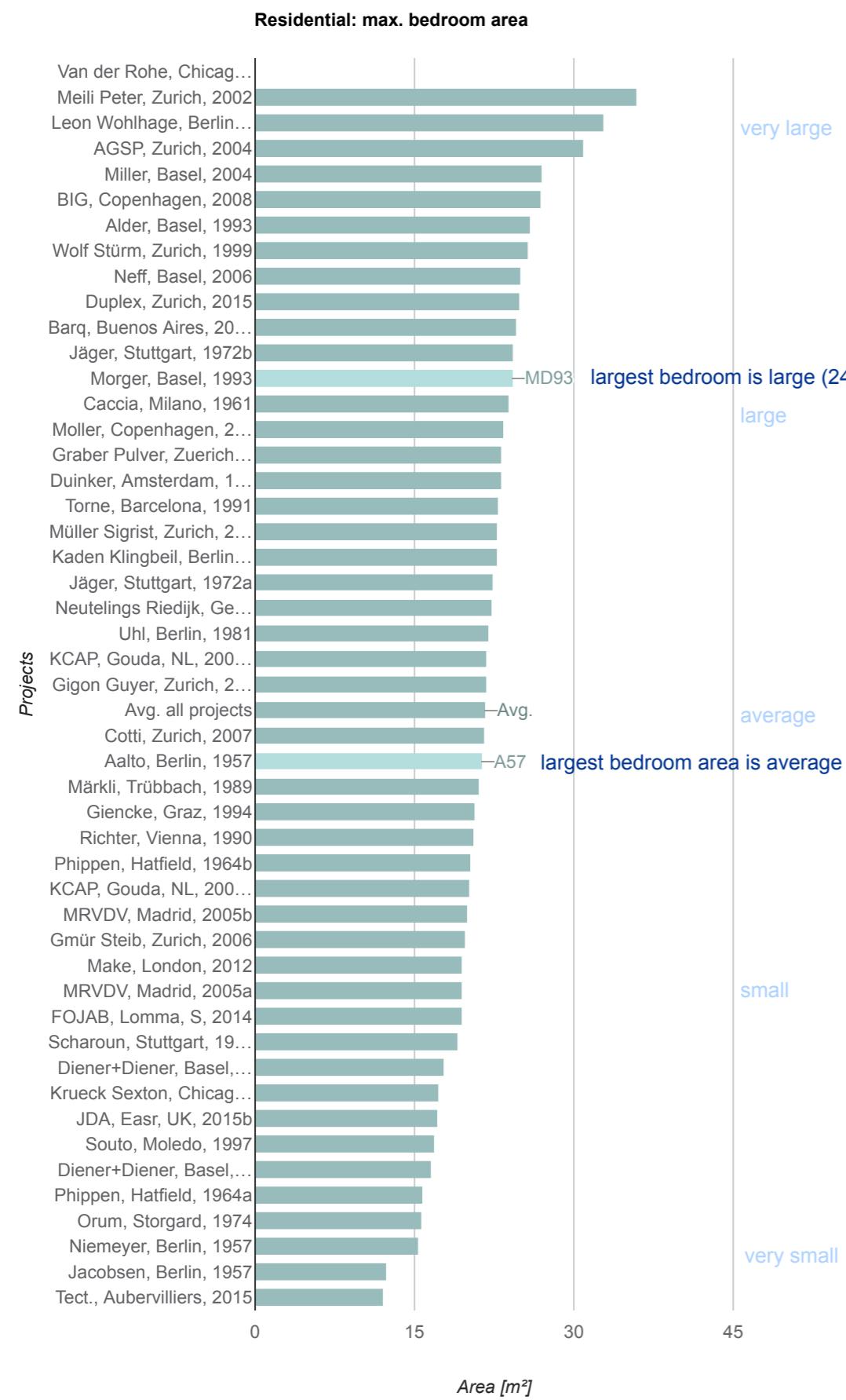
1 room 2 rooms 3 rooms 4 rooms
 5 rooms >5 rooms none

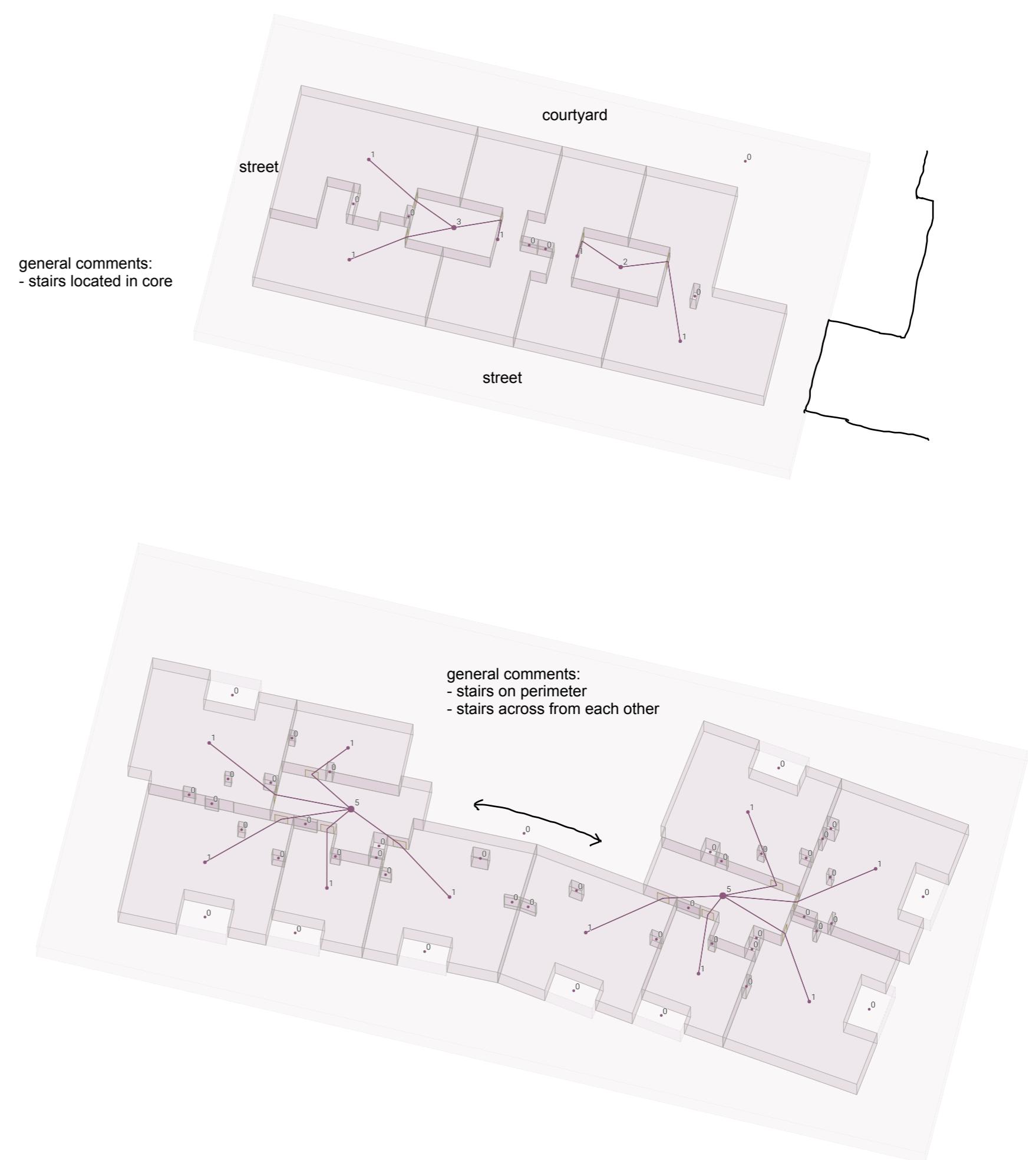
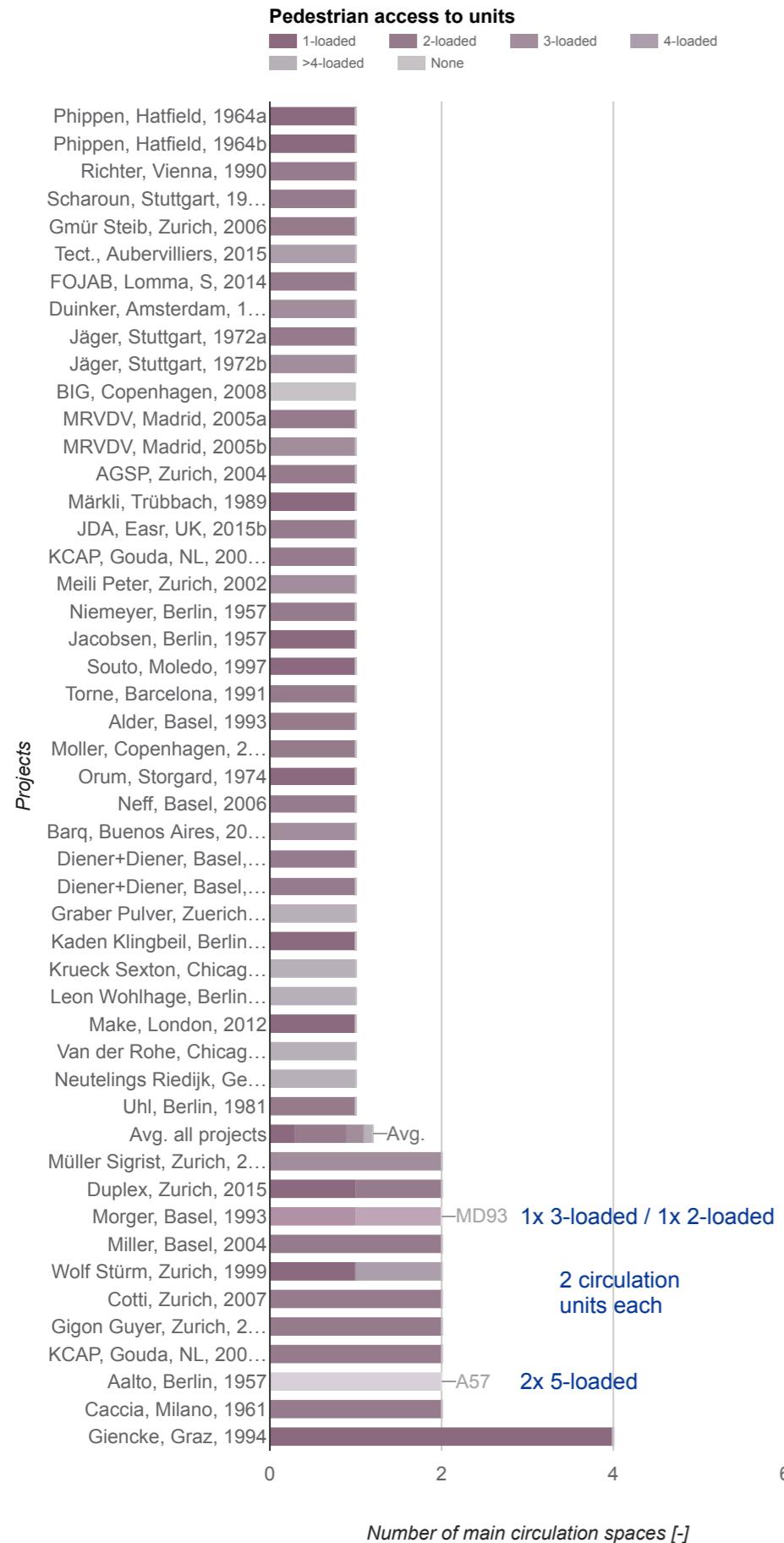




