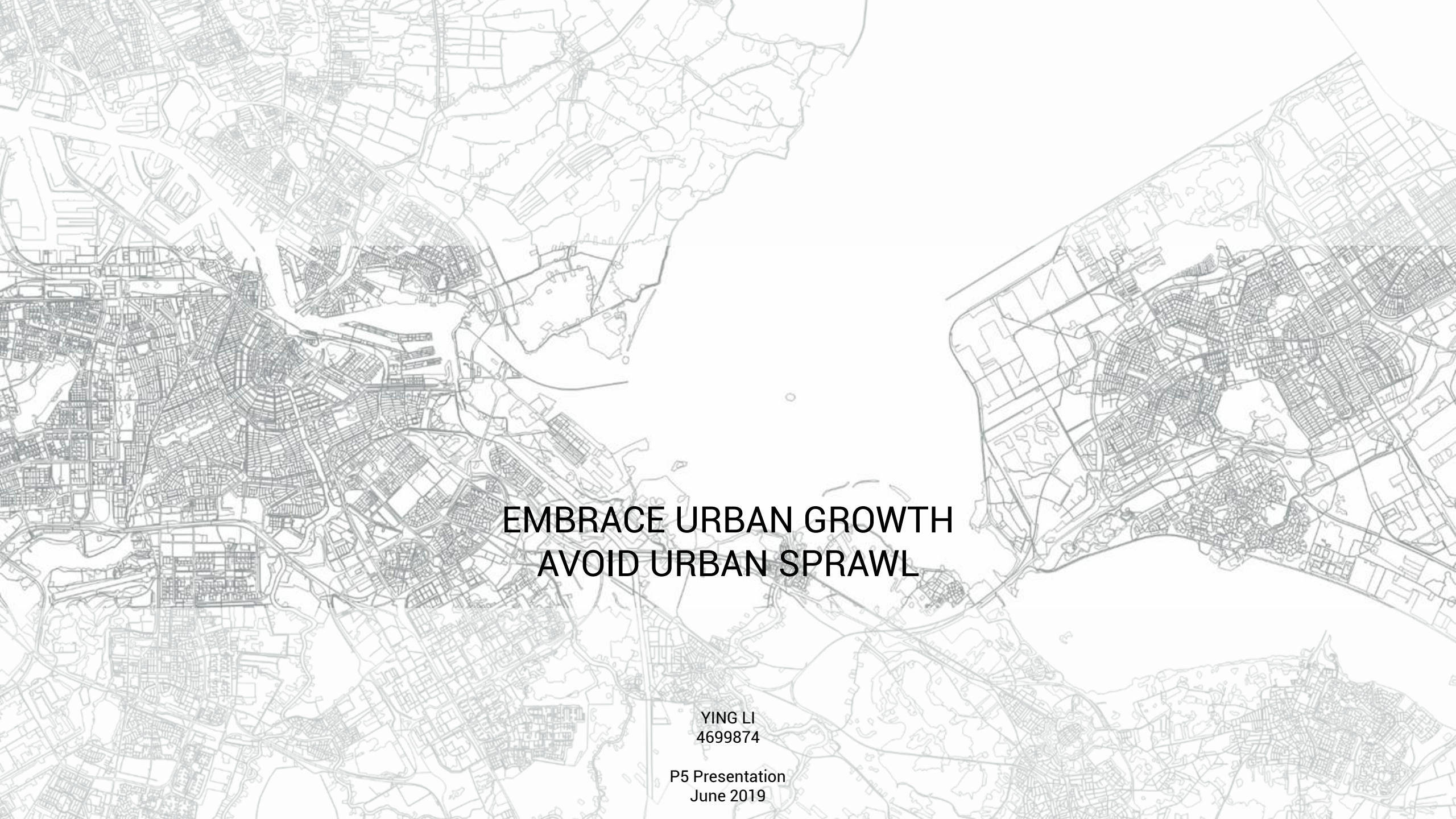


EMBRACE URBAN GROWTH
AVOID URBAN SPRAWL

YING LI
4699874

P5 Presentation
June 2019

Content

Problem Context : Urban sprawl

Part two: Almere future

Part three: Autonomous vehicle

Part four: Compact analysis

Part five: Design AV parking system

1

Problem Context : urban sprawl

Urban footprint comparison

Paris, France

urban area 3,000 km²

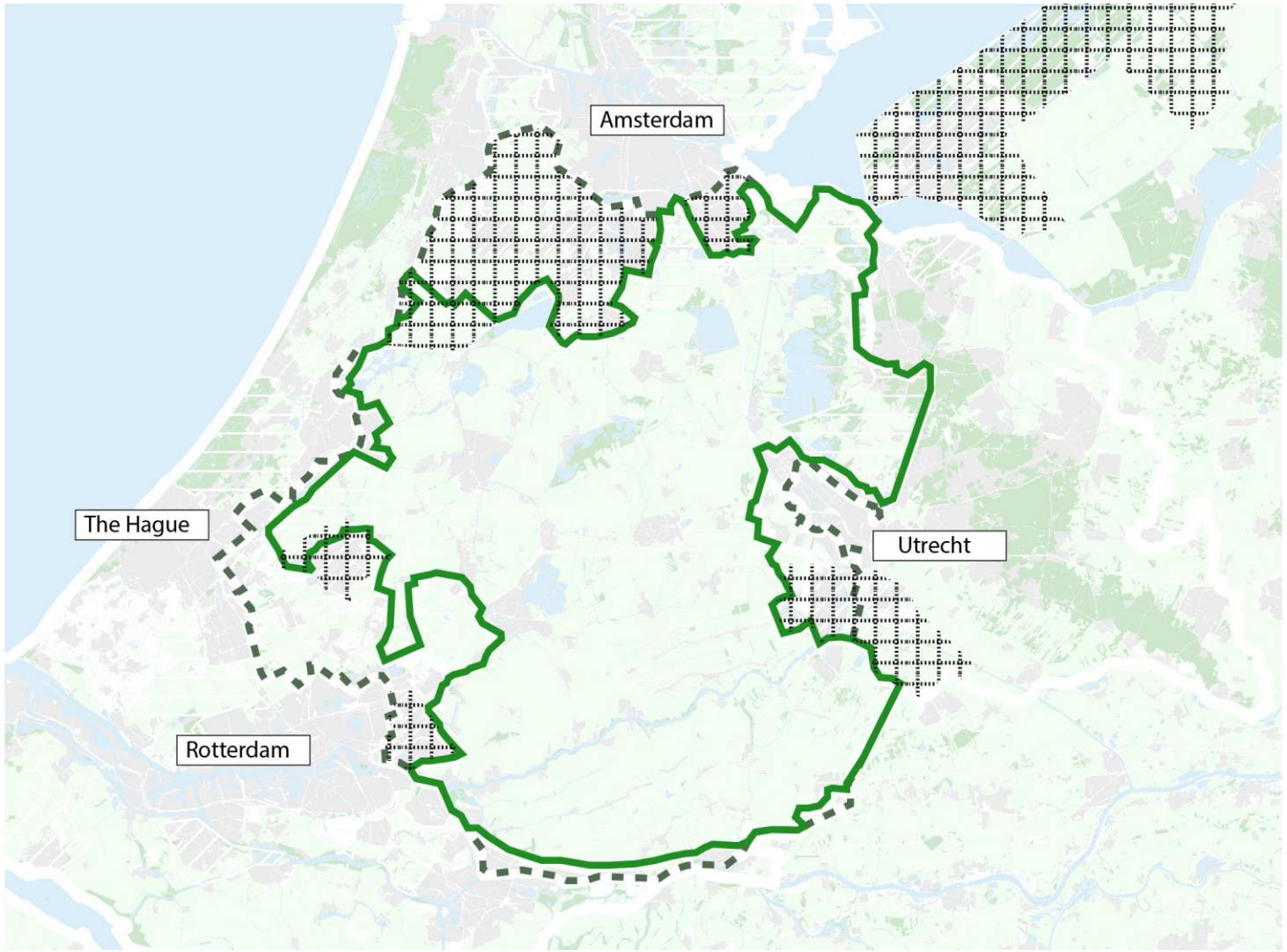
population 10 million

Randstad, the Netherlands

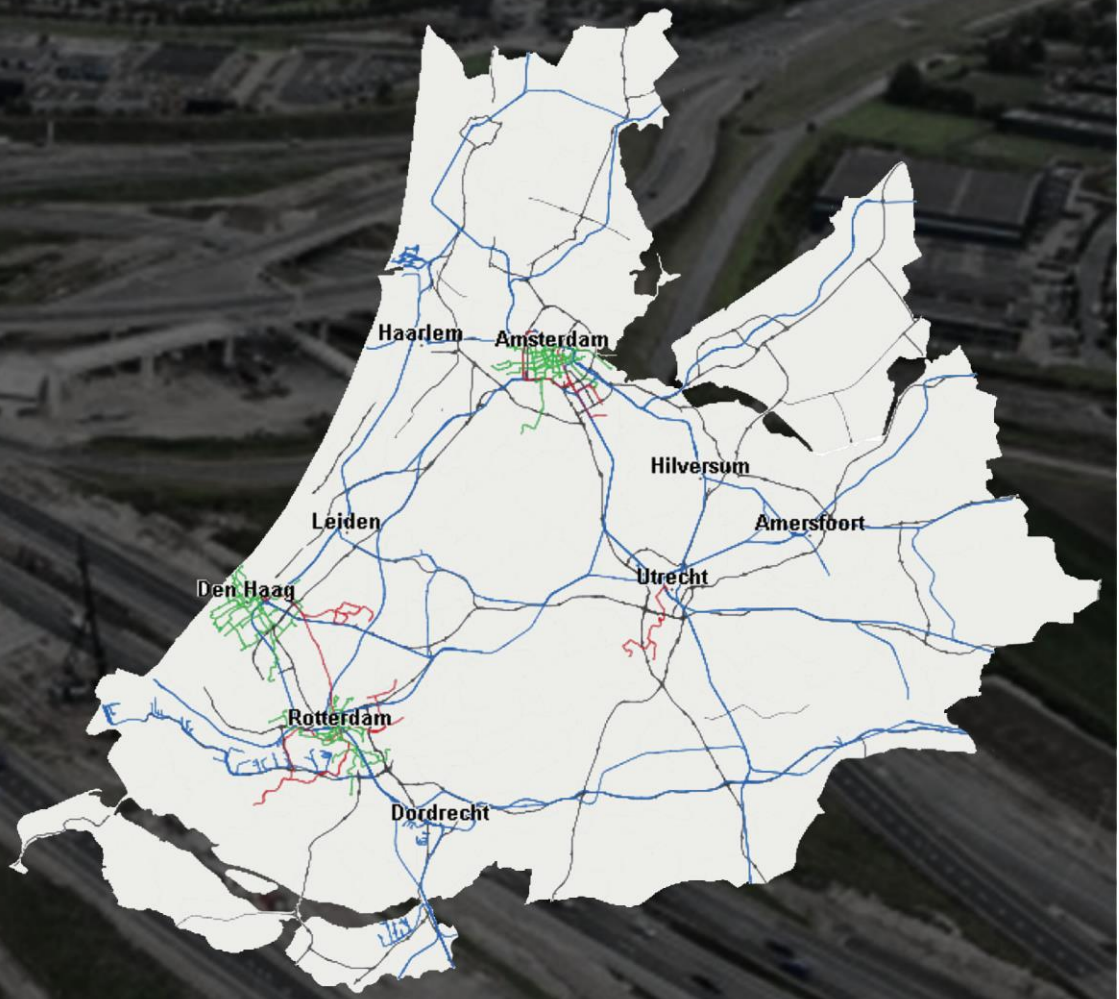
urban area 8,000 km²

population 8 million

Green Heart border changes



Mobility infrastructure networks in Randstad



source: Jorge Gil. Measuring sustainable accessibility potential using the mobility infrastructure's network configuration. (2012)

Car-dependent city

Impact of urban sprawl

decrease in

biodiversity

increase in

infrastructure investments

increase in

automobile dependency

European Policy

European Environmental Agency

2013

7th Environment Action Programme

2020

‘Living well, within the limits of our planet’

2050

‘No net land take’

source : https://www.eea.europa.eu/policy-documents/7th-environmental-action-programme

Comparison between urban density and urban form

Which city is more dense?

Paris, France

?

New York, America

Paris, France

20,200 per sq km downtown

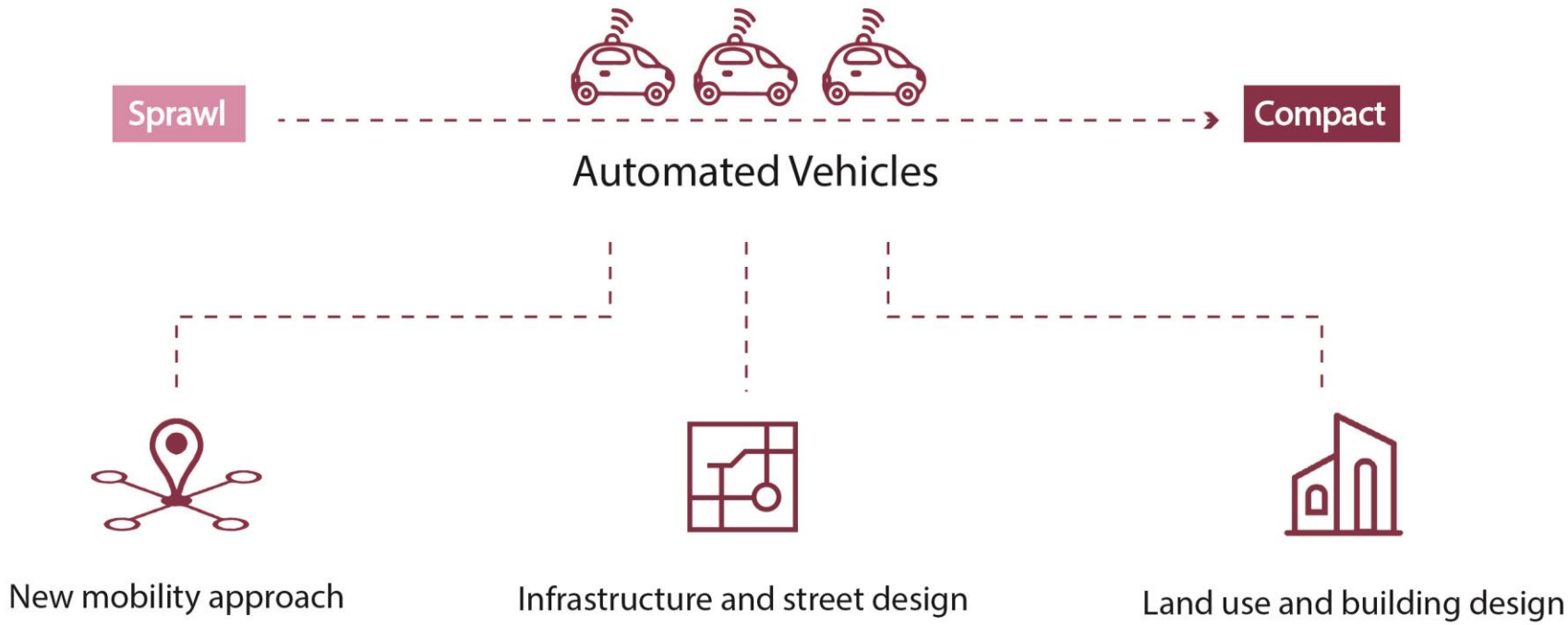
New York, America

25,800 per sq km Manhattan

Automated vehicles (AVs)

People in AVs

AVs on street


Sprawl
Compact
Automated Vehicles
New mobility approach
Infrastructure and street design
Land use and building design

Goal of compact city

contribute to

environmental sustainability

contribute to

non-motorized mobility

contribute to

public space quality

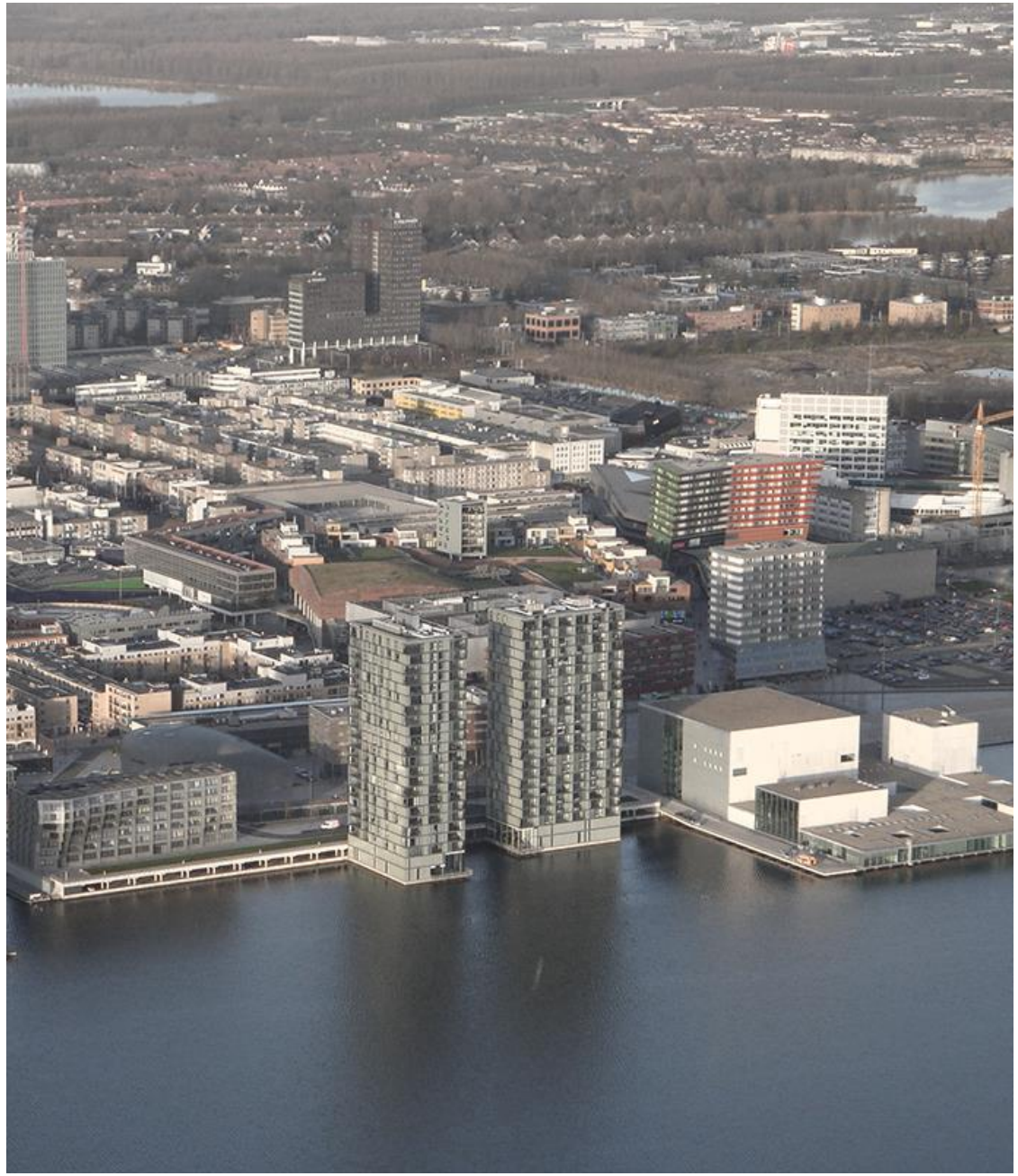
2

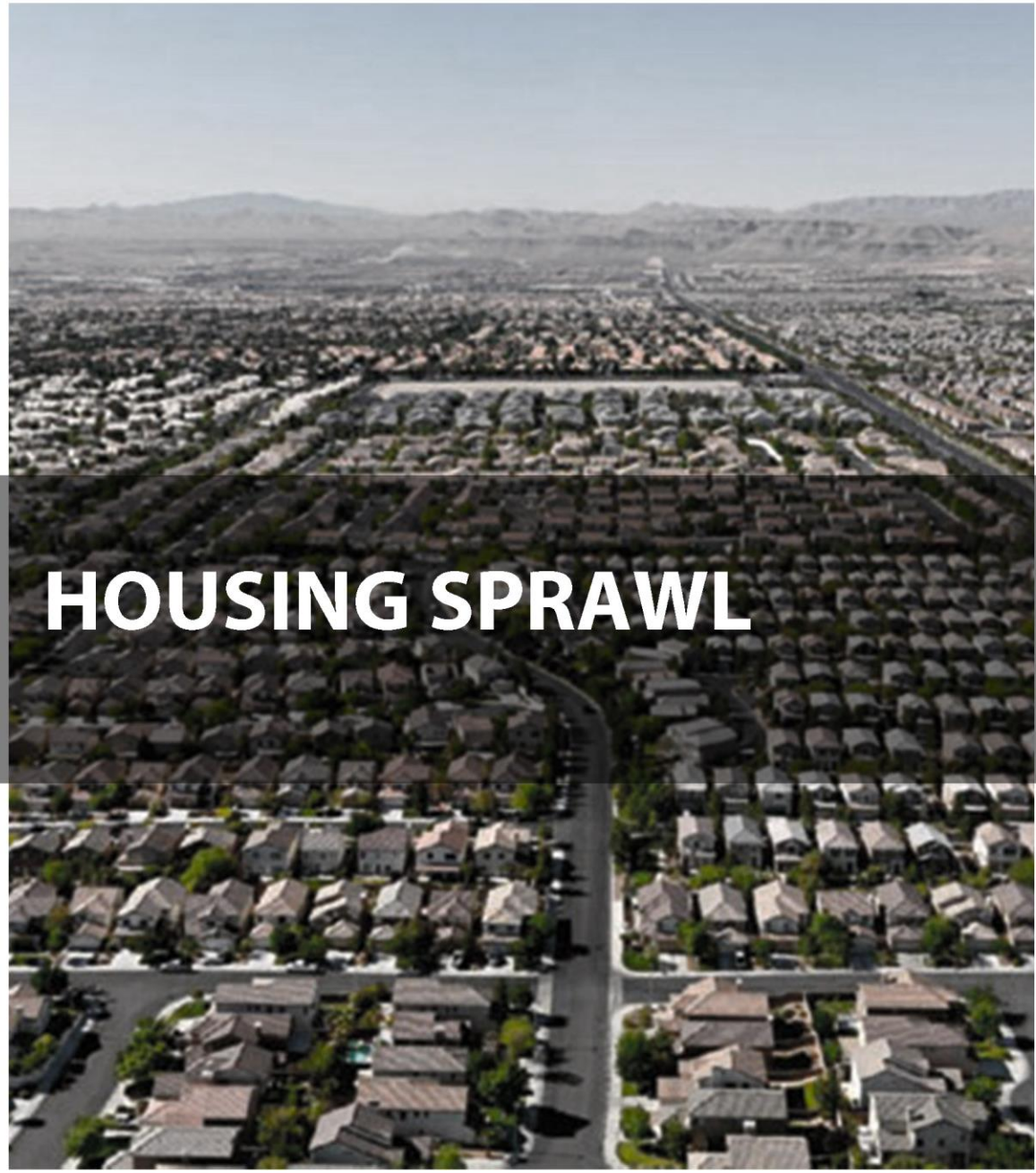
Almere future

Almere - The Dormitory Town

"**Almere** has historically been a **dormitory town** from which residents have been content to travel for both work and leisure"