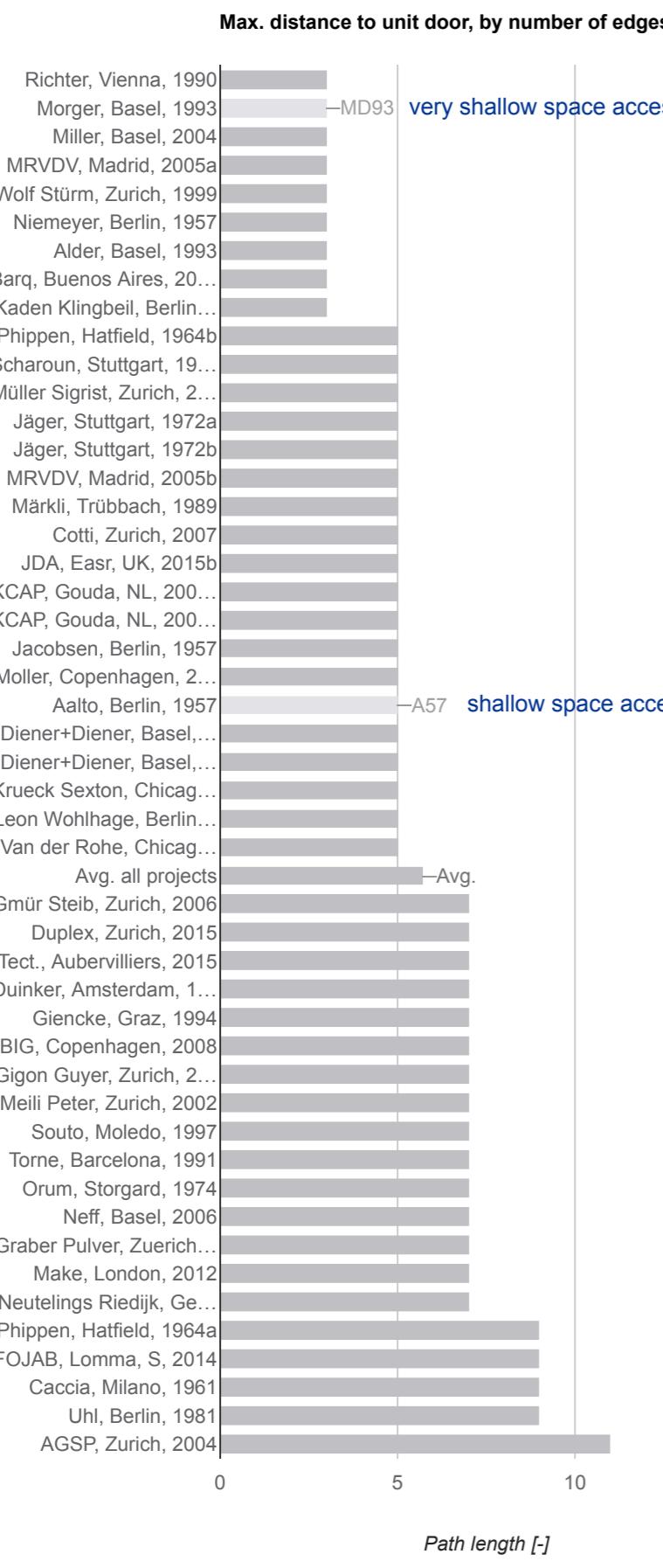
Residential: avg. living room area







Projects



Richter, Vienna, 1990
Morger, Basel, 1993
Miller, Basel, 2004
MRVDV, Madrid, 2005a
Wolf Stürm, Zurich, 1999
Niemeyer, Berlin, 1957
Alder, Basel, 1993
Barq, Buenos Aires, 20...
Kaden Klingbeil, Berlin...
Phippen, Hatfield, 1964b
Scharoun, Stuttgart, 19...
Müller Sigrist, Zurich, 2...
Jäger, Stuttgart, 1972a
Jäger, Stuttgart, 1972b
MRVDV, Madrid, 2005b
Märkli, Trübbach, 1989
Cotti, Zurich, 2007
JDA, Easr, UK, 2015b
KCAP, Gouda, NL, 200...
KCAP, Gouda, NL, 200...
Jacobsen, Berlin, 1957
Moller, Copenhagen, 2...
Aalto, Berlin, 1957
Diener+Diener, Basel,...
Diener+Diener, Basel,...
Krueck Sexton, Chicag...
Leon Wohlhage, Berlin...
Van der Rohe, Chicag...
Avg. all projects
Gmür Steib, Zurich, 2006
Duplex, Zurich, 2015
Tect., Aubervilliers, 2015
Duinker, Amsterdam, 1...
Giencke, Graz, 1994
BIG, Copenhagen, 2008
Gigon Guyer, Zurich, 2...
Meili Peter, Zurich, 2002
Souto, Moledo, 1997
Torne, Barcelona, 1991
Orum, Storgard, 1974
Neff, Basel, 2006
Graber Pulver, Zuerich...
Make, London, 2012
Neutelings Riedijk, Ge...
Phippen, Hatfield, 1964a
FOJAB, Lomma, S, 2014
Caccia, Milano, 1961
Uhl, Berlin, 1981
AGSP, Zurich, 2004

MD93 **very shallow space access network (3 edges or 2 spaces)**

very shallow

- cycles:
none

- balanced space access network
max. depth=3

- paths from entrance:

e-h-k

e-h-l

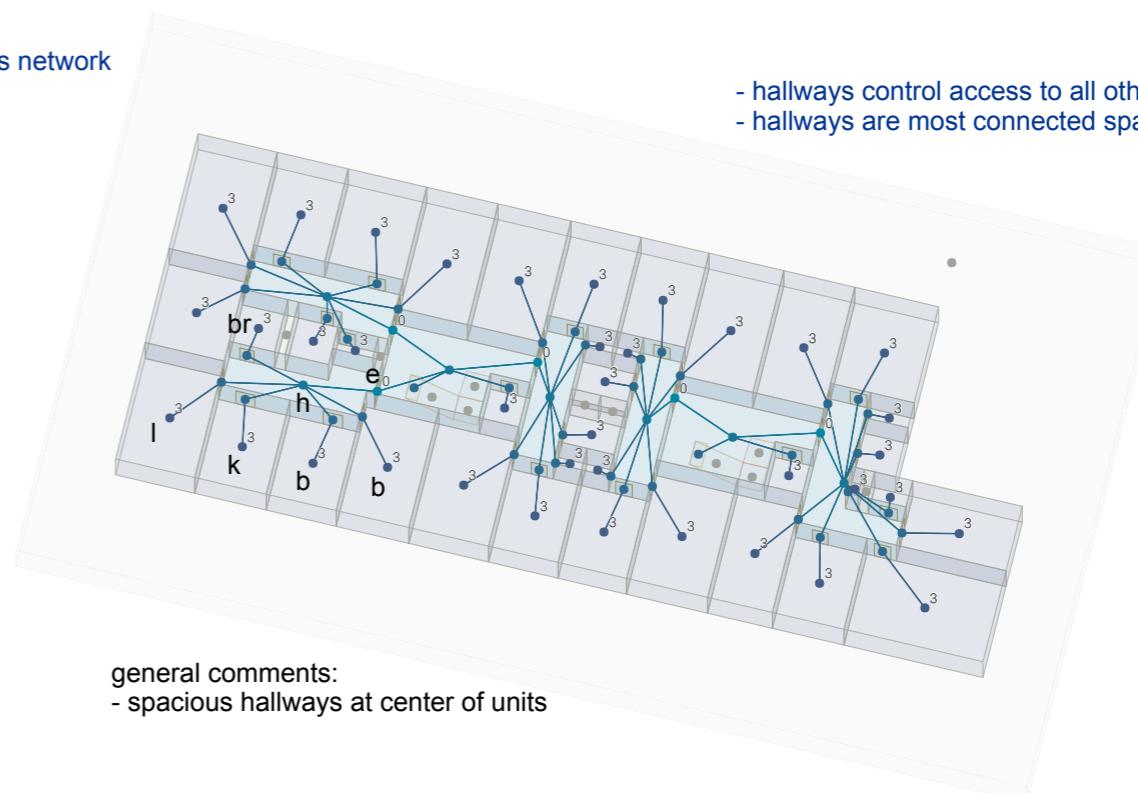
e-h-b

- functional paths:

d in large k

b-h-br

- hallways control access to all other spaces
- hallways are most connected spaces (max. degree=8)



A57 **shallow space access network (5 edges or 3 spaces)**

shallow

general comments:

- spacious living rooms at center of units
- narrow hallways (folding doors to separate or open hallways to living room)

- living rooms control access to all other spaces

- living rooms and hallways are most connected spaces (max. degree=6)
- bedrooms and bathrooms have max. depth=5

average

no cycles

no cycles

deep

- cycles:

I-k-l

I-h-l

- paths from entrance:

e-l-k

e-l

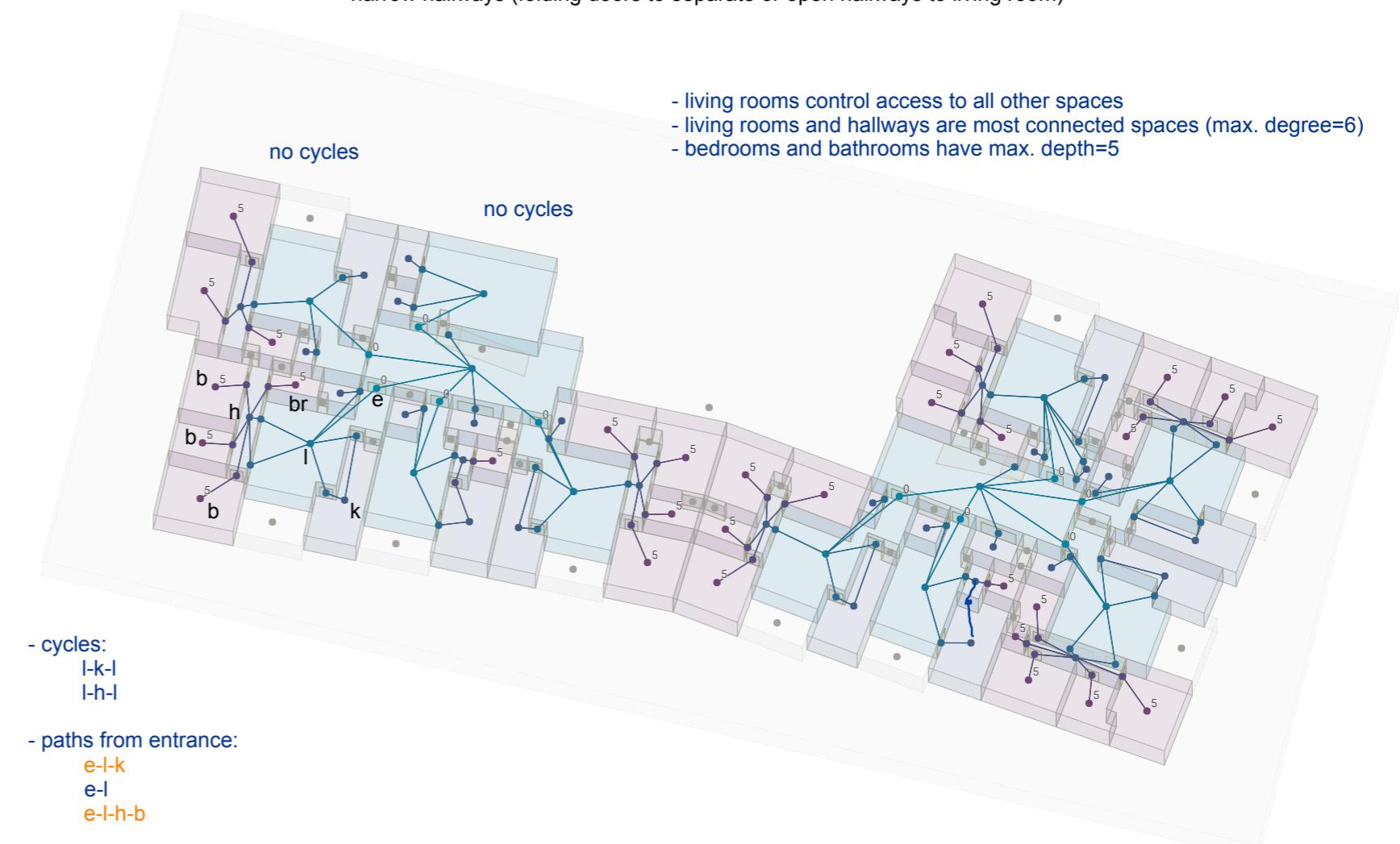
e-l-h-b

very deep

- functional paths:

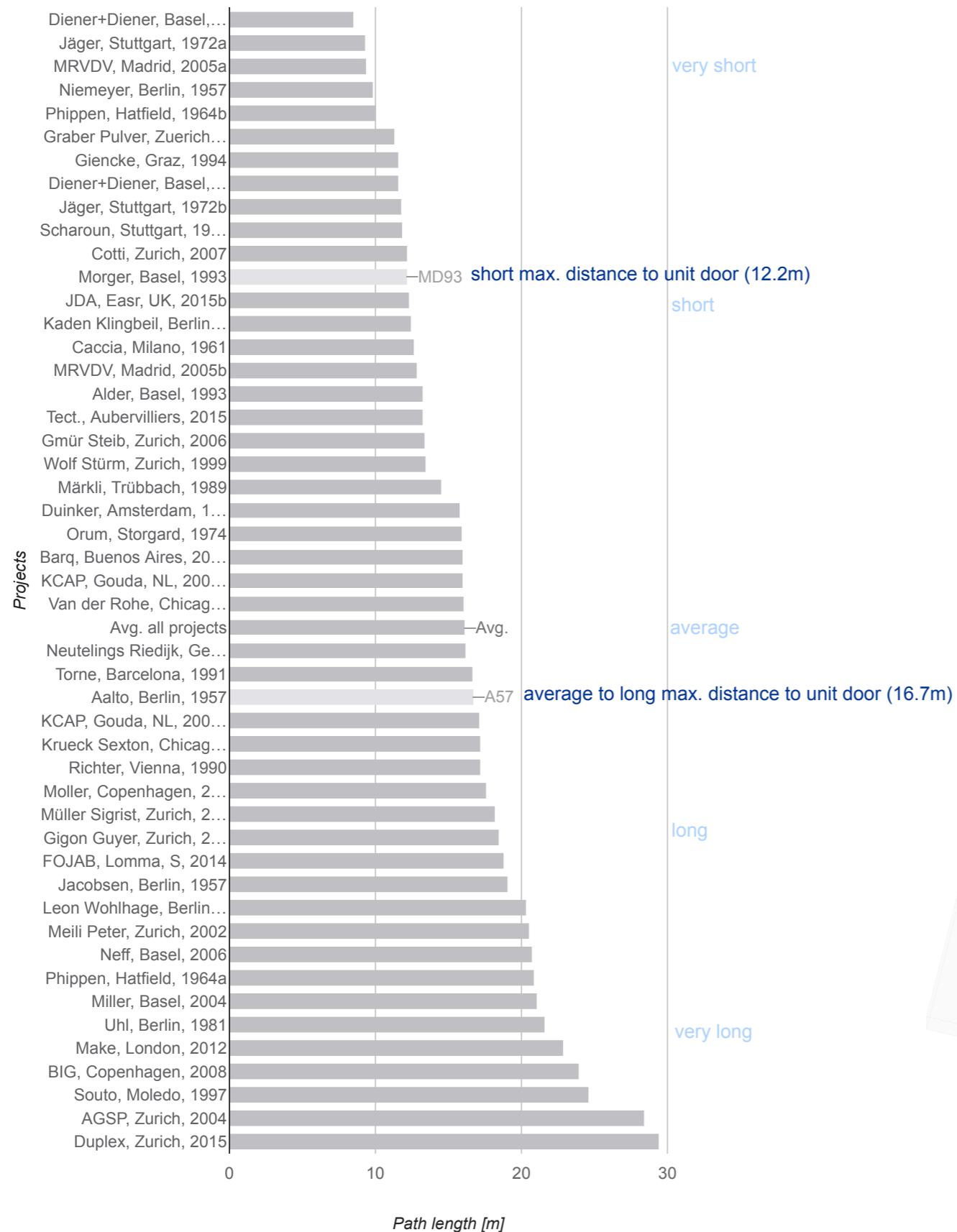
d in large k (access to I or loggia)