--- (Woodman, 2004)

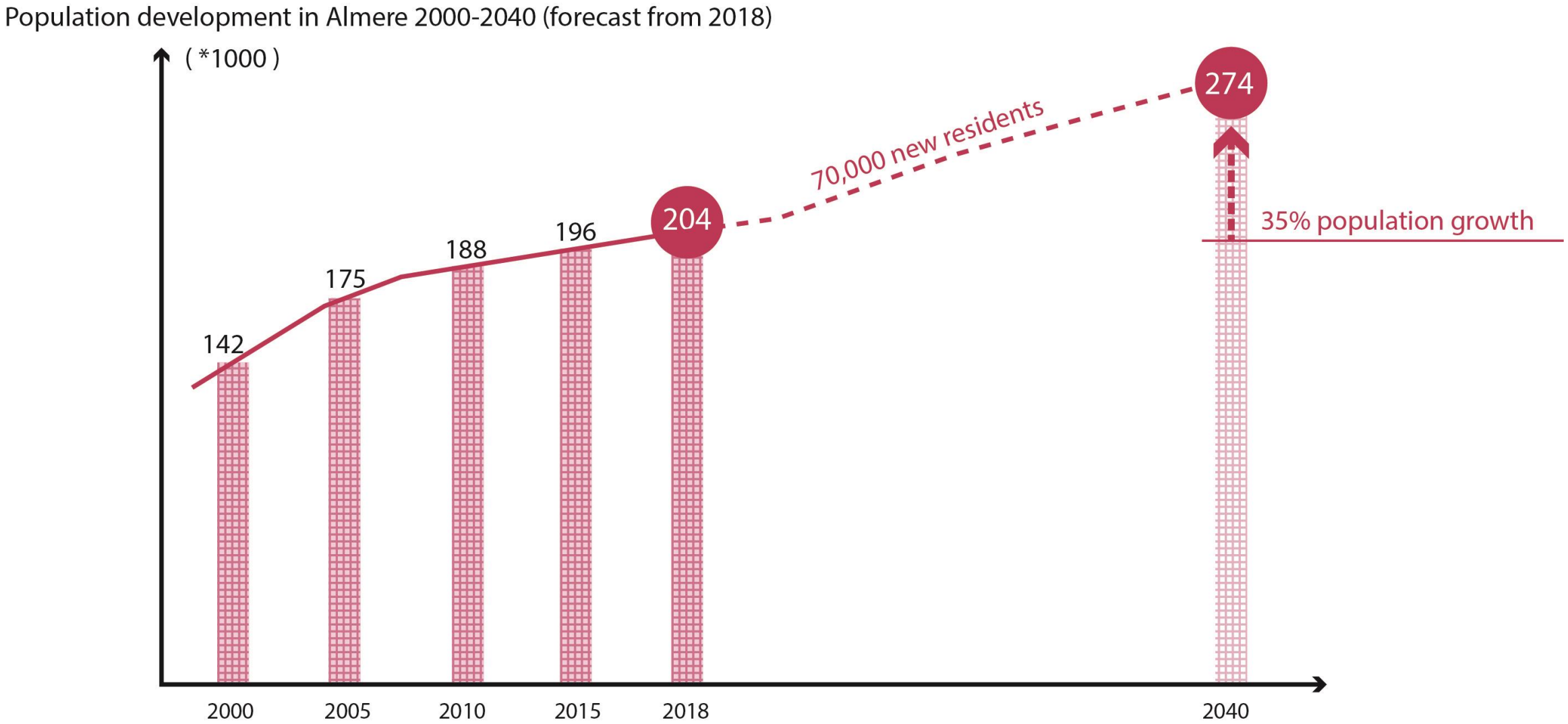




HOUSING SPRAWL

TRAFFIC CONGESTION

Population Growth Task of Almere



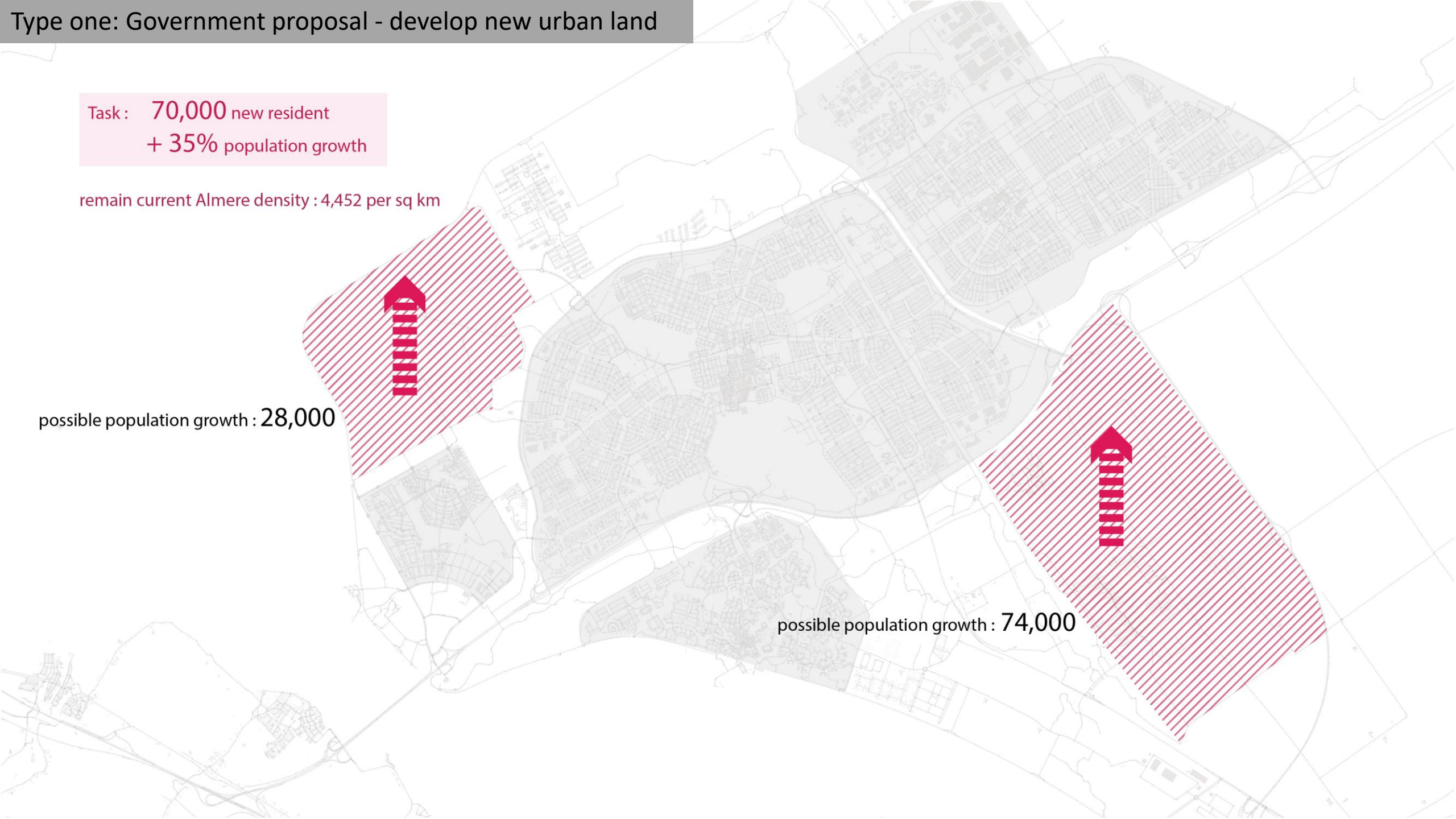
Source: ONTWIKKELING BEVOLKING ALMERE 2017 (https://www.osalmere.nl/docs/Ontwikkeling%20bevolking%20Almere%202017.pdf)

Type one: Government proposal - develop new urban land

Type one: Government proposal - develop new urban land

Task : 70,000 new resident
+ 35% population growth

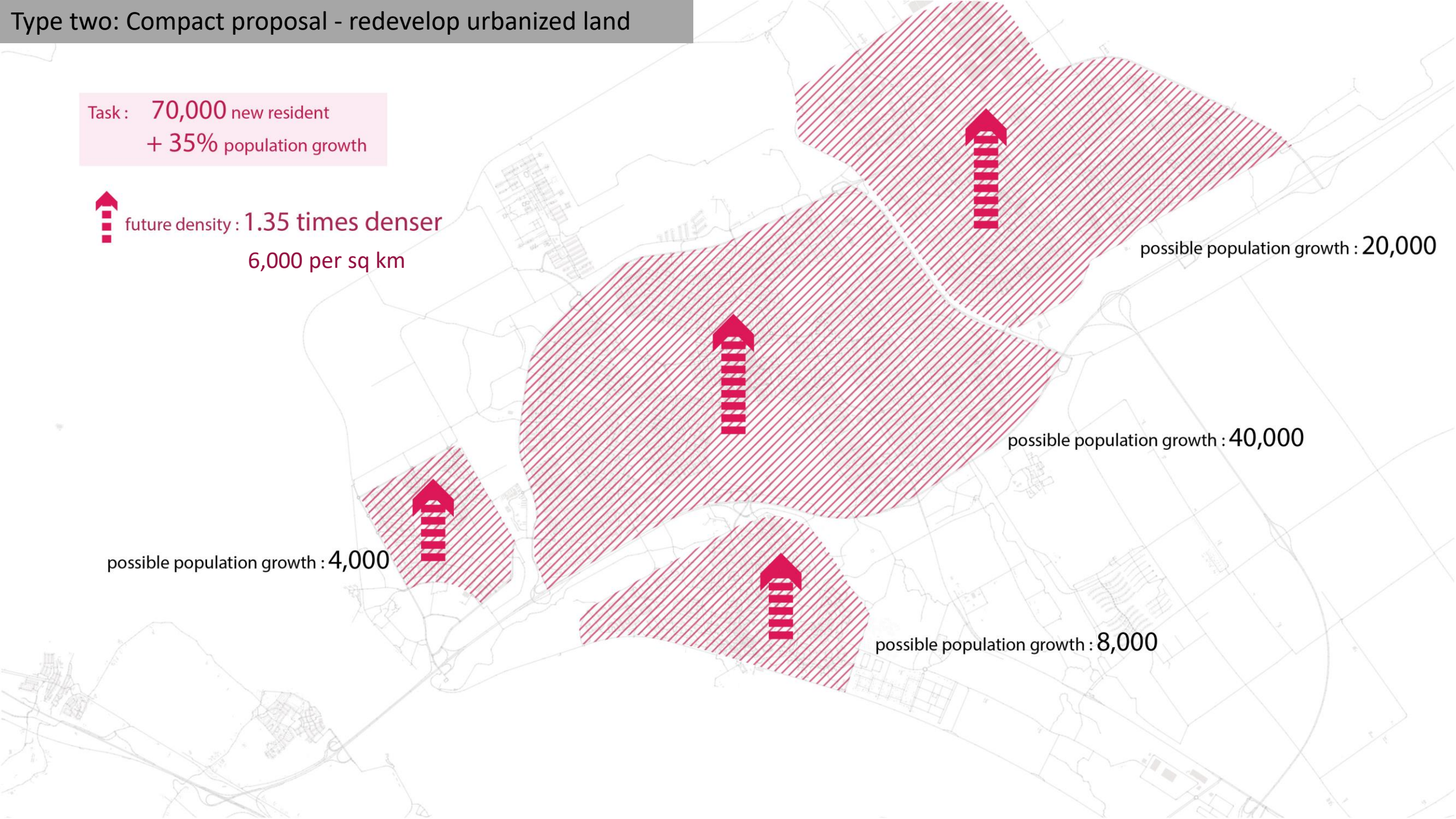
remain current Almere density : 4,452 per sq km

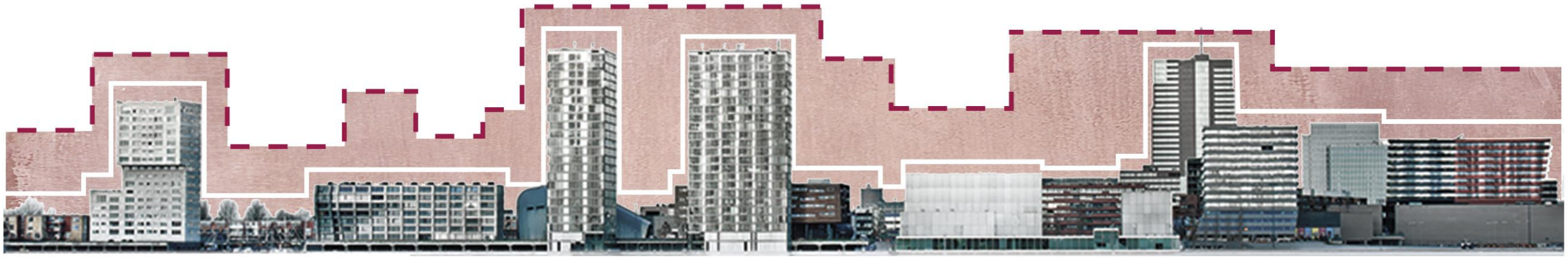


Type two: Compact proposal - redevelop urbanized land

Task : 70,000 new resident
+ 35% population growth

future density : 1.35 times denser
6,000 per sq km



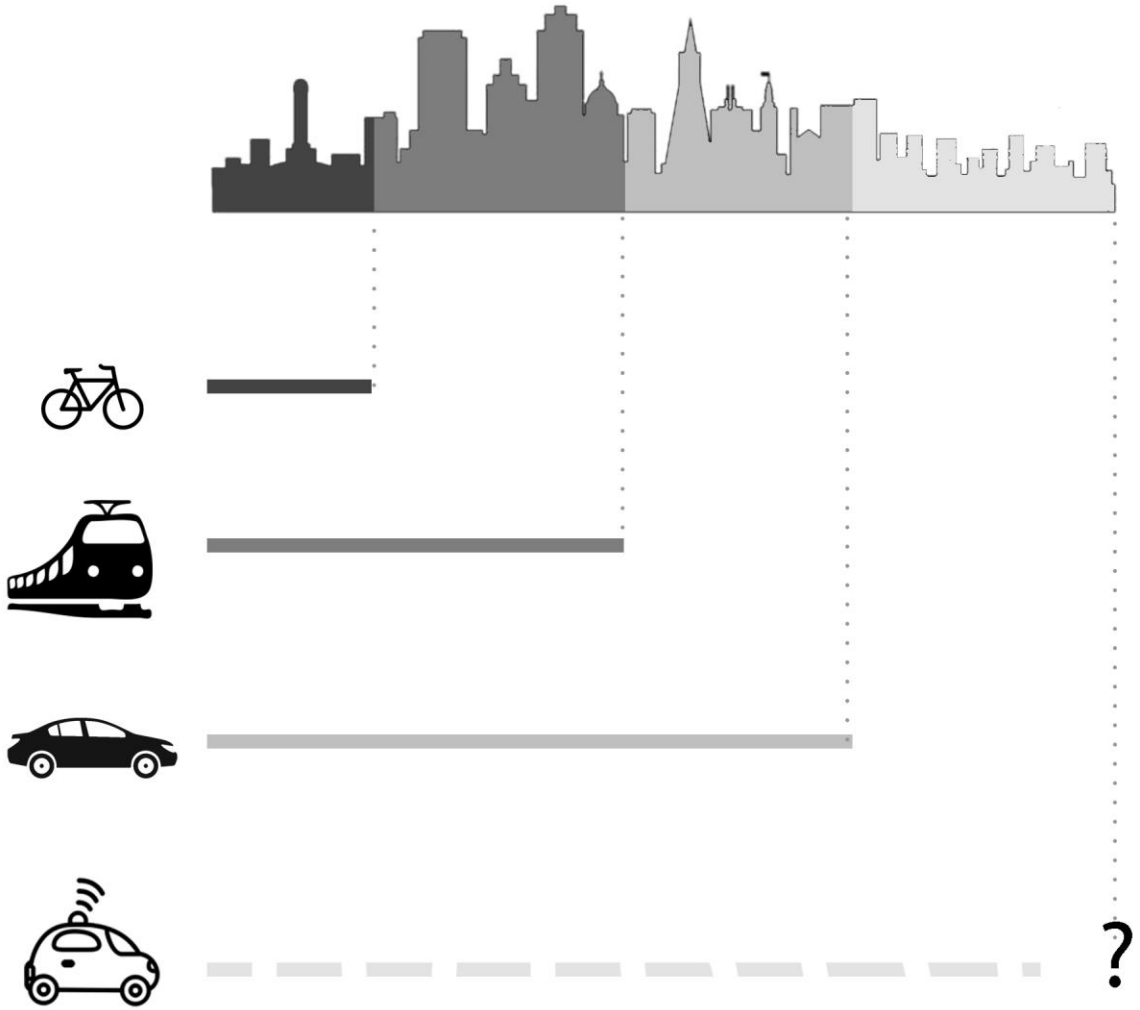


How to design **a compact Almere** in a future of **automated vehicles**

… … and contribute to **urban sustainability**?

3 Autonomous Vehicle

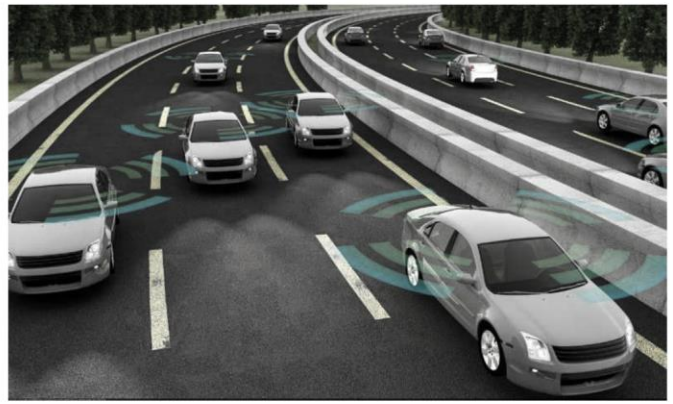
The possible impact of AV : sprawl future