b-h-br

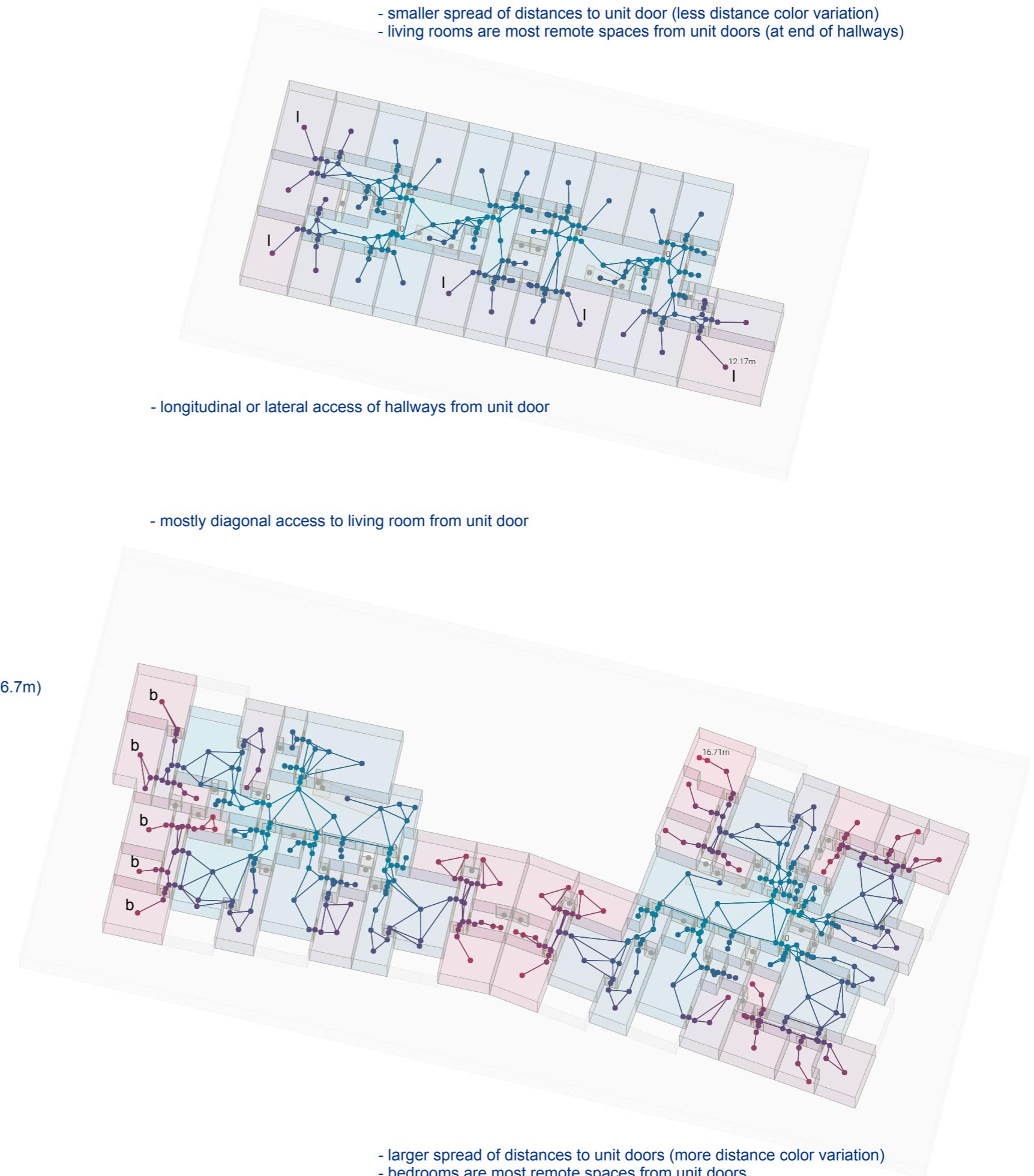


- smaller spread of distances to unit door (less distance color variation)
- living rooms are most remote spaces from unit doors (at end of hallways)

Max. distance to unit door, by edge lengths



- larger spread of distances to unit doors (more distance color variation)
- bedrooms are most remote spaces from unit doors



What is a functional zone?

Connected spaces with similar functional properties in the architectural view are merged

General properties

Functional zoning typically facilitates

- Activity separation,
- Sound control,
- Internal/external accessibility,
- Provision of technical services (thermal, electrical, water)
- ...

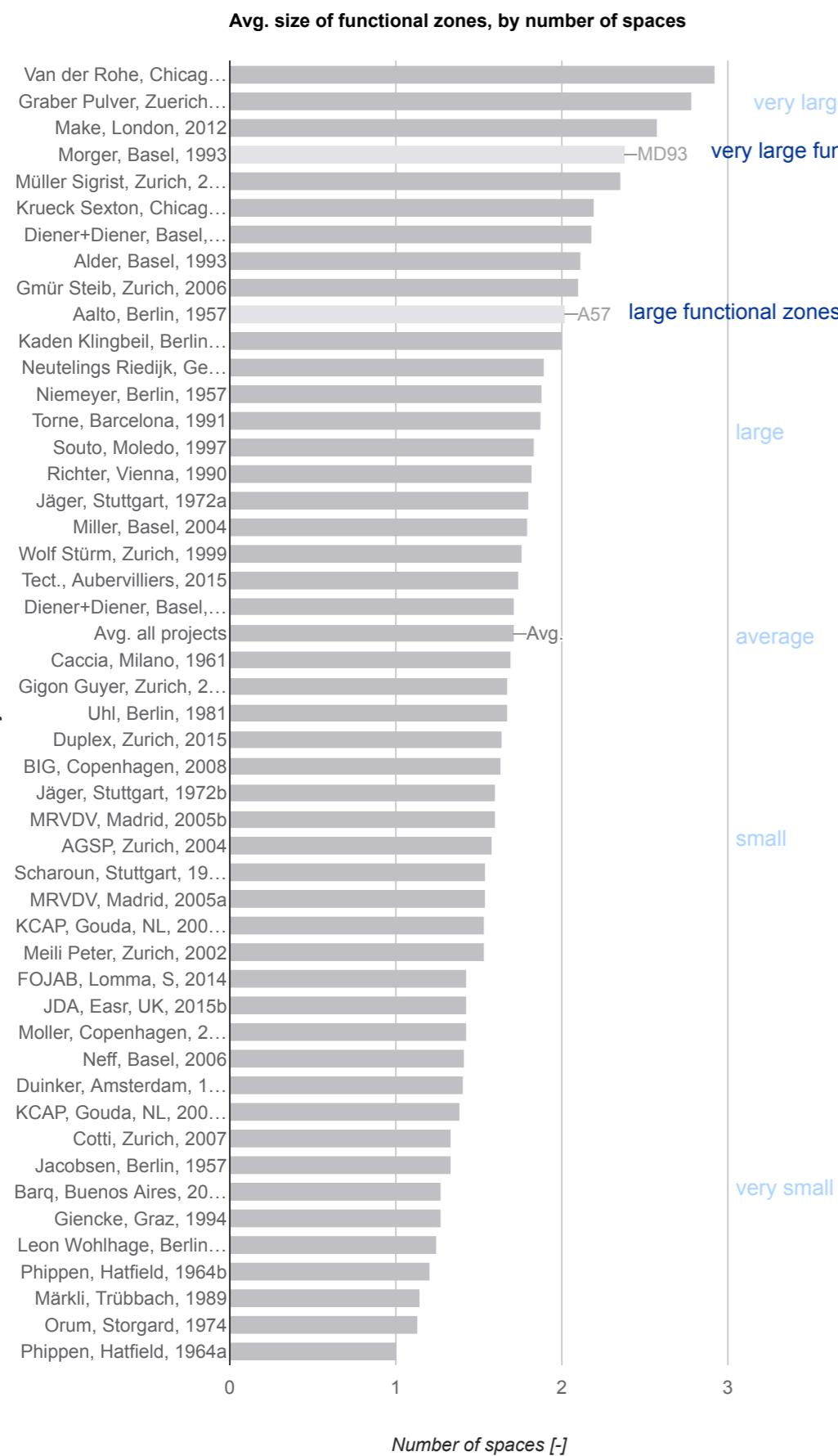
Properties in residential buildings

Minimize interferences between joint and individual activities

- Separate shared (living room, dining room, kitchen) from individual rooms (bedrooms, bathrooms)
- Often in combination with hallways serving as buffer zones and providing separate access to shared and individual rooms

Avoid functional zoning to ensure privacy (e.g. separate individual rooms in large shared apartments)

Projects



very large
very large functional zones (2.4 spaces)

large functional zones (2 spaces)

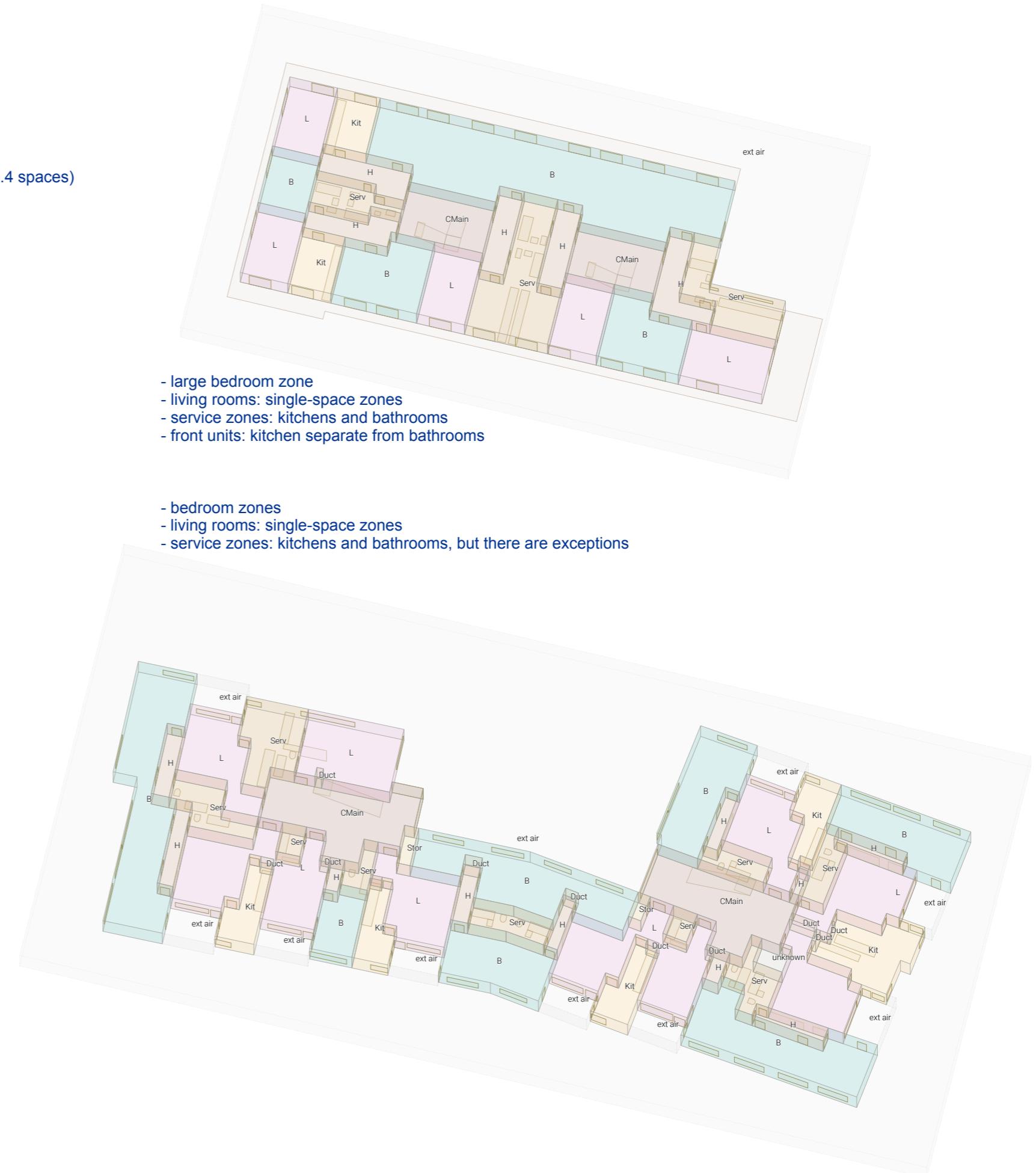
large

average

small

very small

Number of spaces [-]



What are orientation zones?