45min

1H

Efficient traffic



Valuable travel time

The possible impact of AV : compact future

mass transit street space

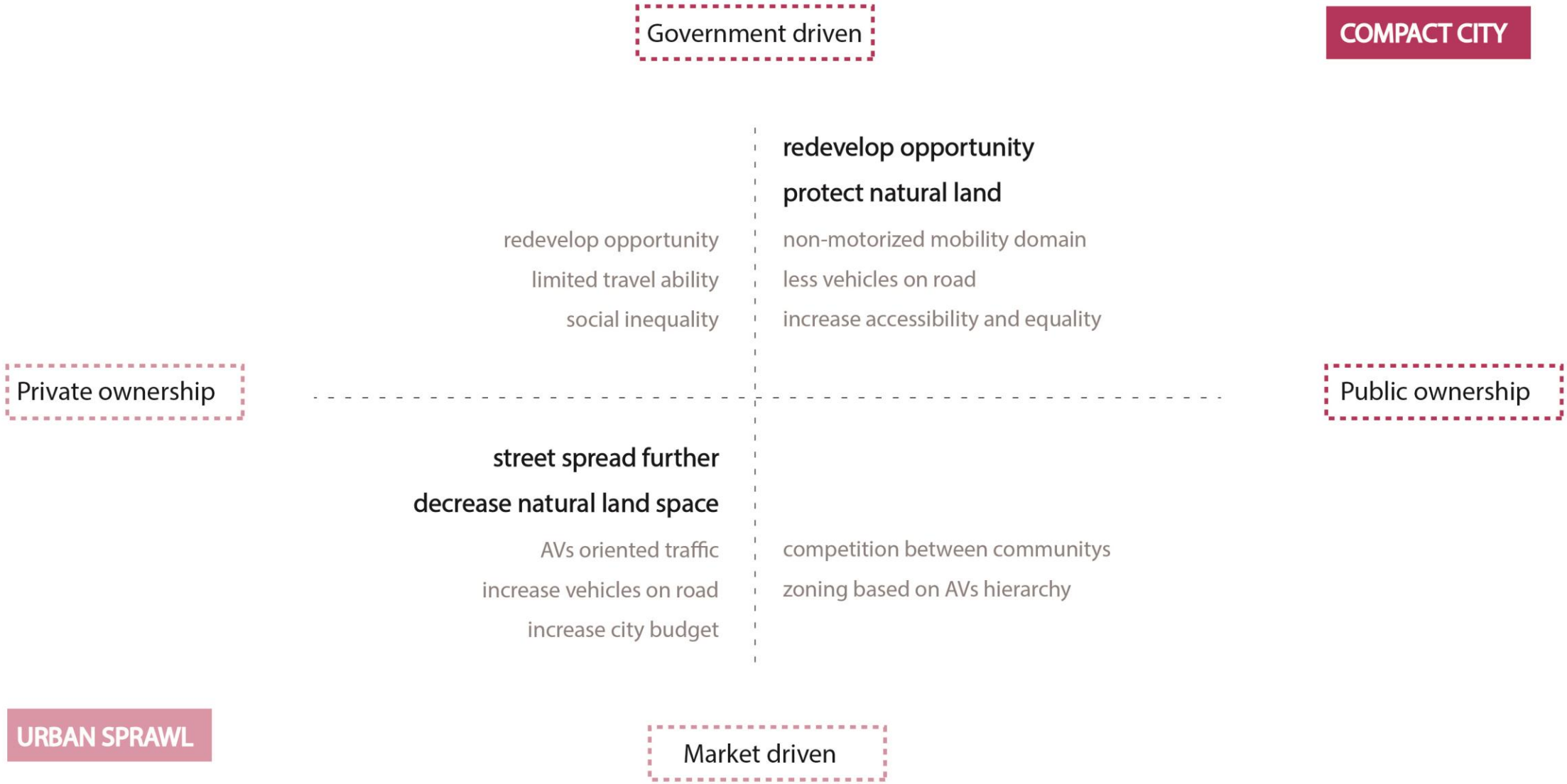
massive parking space

land use for conventional vehicles

Smaller street

Redevelop opportunity

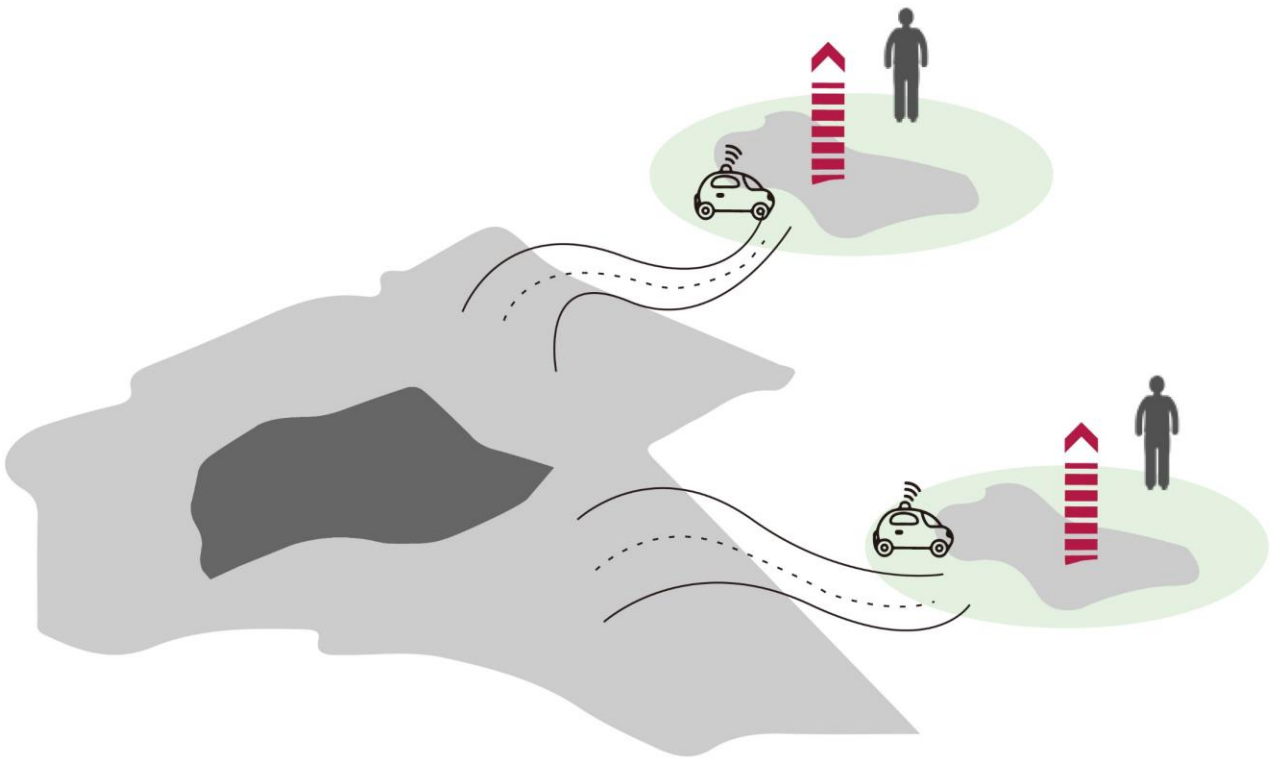
Scenario building

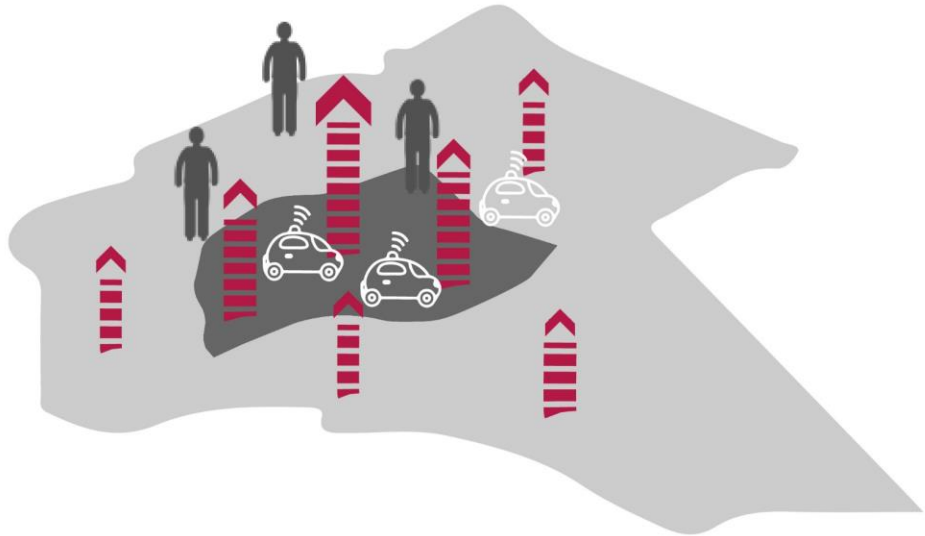


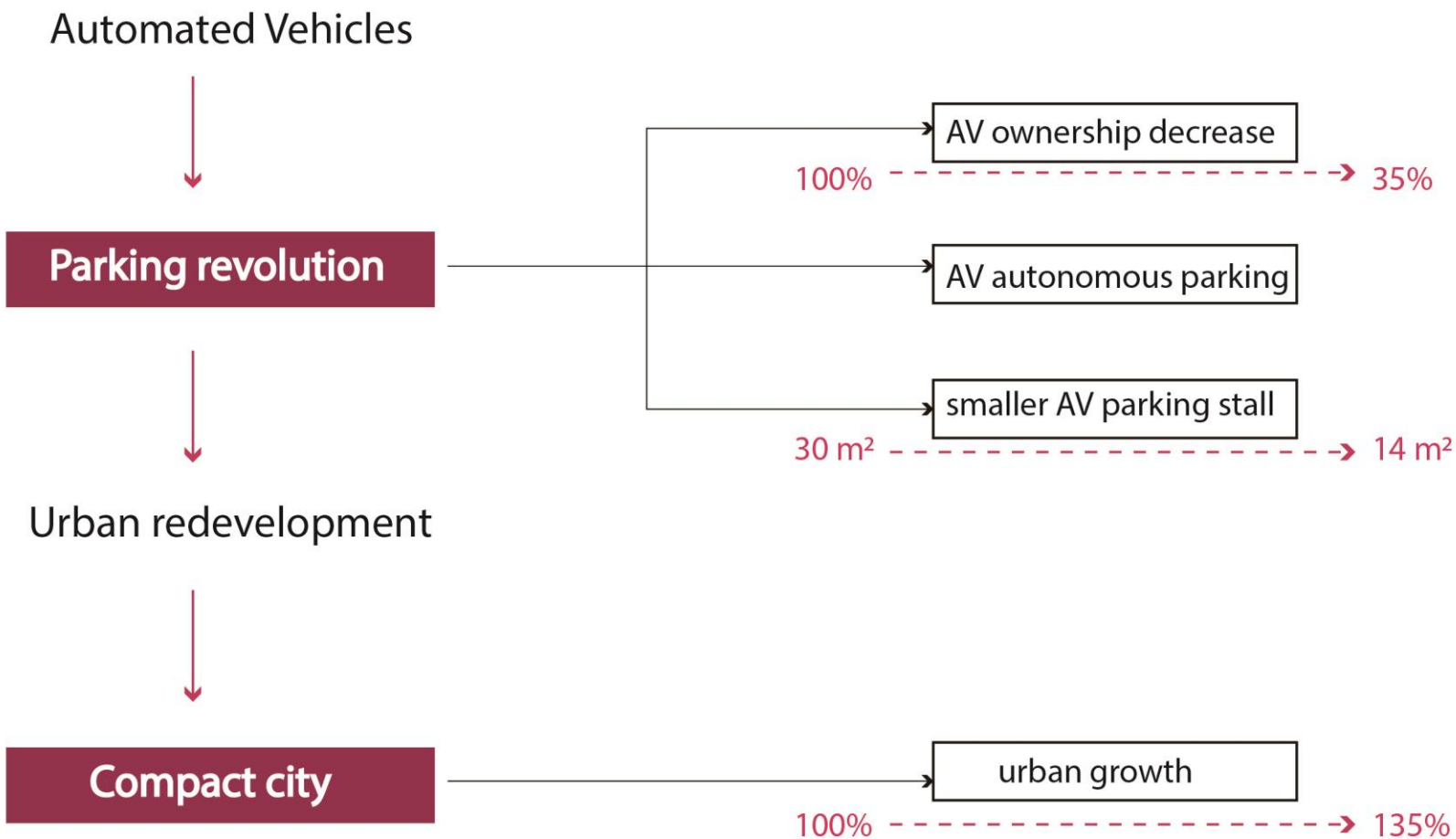
Urban Sprawl

VS

Compact City






Automated Vehicles
Parking revolution
AV ownership decrease
100%
35%
AV autonomous parking
smaller AV parking stall
30 m²
14 m²
Urban redevelopment
Compact city
urban growth
100%
135%

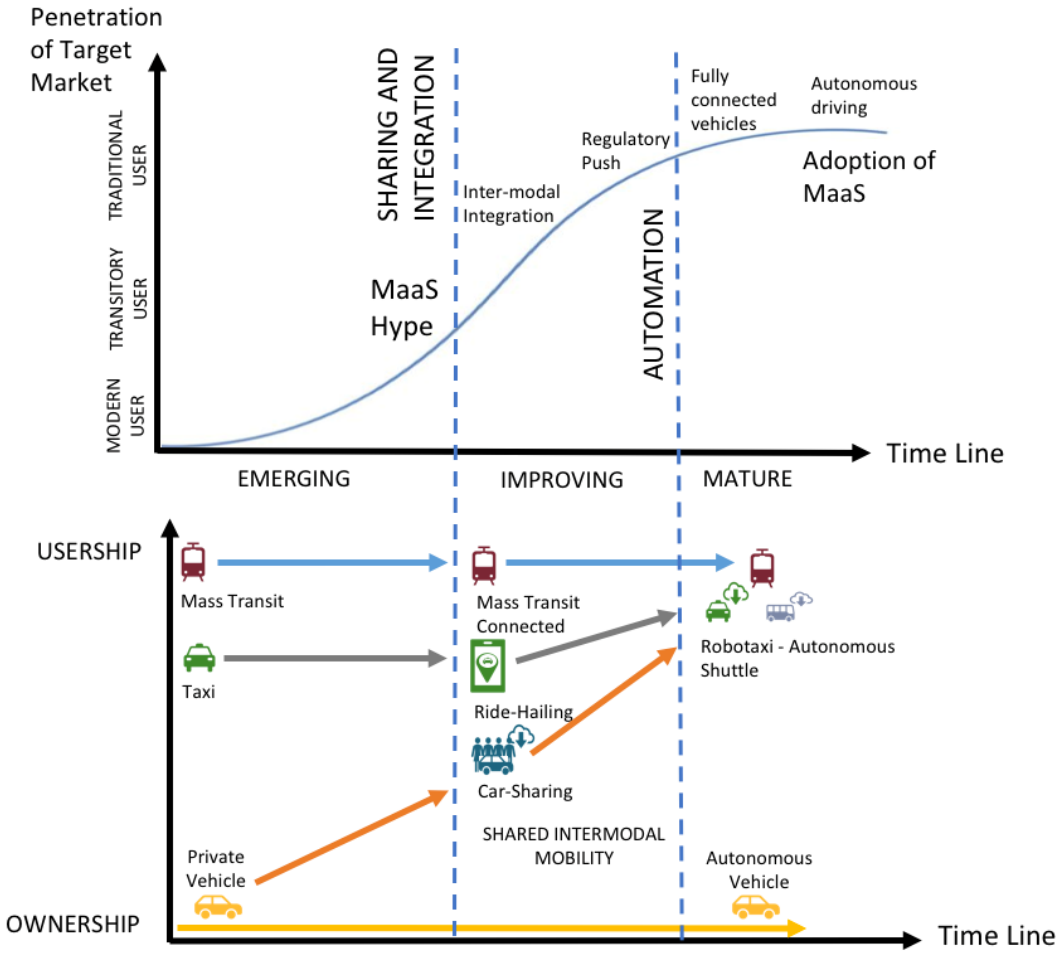
Decrease of vehicles ownership

The only available option today

Mobility as a service

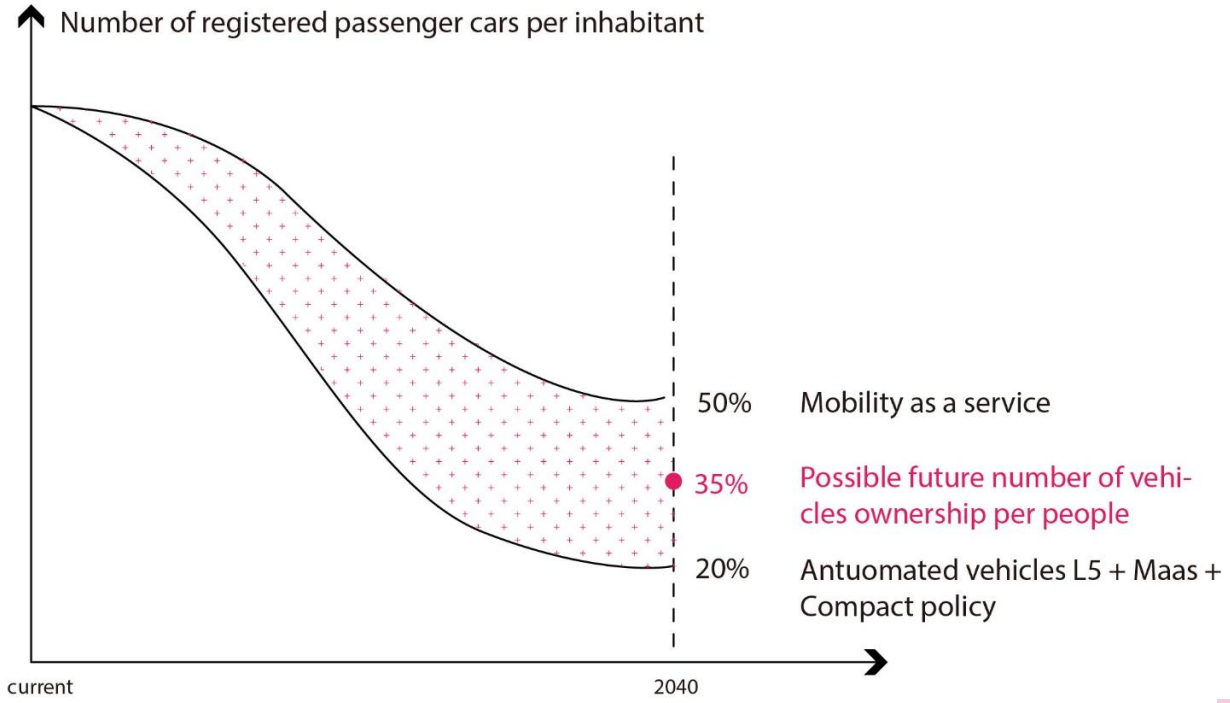
Tomorrow's freedom of mobility

Decrease of vehicles ownership



Source: Serra, A., Verstappen, J., Devaux, V., & Bax, L. (2018). FROM CAR OWNING TO RIDE-SHARING: HOW MAAS COULD CHANGE THE WAY WE TRAVEL. (Bax & Company).

Decrease of vehicles ownership



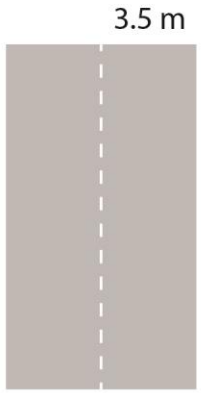
source: A RethinkX Sector Disruption Report (2017)

Future AV ownership = current car ownership * 35%

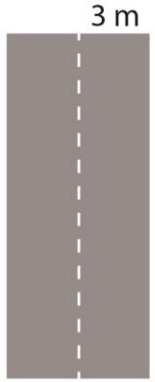
Decrease of parking space

Narrower lanes

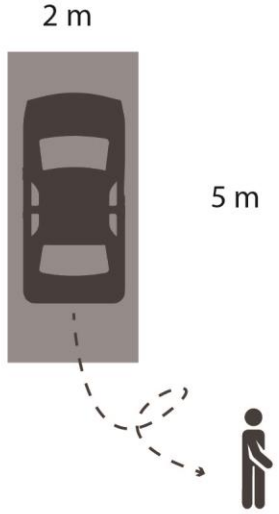
Conventional vehicles



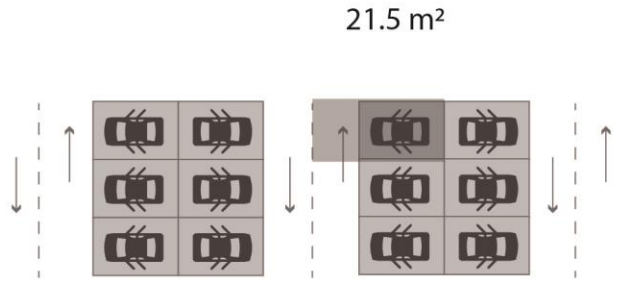
Autonomous vehicles

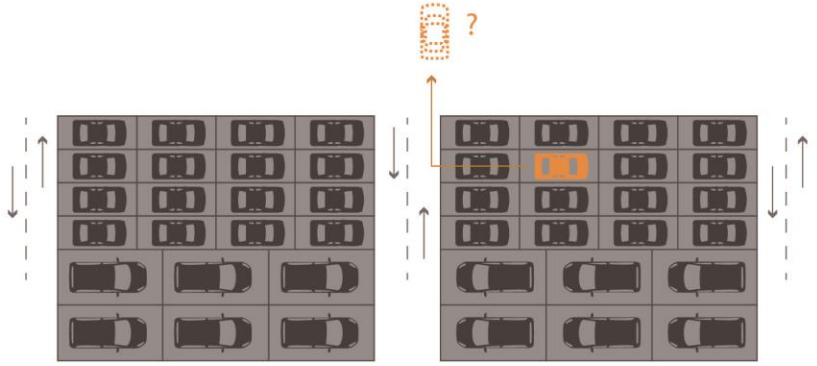


Smaller stalls



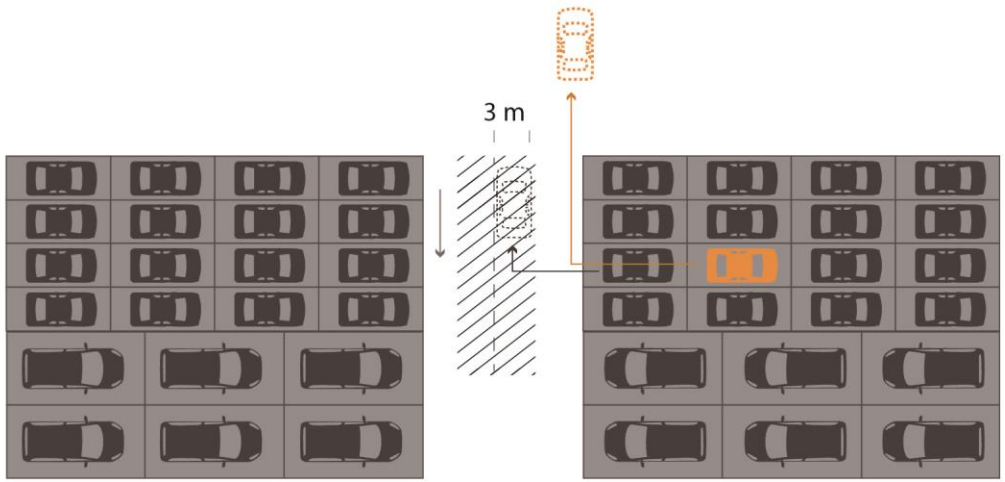
Stall stacks





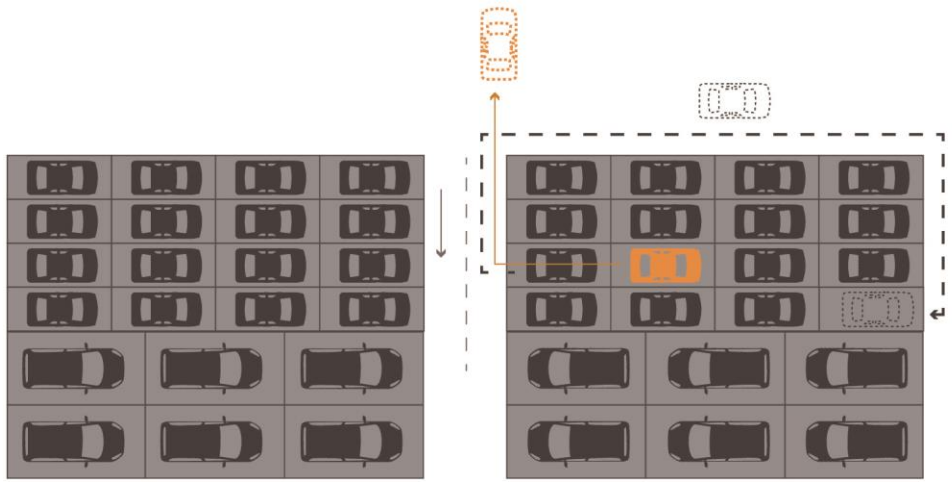
Autonomous parking

with temporary standing lane



parking stall space 16 m²

without temporary standing lane
- cruise the island



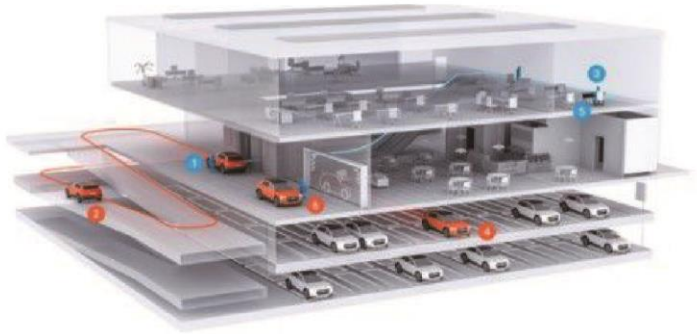
parking stall space 12.5 m²

Empirical evidence

Source: http://www.arrowstreet.com/portfolio/autonomous-vehicles/

Assembly Row, Somerville, MA

Driverless vehicles storage is packed in hyper-efficient rows on the top level. Garage designed for autonomous for self-parking vehicles can substantially increase their efficiency and use 60% less space.

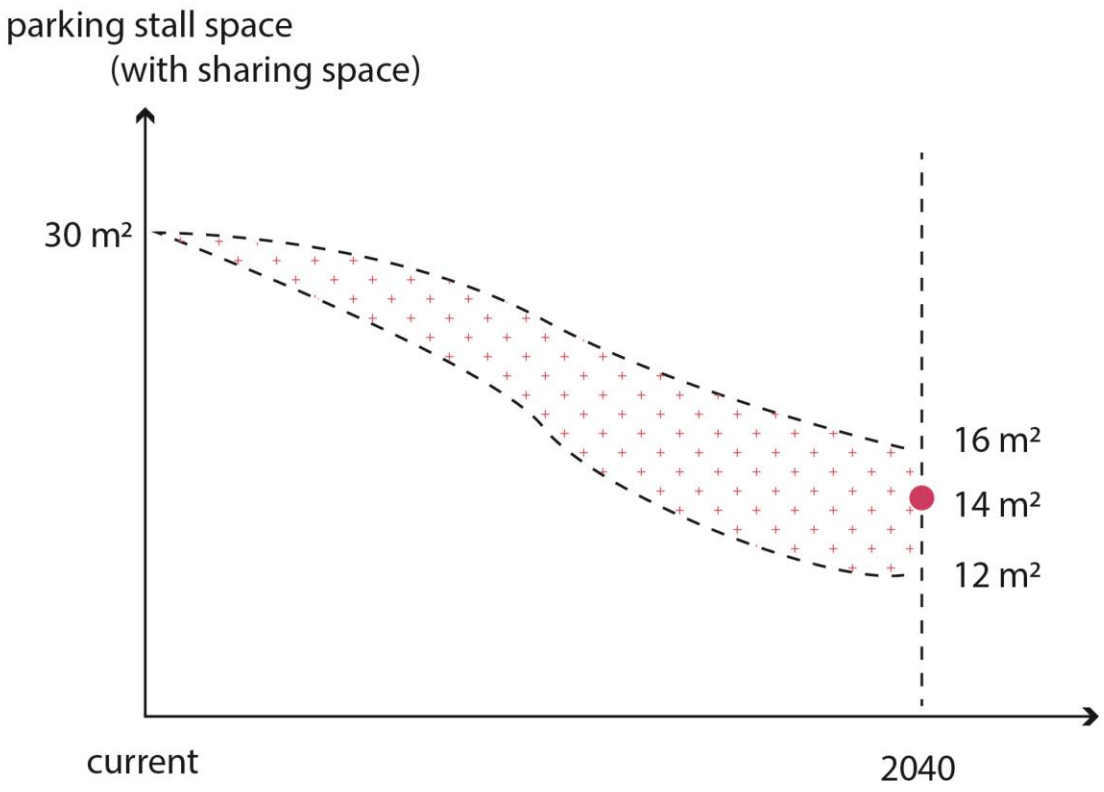


Source: Driverless future. A POLICY ROADMAP FOR CITY LEADERS

Assembly Row, Somerville, MA

The garage is expected to reduce parking square footage by 26%, with a mix of conventional and driverless cars. When the garage is used exclusively for driverless cars, parking square footage can be reduced by up to 60%.