Connected spaces in the architectural view with openings oriented to the same external spaces are merged

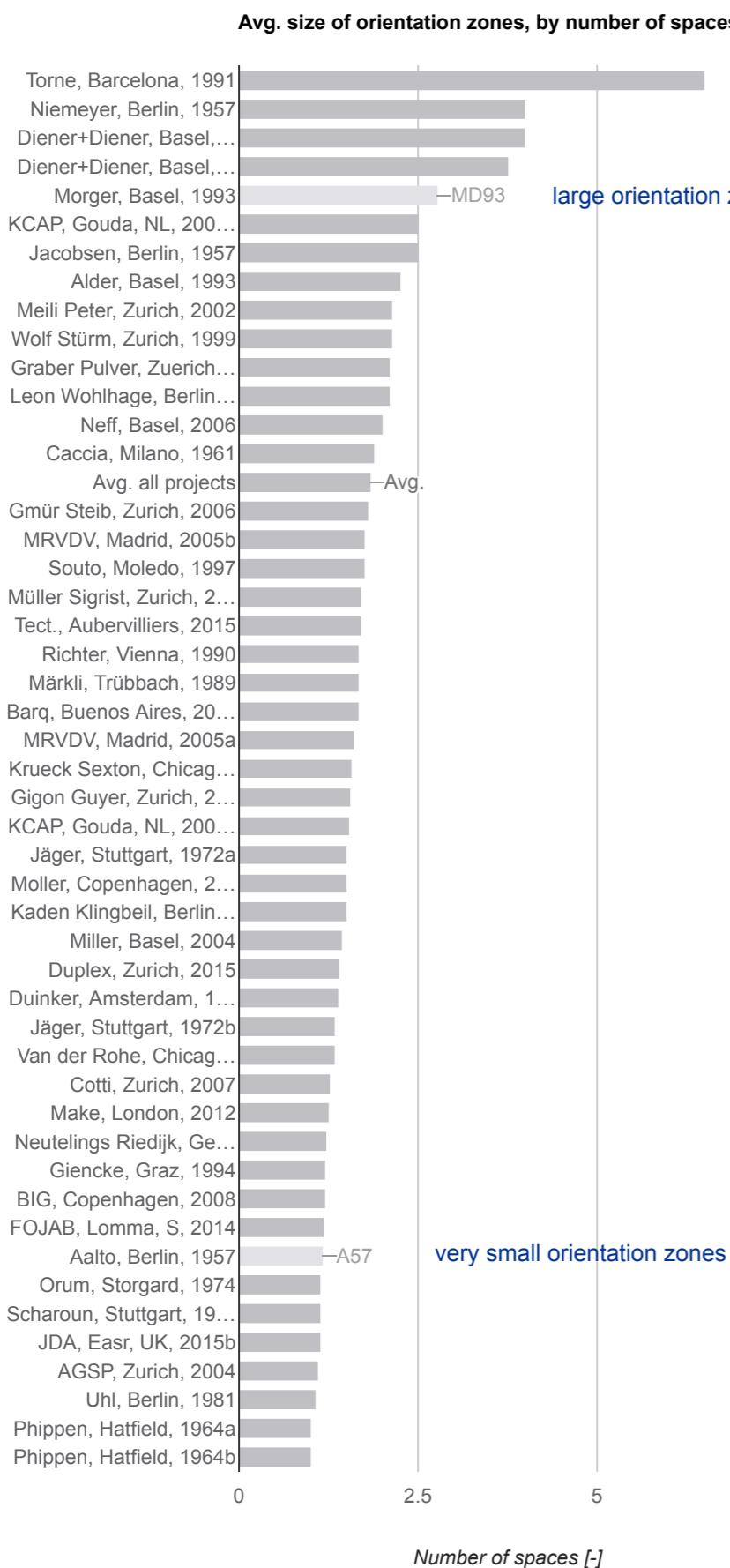
General properties

- Large orientation zones typical for buildings with few main orientations (unilateral, bilateral) planar enclosures
- Small orientation zones typical for buildings with multiple orientations (multi-lateral) protrusions or recesses

Properties in residential buildings

- Large orientation zones typical for row houses
- Small orientation zones typical for detached and semi-detached houses loggias, bay windows attached main circulation

Projects



very large

large orientation zones (2.8 spaces)

large

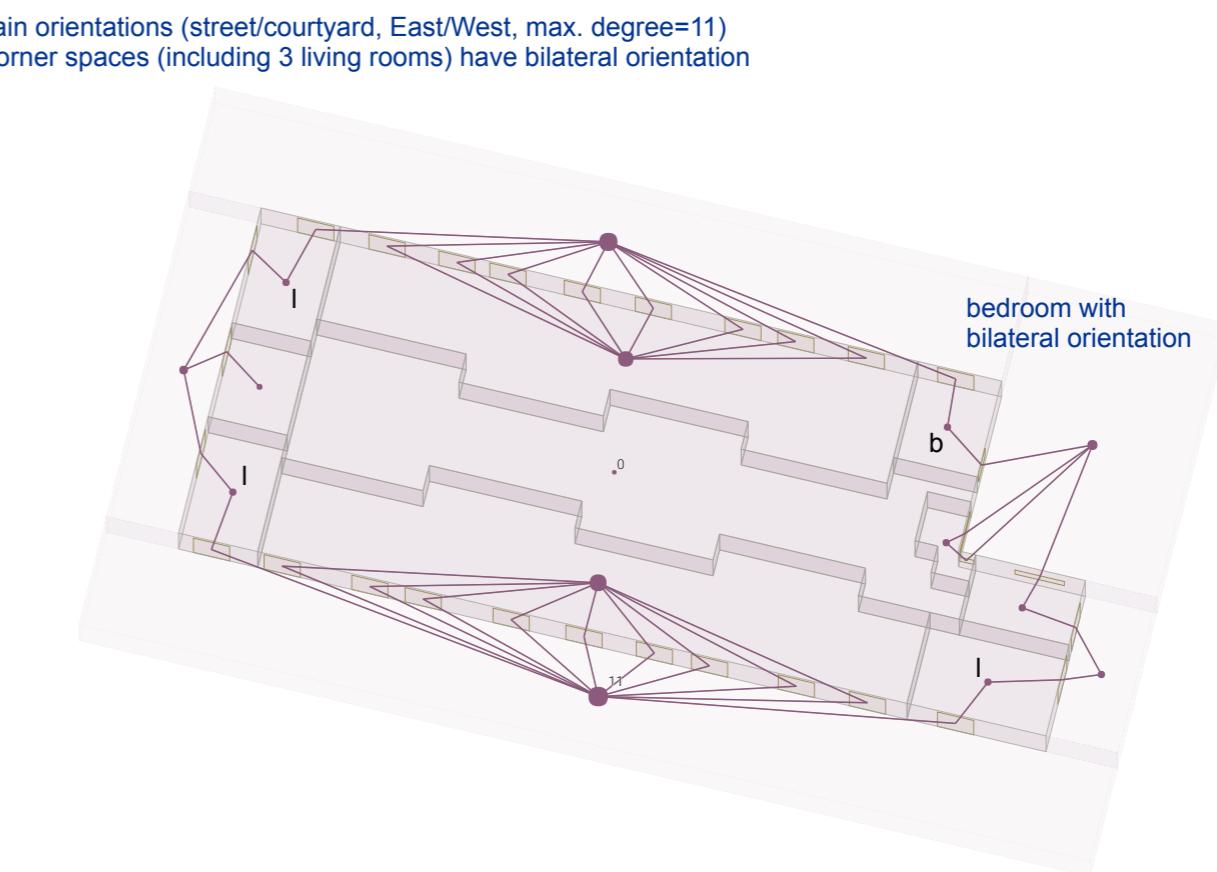
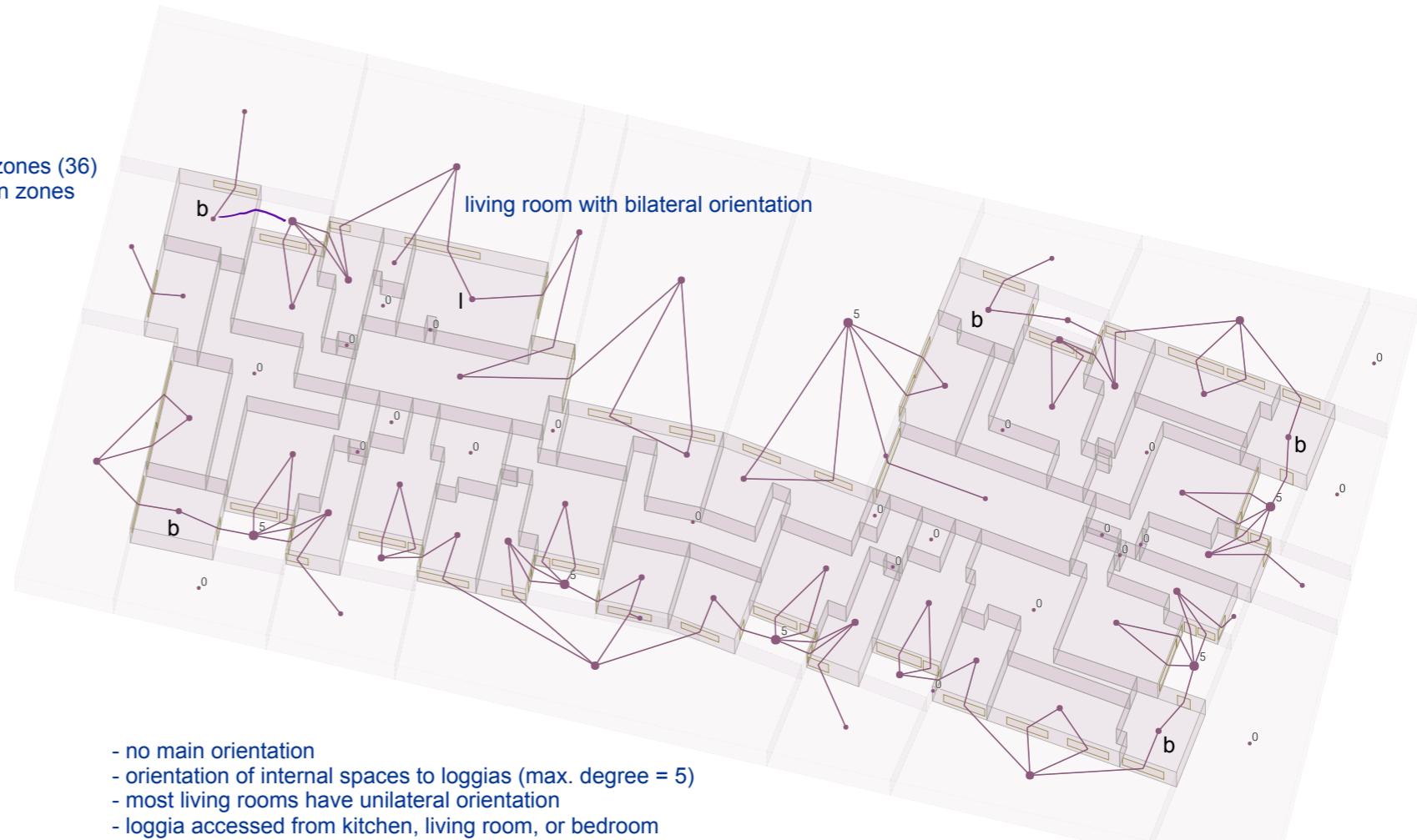
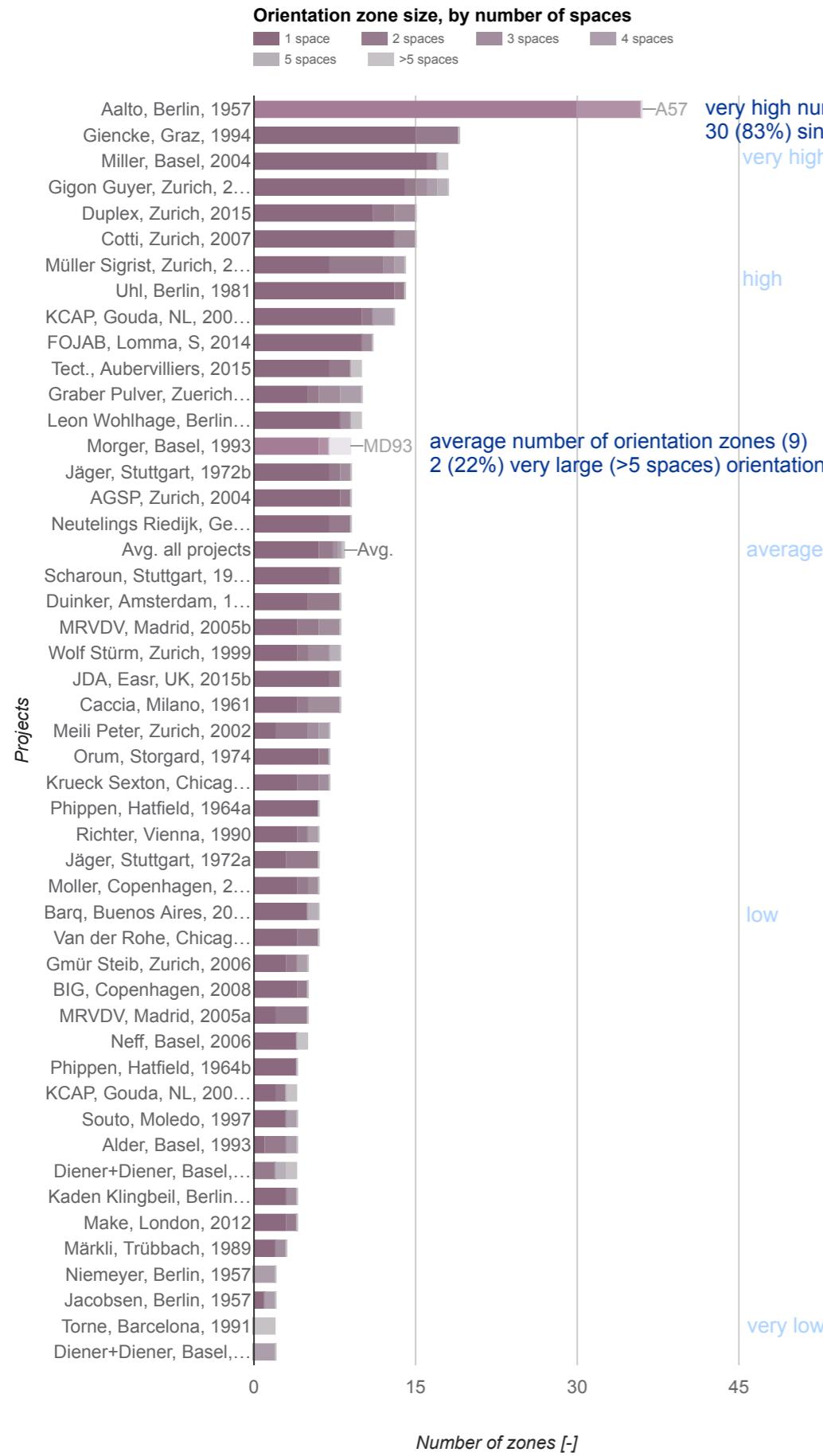
average