Decrease of parking space



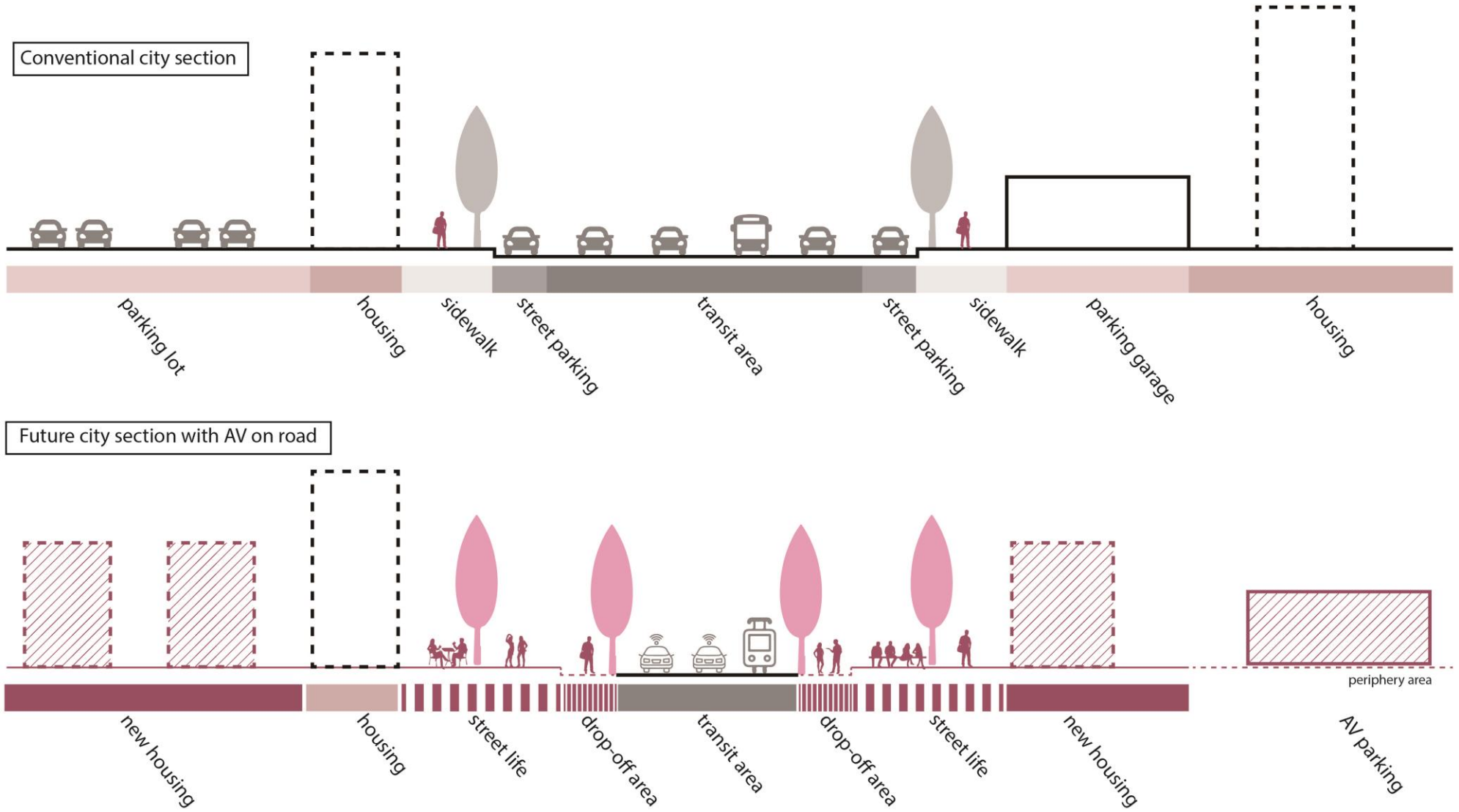
16 m² parking stall with temporary stading lane

14 m² Possible AV parking stall space

12 m² emprical AV parking garage design

14 m² per parking stall

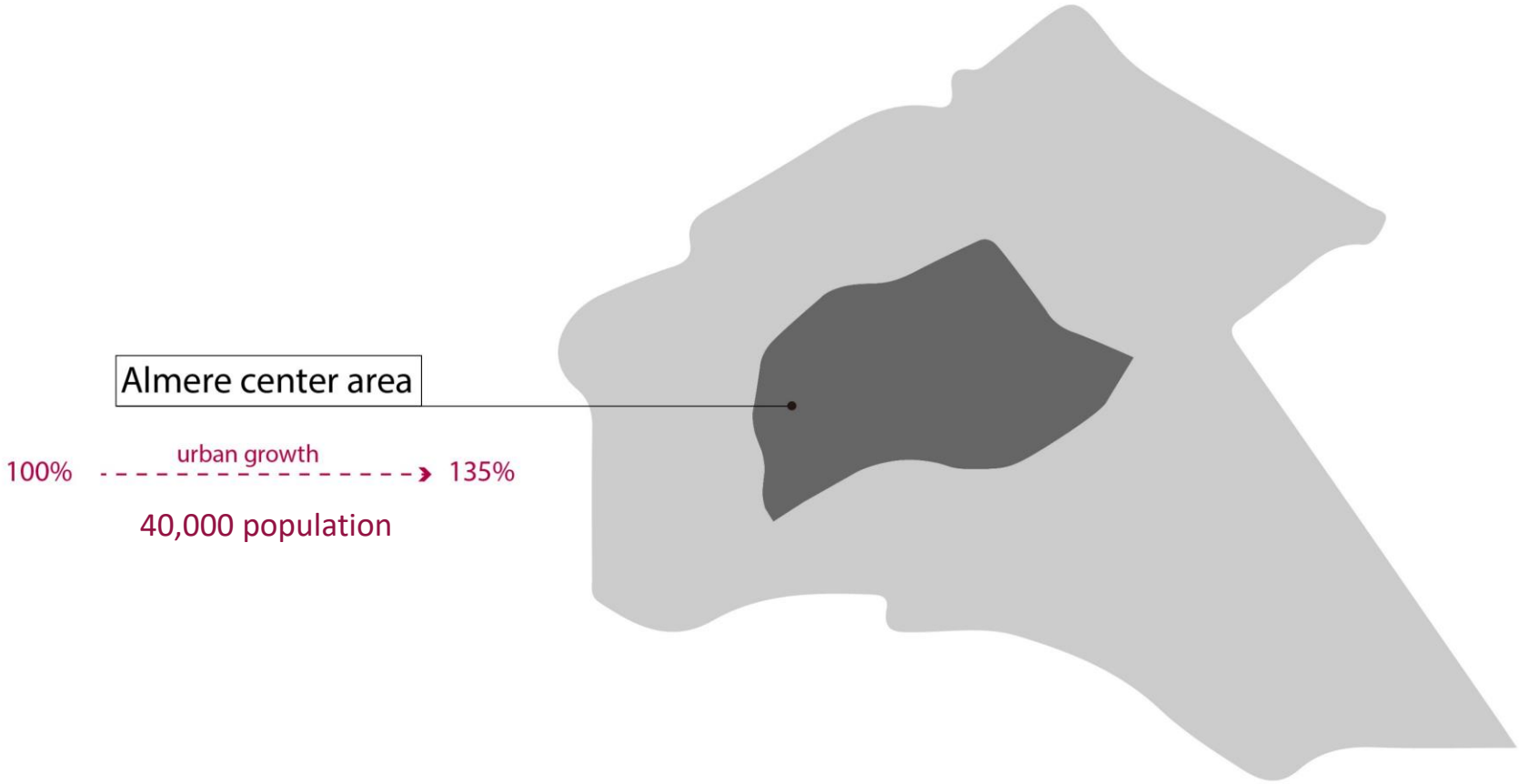
Transform parking space

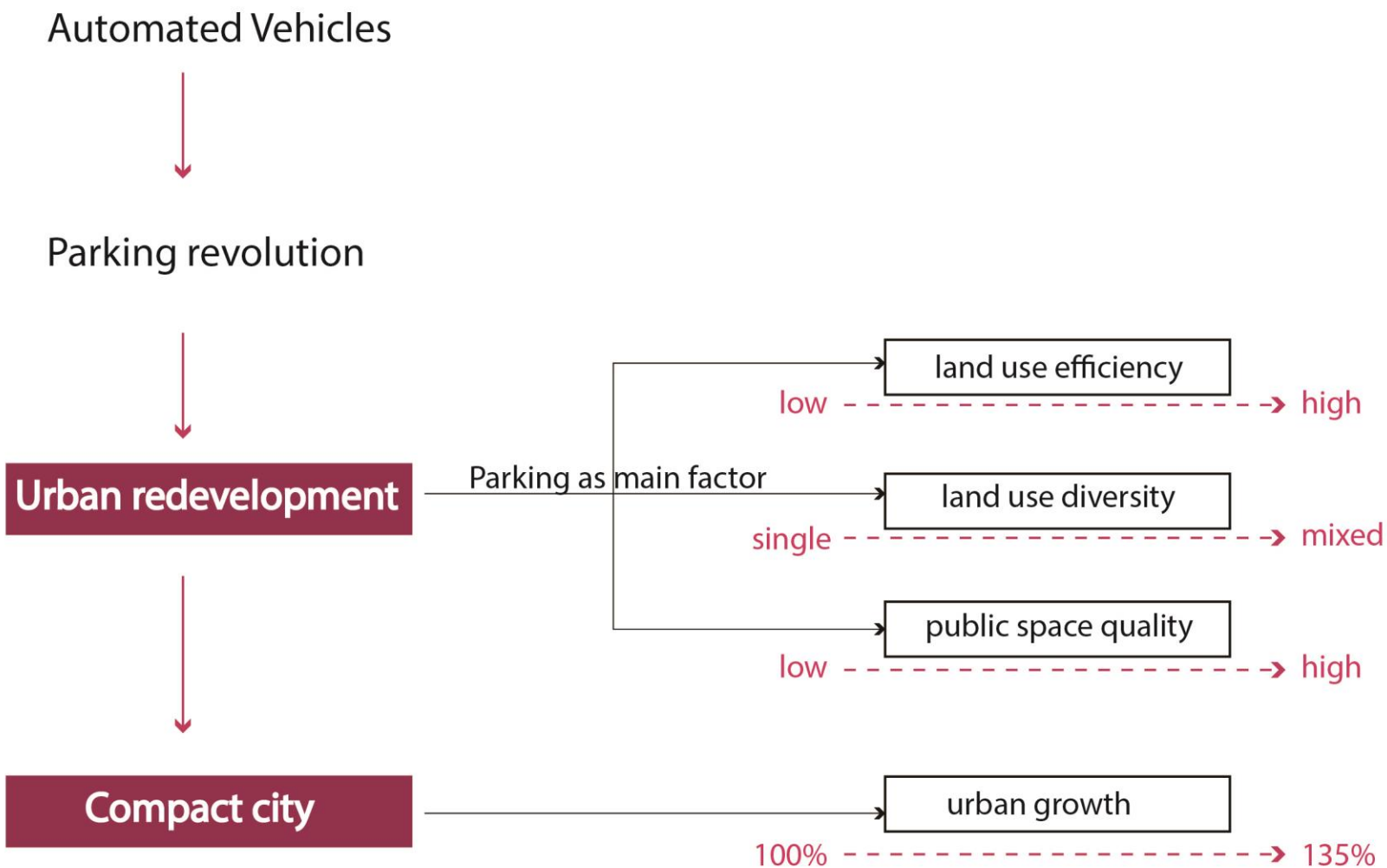


AVs would make parking no longer a nightmare

4 Compact Analysis

Design area




Automated Vehicles
Parking revolution
Urban redevelopment
Parking as main factor
land use efficiency
low
high
land use diversity
single
mixed
public space quality
low
high
Compact city
urban growth
100%
135%