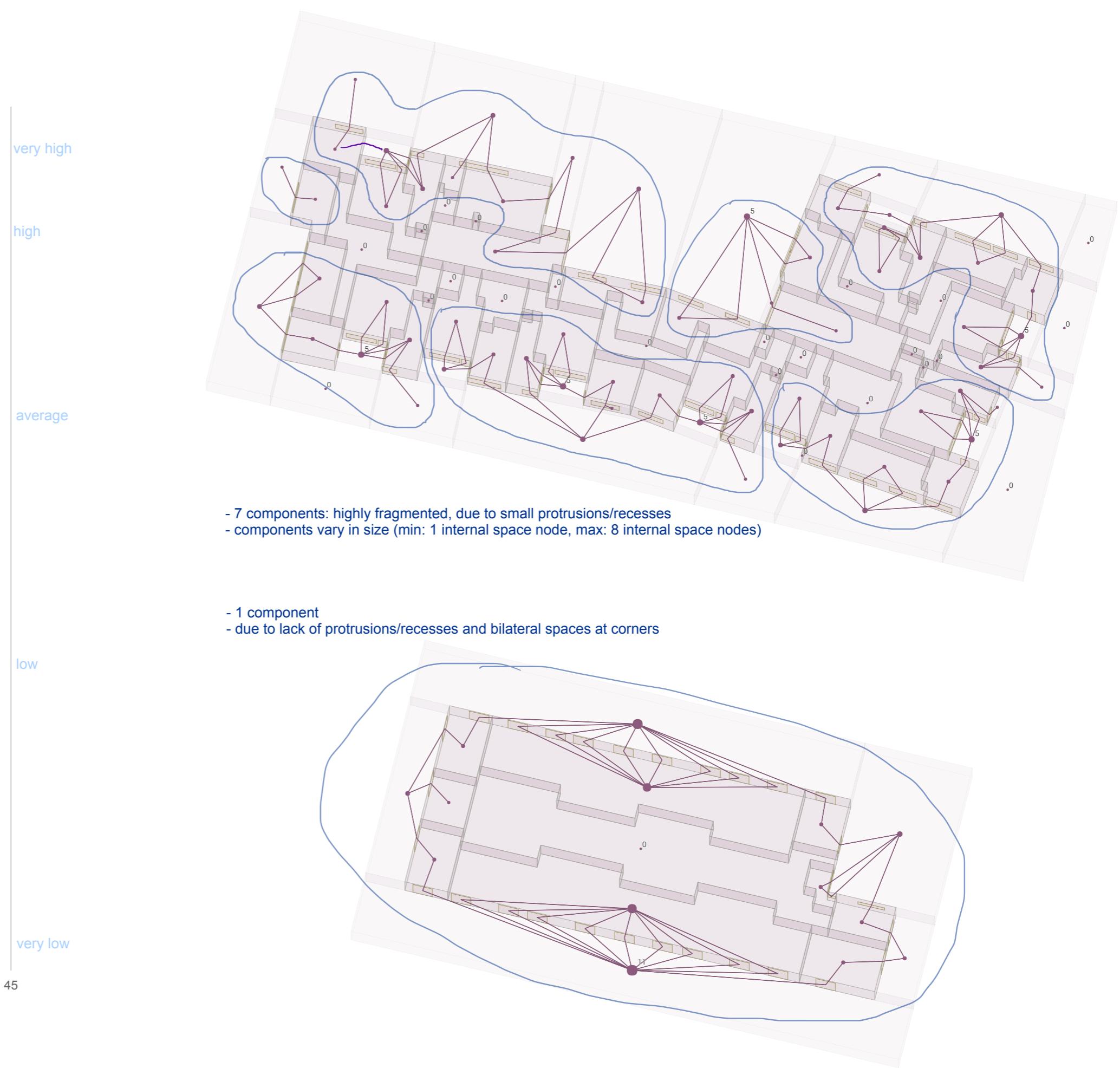
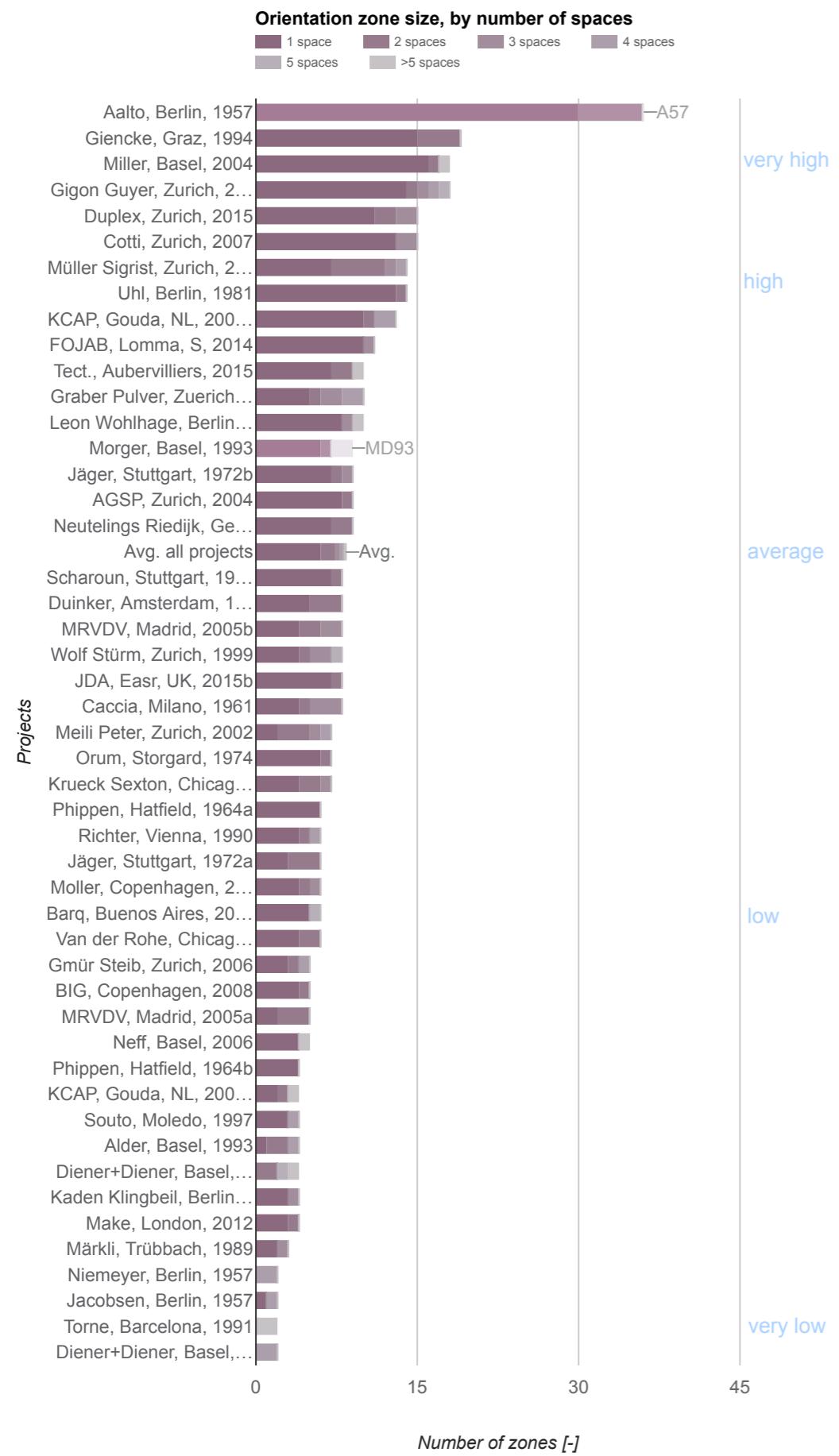
small

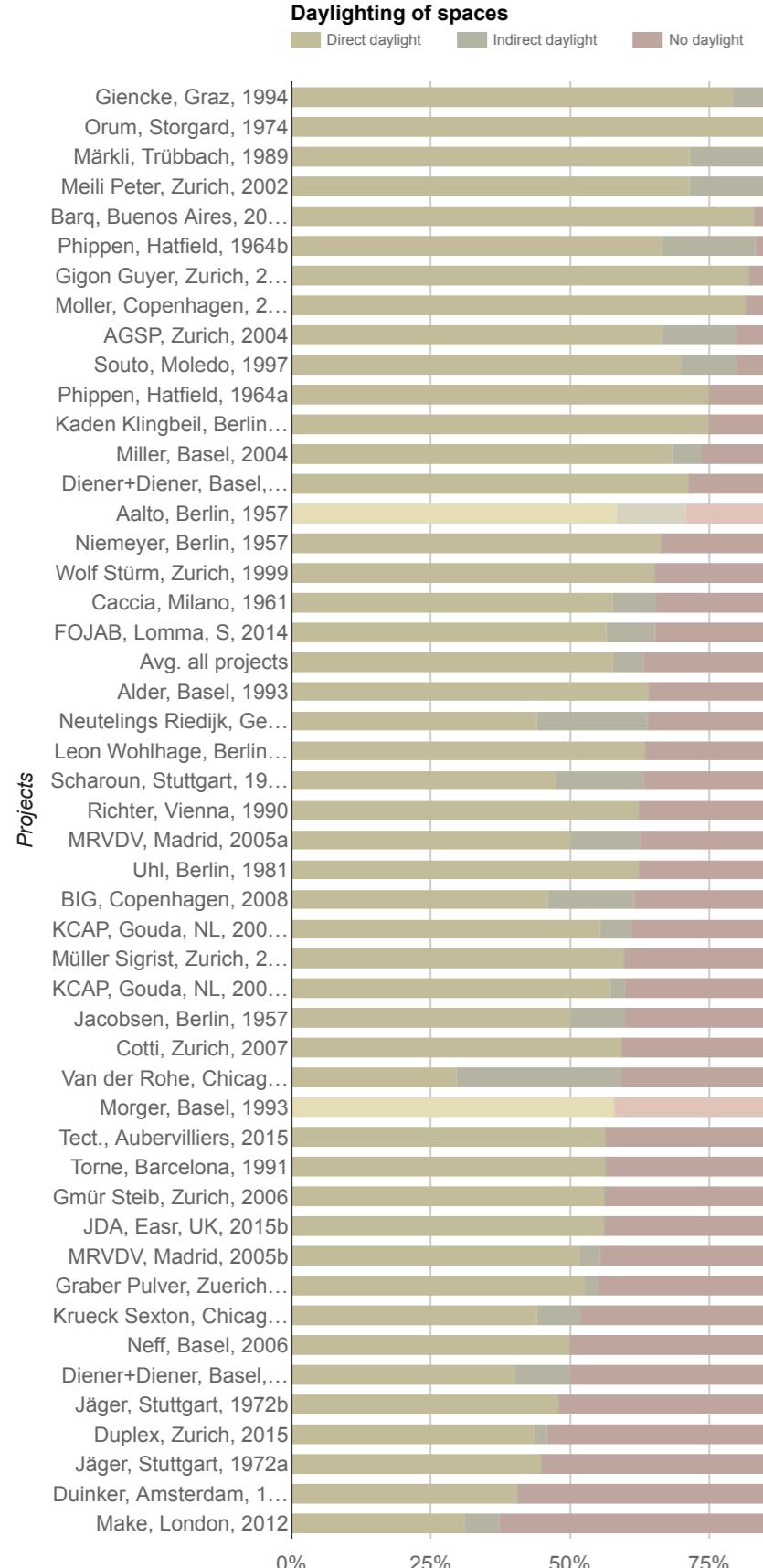
general comment:
- bedrooms facing north

very small

ext air







Direct, indirect, no daylight [%]

very high

high

A57
average to high
access to daylight

Avg.

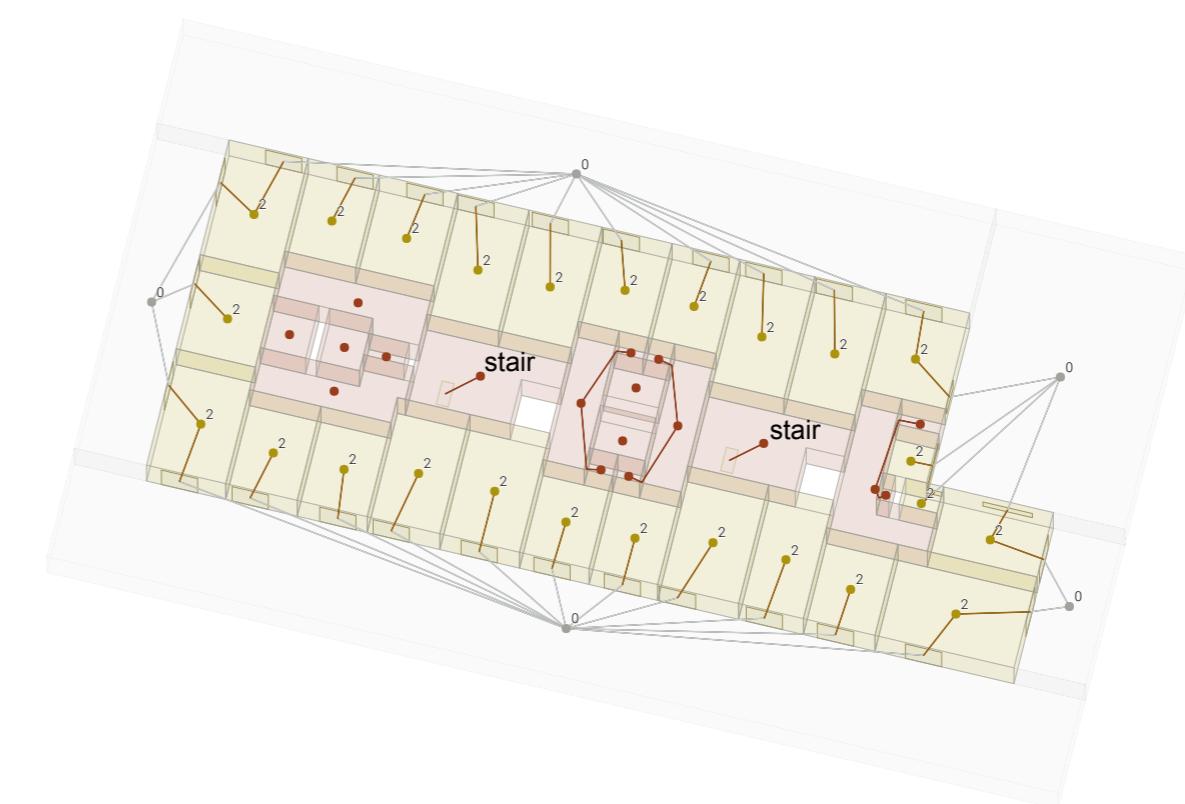
low

MD93
low access to daylight
(but stair cases have sky
lights, which is not
considered here)

very low

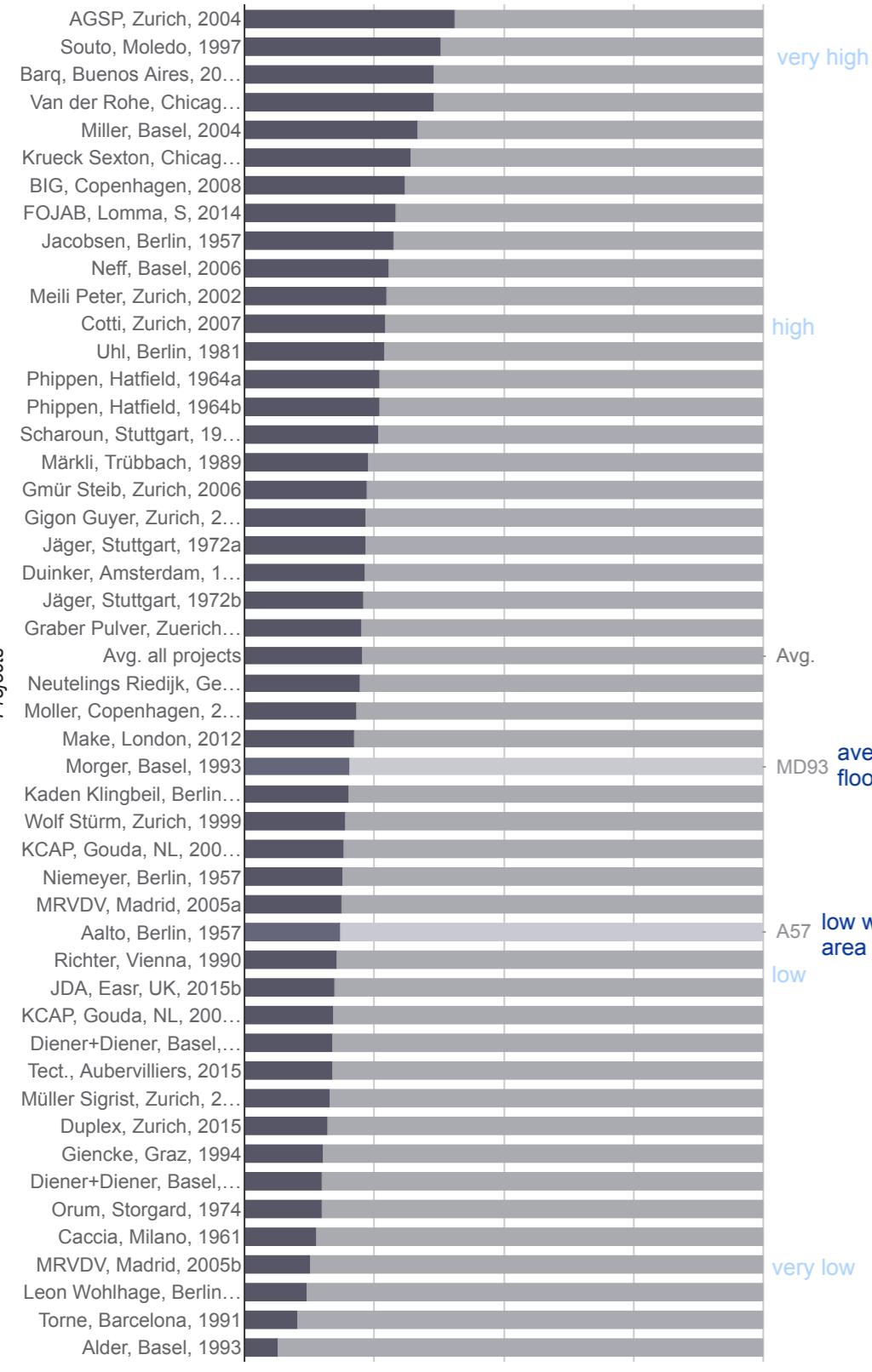


- hallways have no daylight



Window and space with direct daylight areas

Window Space with direct daylight



very high

high

Avg.

average to low window to floor area ratio (20%)

A57 low window to floor area ratio (18%)

low

very low



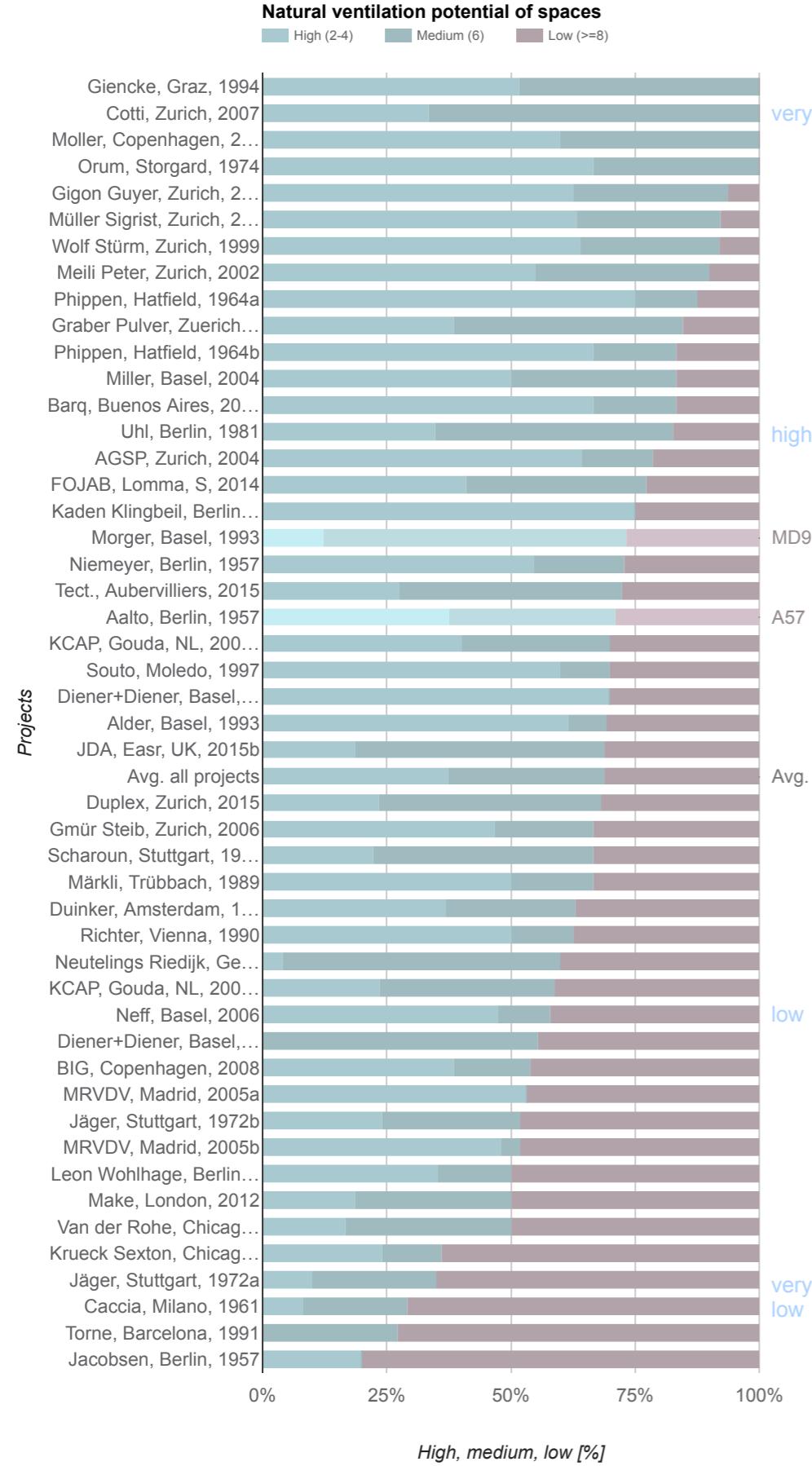
general comments:

- continuous balcony wrapping around units
- protruding balcony at street intersection
- balcony filling gap to adjacent building
- french windows to balconies

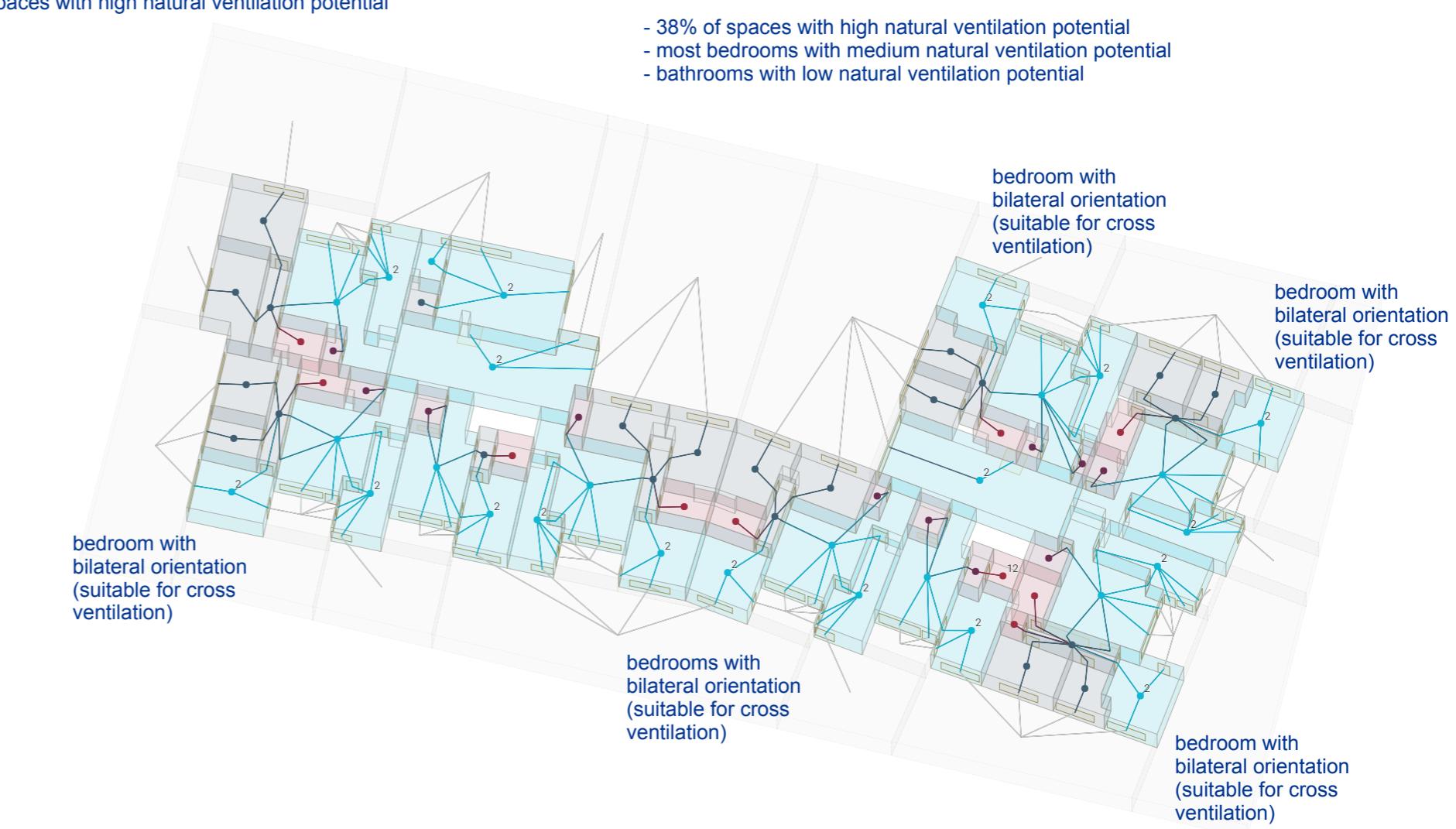
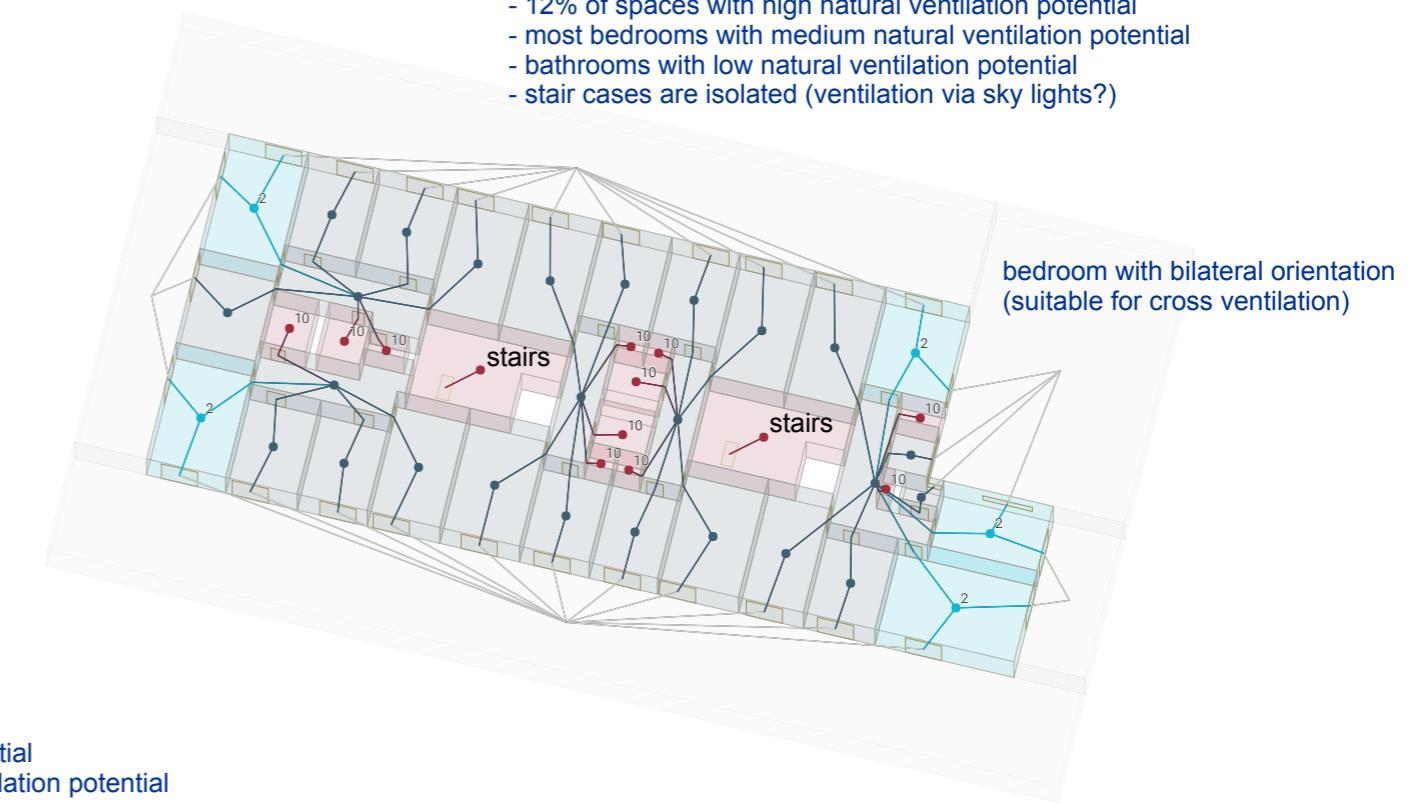


general comments:

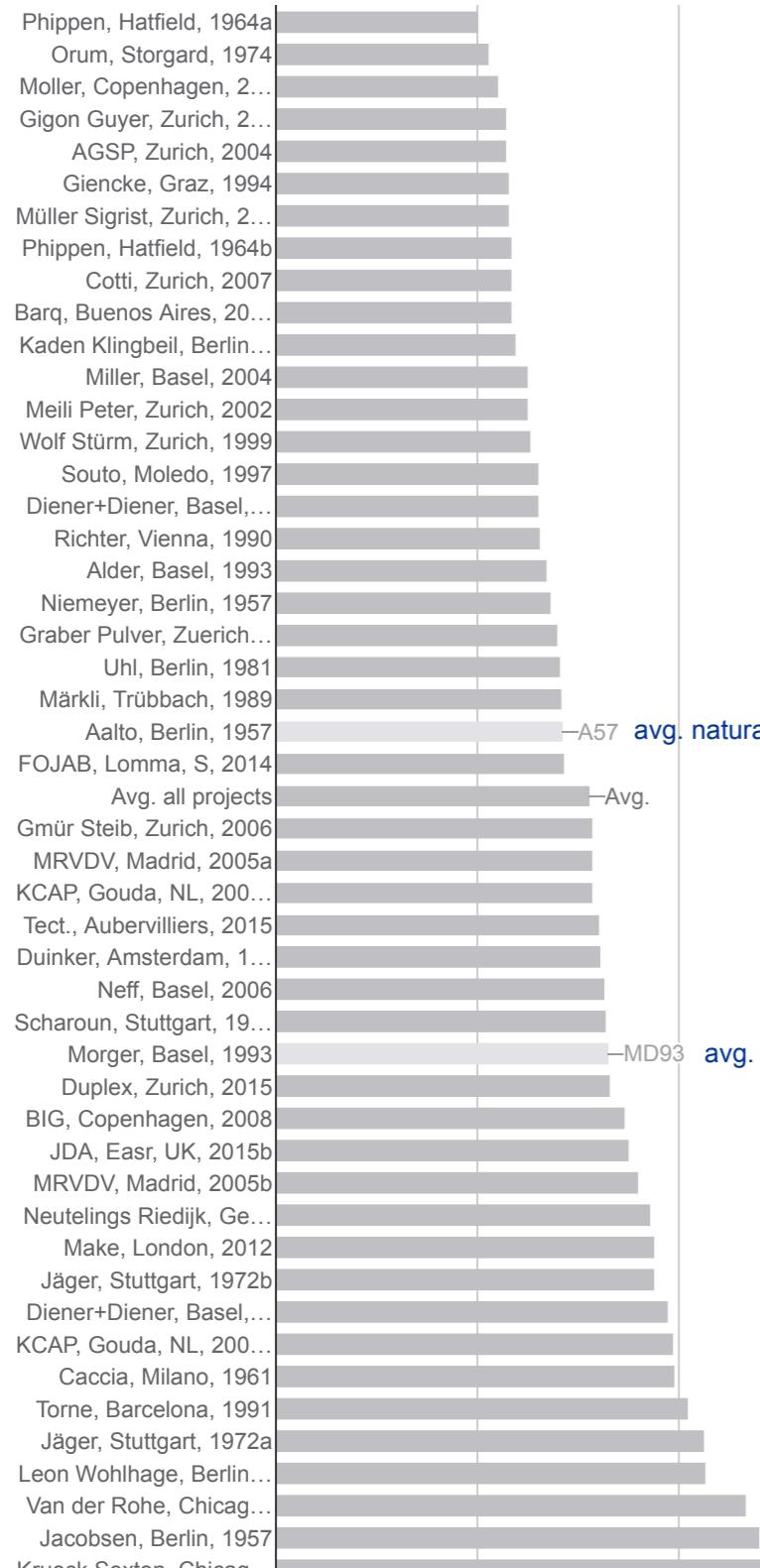
- each unit (except smallest) has a spacious loggia
- loggia and living room separated by large windows and glazed doors
- loggia and living room form the core of the unit



- 12% of spaces with high natural ventilation potential
- most bedrooms with medium natural ventilation potential
- bathrooms with low natural ventilation potential
- stair cases are isolated (ventilation via sky lights?)



Avg. natural ventilation path length, by number of edges



very short

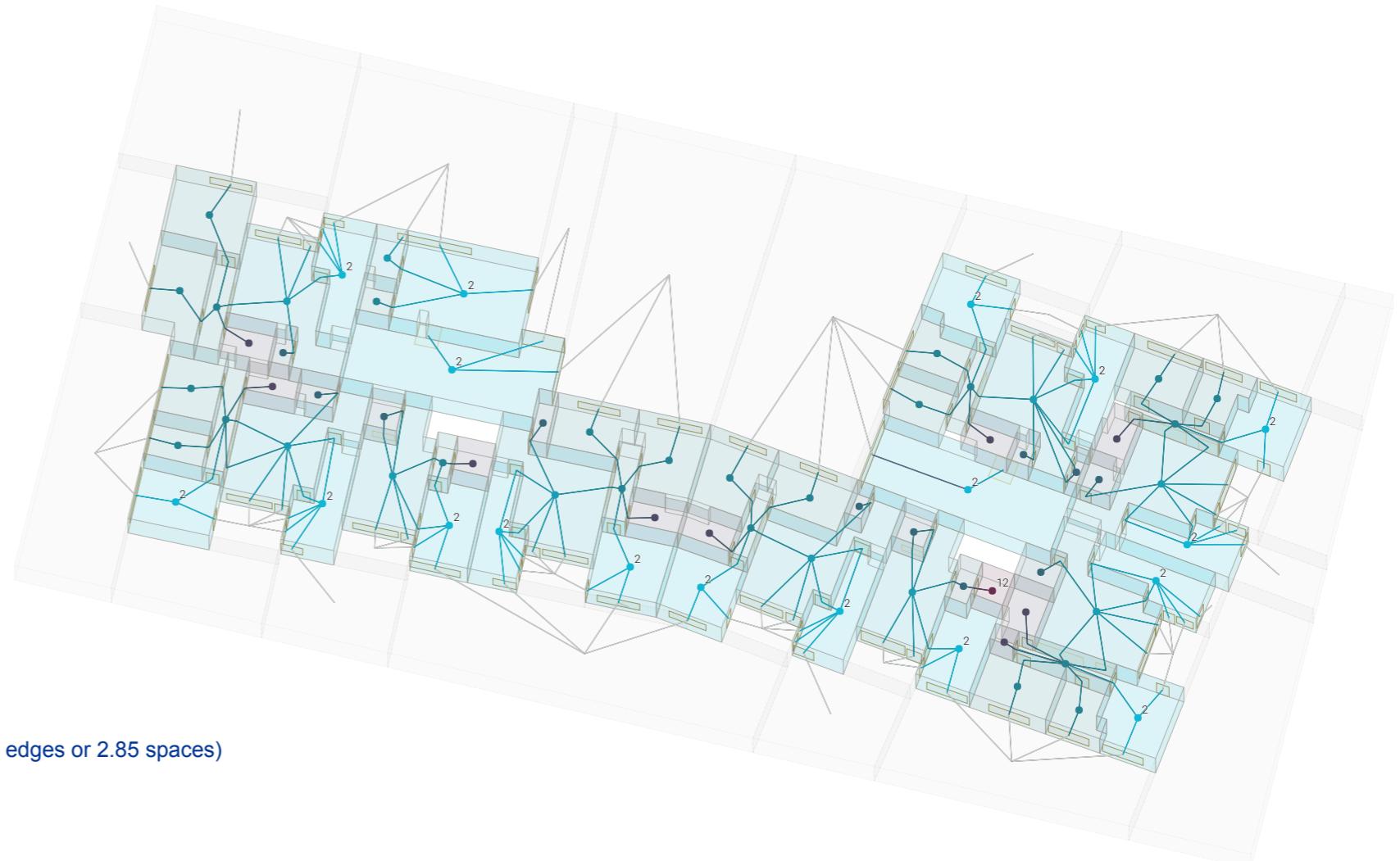
short

average

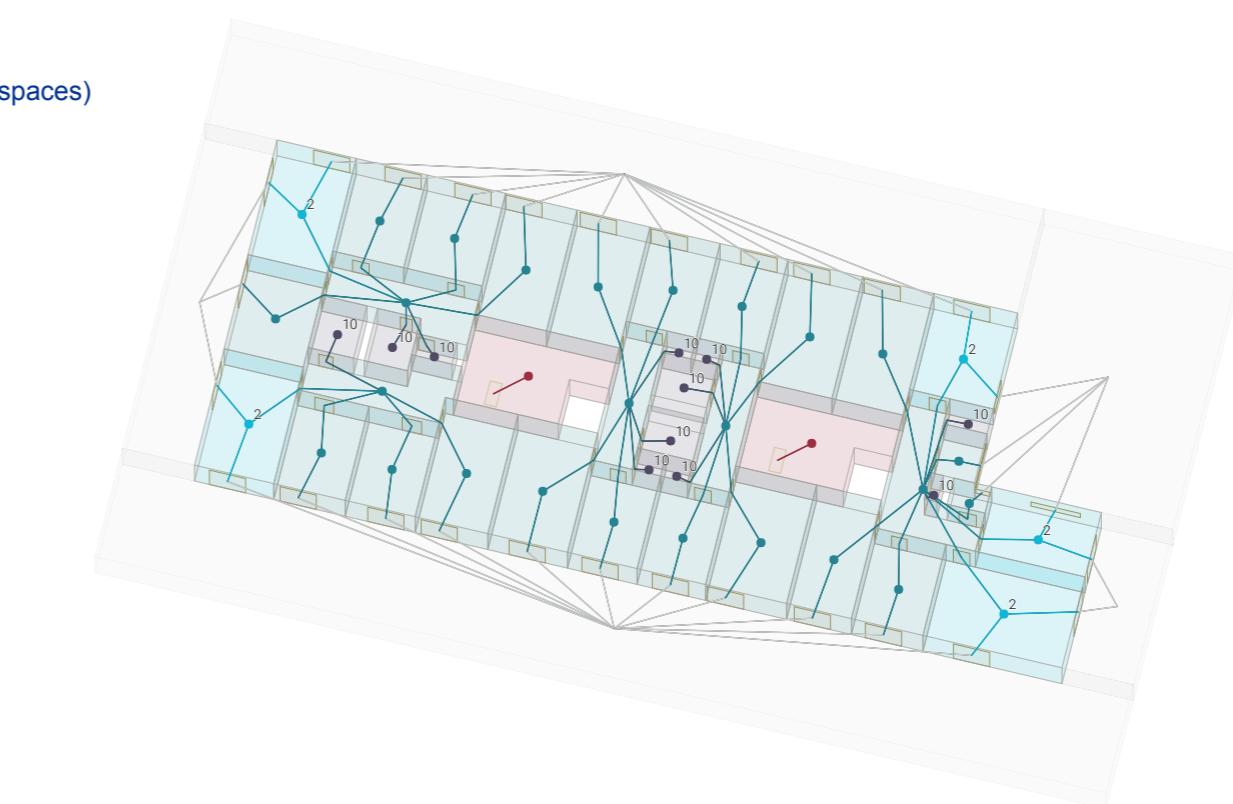
long

very long

Path length [-]

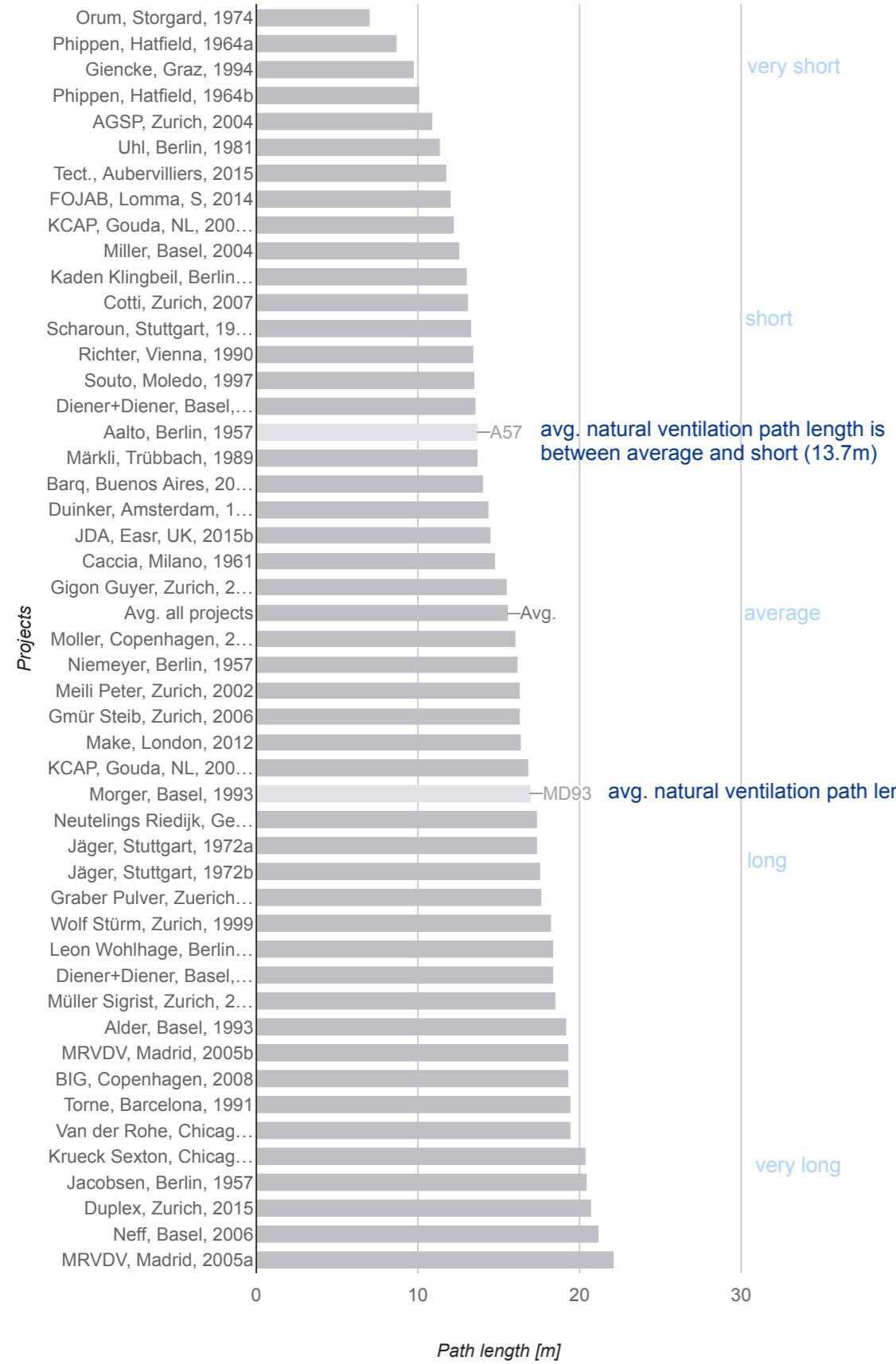


-A57 avg. natural ventilation path length is average (5.7 edges or 2.85 spaces)



avg. natural ventilation path length is long (6.8 edges or 3.4 spaces)

Avg. natural ventilation path length, by edge lengths



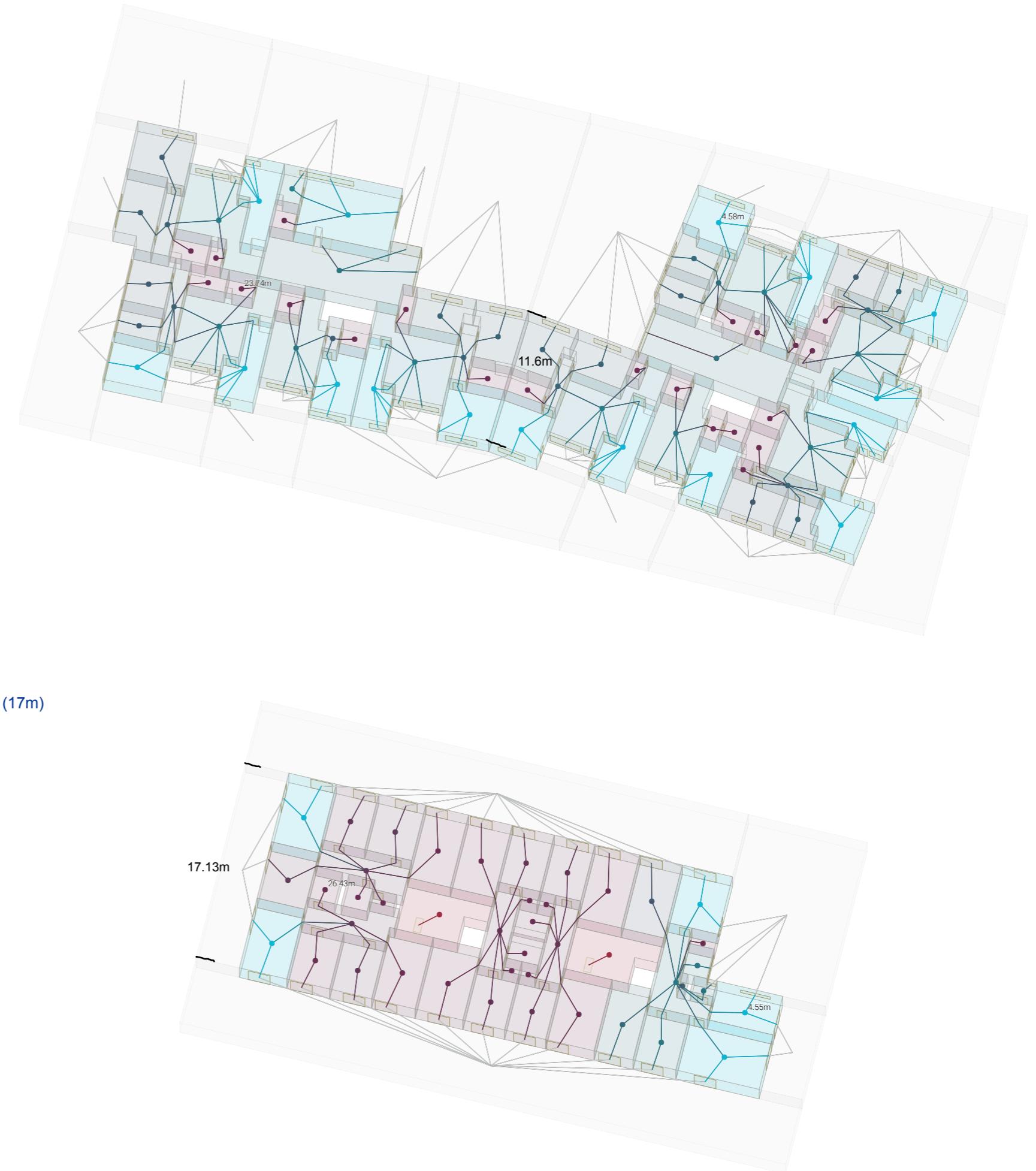
Avg. natural ventilation path length is between average and short (13.7m)

average

Avg. natural ventilation path length is long (17m)

long

very long



What are perimeter and core zones?

Perimeter zone

- Adjacent to external spaces
- Created by merging connected perimeter spaces in the Architectural view

Core zone

- Not adjacent to external spaces (e.g. in compact buildings with high depth)
- Created by merging connected core spaces in the Architectural view

General properties

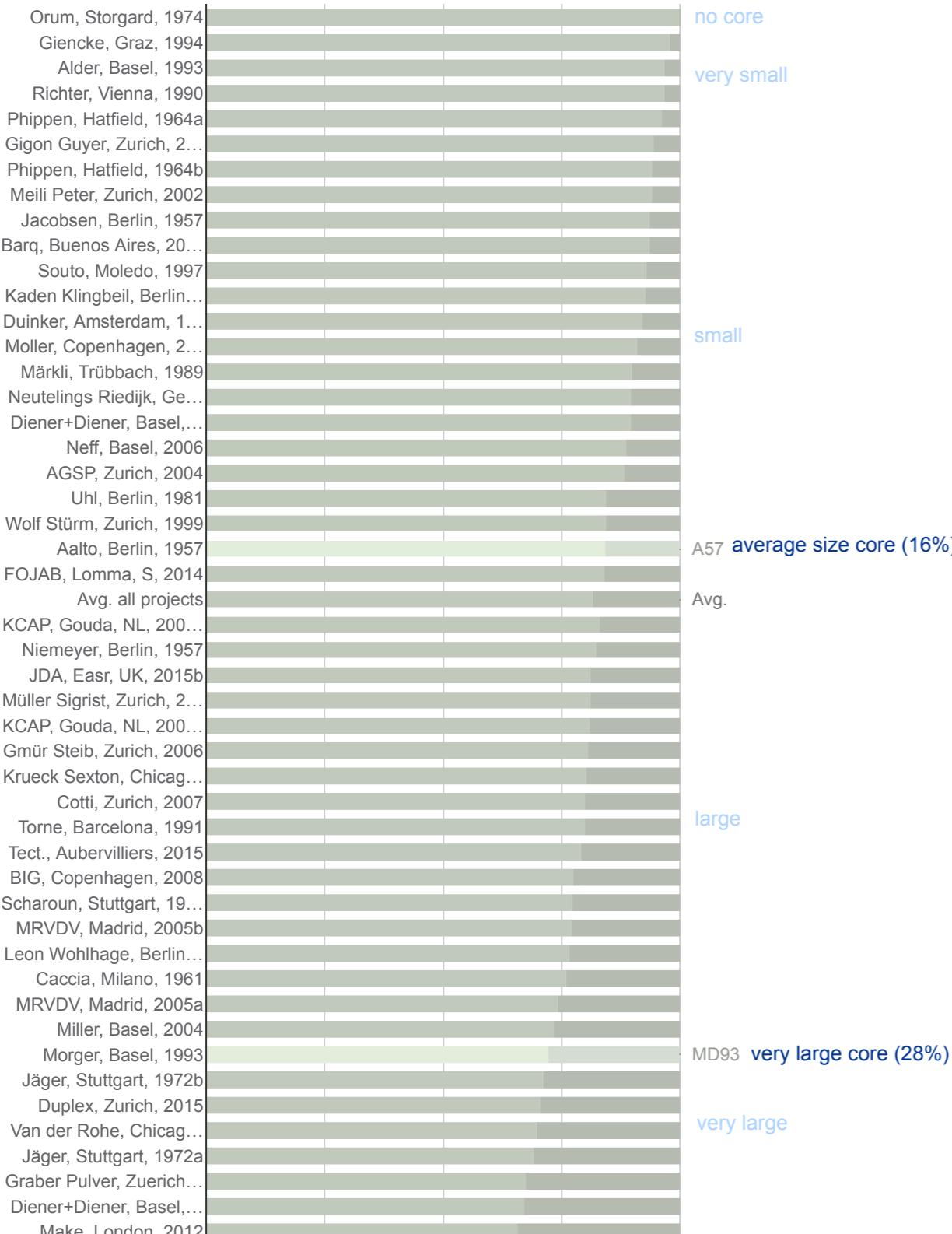
- Perimeter spaces interact with outdoor climate through building enclosure (e.g. solar irradiance)
- Core zones:
 - How provide daylight?
 - How provide fresh air?
 - How extract heat?

Properties in residential buildings

- Circulation spaces located in core zones
 - Main stair cases, hallways, elevators
 - Internal hallways and stairs
- Service spaces located in core zones

Perimeter and core zone areas

Perimeter zone area Core zone area



no core

very small

small

A57 average size core (16%)

Avg.

large

MD93 very large core (28%)

very large



- 1 core with multiple levels