Redevelop opportunity

community parking

parking lot in city center

green space in low quality

campus neighborhood

community centre

community border

business district

industry area

highway area

street parking

Redevelop opportunity

Legend

City center

- parking in city center
- business area
- green space in low quality
- mixed-use city center

Community

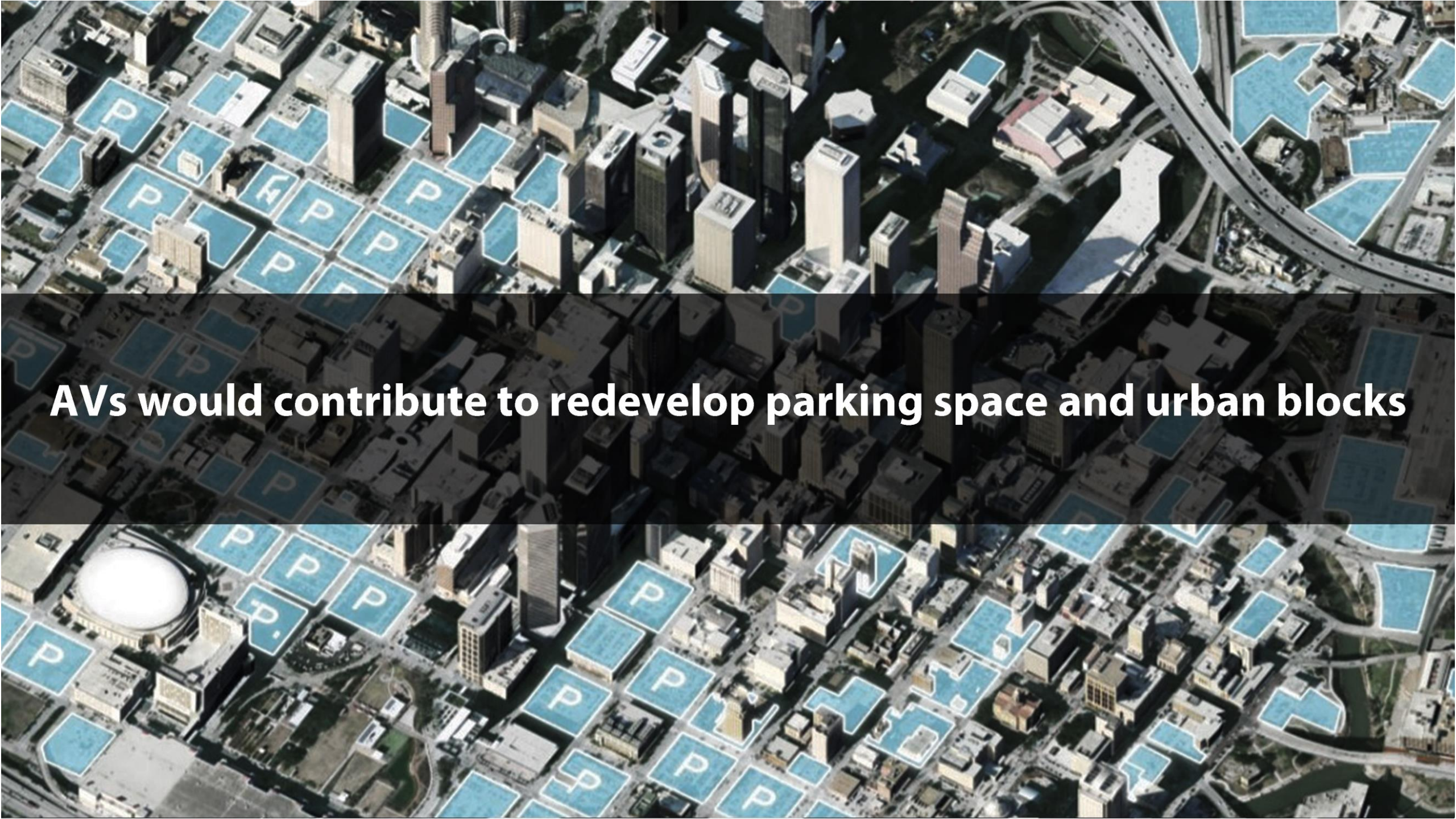
- community parking
- community center
- mix border
- campus neighborhood
- community living
- industrial area
- highway

Calculation for population growth

Design base	Redevelop type	Current space
almere central	d-01 parking lot	16805
	d-02 parking lot	13841
	d-03 parking lot	3197
	d-04 parking garage	2543
	d-05 parking lot	1375
	d-06 parking garage	2992
	d-07 parking lot	6566
	d-08 parking lot	2758
	d-09 parking garage	3129
	d-10 parking lot	6417
	d-11 green space-low quality	4550
	d-12 parking lot	2294
	d-13 parking lot	5573
	d-14 parking lot	2137
	d-15 parking lot	1625
	d-16 road space	8854
neighborhood-Stedenwijk	d-17 community parking	12492
	d-18 community center	9884
	d-19 mix border	83015
	d-20 mix border	26165
	d-21 community parking	5280
	d-22 community center	3988
	d-23 community center	9408
	d-24 mix border	19983
	d-25 campus neighbor	148121
	d-26 overpass area	549747
neighborhood- Muziekwijk	d-27 mix border	103499
	d-28 community center	31065
	d-29 community center	50788
	d-30 mix border	86733
	d-31 mix border	33684
	d-32 community parking	7701
	d-33 mix border	52823
	d-34 mix border	37104
	d-35 community center	4208
	d-36 community parking	12724
	d-37 community center	29978
	d-38 community center	7825
	d-39 green space-low quality	15762
neighborhood- Literatuurwijk	d-40 campus neighbor	97647
	d-41 community center	20220
	d-42 community center	9546
neighborhood- Kruidenwijk	d-43 mix border	40562
	d-44 community parking	23479
	d-45 community parking	1266
	d-46 community center	8147
	d-47 green space-low quality	3437
	d-48 mix border	66146
	d-49 community center	10279
	d-50 green space-low quality	45808
neighborhood- Waterwijk	d-51 community center	20678
	d-52 community center	3969
	d-53 community parking	2836
	d-54 mix border	10735
	d-55 community center	17254
	d-56 community center	8306
	d-57 community center	10339
	d-58 green space-low quality	3644
	d-59 mix border	46159
	d-60 mix border	338642
neighborhood- Verzetswijk	d-61 community center	25274
	d-62 campus neighbor	27739
	d-63 green space-low quality	10406
neighborhood- Filmwijk	d-64 green space-low quality	122770
	d-65 community parking	30934
	d-66 community center	32000
	d-67 green space-low quality	27894
	d-68 campus neighbor	212524
	d-69 campus neighbor	13473
	d-70 campus neighbor	41315
neighborhood- Parkwijk +Dansw	d-71 campus neighbor	108995
	d-72 community center	22736
	d-73 community center	10135
	d-74 green space-low quality	11509
	d-75 green space-low quality	73273
	d-76 community center	19136
	d-77 green space-low quality	21438
	d-78 green space-low quality	16715
neighborhood- Tussen	d-79 campus neighbor	74646
	d-80 community center	16192
	d-81 green space-low quality	20259
	d-82 community center	16022
	d-83 green space-low quality	59629
	d-84 mix border	58857
	d-85 overpass area	262278
industrial area	d-86 industrial area	1394007
	d-87 industrial area	312575
	d-88 industrial area	1201149
	d-89 industrial area	482273

Calculation for population growth

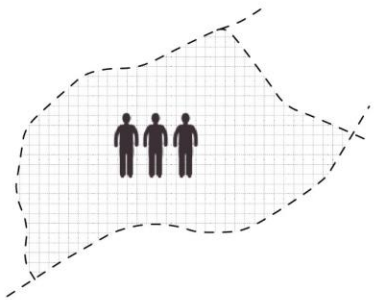
Main Category	Current space (sq m)	Redevelop percentage	Numbers of floor	Redevelop space in surface	Redevelop density (per sq m)	Possible population growth
Parking lot in center	62588	50%	3	31294	0.033	1043
Parking garage in center	8664	100%	5	8664	0.111	963
Community parking	96712	50%	3	48356	0.033	1612
Green space in low quality	437094	30%	5	131128	0.033	4371
Community center	397377	20%	3	79475	0.013	1060
Mix border	1004107	35%	5	351437	0.039	13667
Campus neighborhood	724460	20%	3	144892	0.013	1932
Industrial area	3390004	15%	7	508501	0.023	11865
Business area	214547	30%	5	64364	0.033	2145
Highway area	812025	20%	7	162405	0.031	5053
Total	7147578			1530517		43710

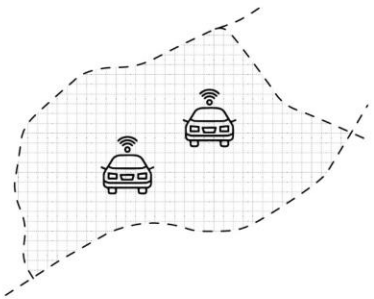

AVs would contribute to redevelop parking space and urban blocks

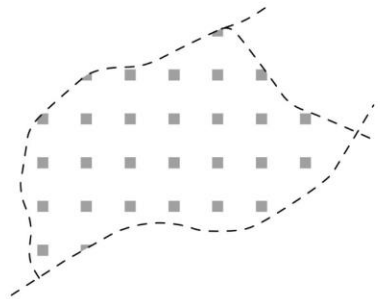
5 Design AV Parking System

Calculation for future AV parking space

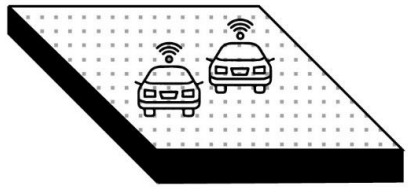
	Population in Almere center area	Car owner ship	Space for parking unit	Future AV parking space
Current (2018)	110,000	0.37 conventional car per people	30 m² for conventional car	
	↓ increase to 135%	↓ decrease to 35%	↓	
Future (2040)	148,500	0.16 AV per people	14 m² for AV	333,000 m²







AV parking system

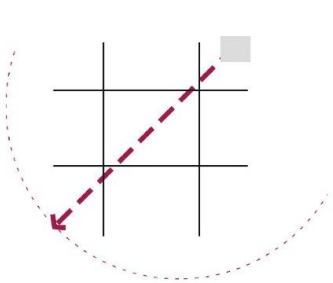


Total AV parking space
333,000 m²

50%

AV garage in periphery

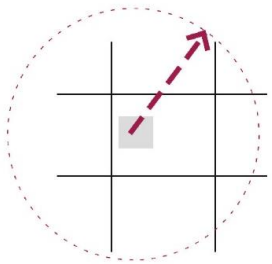
166,500 m²



40%

AV floor parking in community

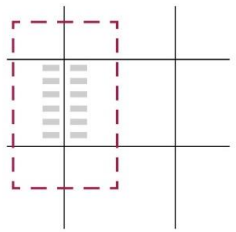
133,000 m²



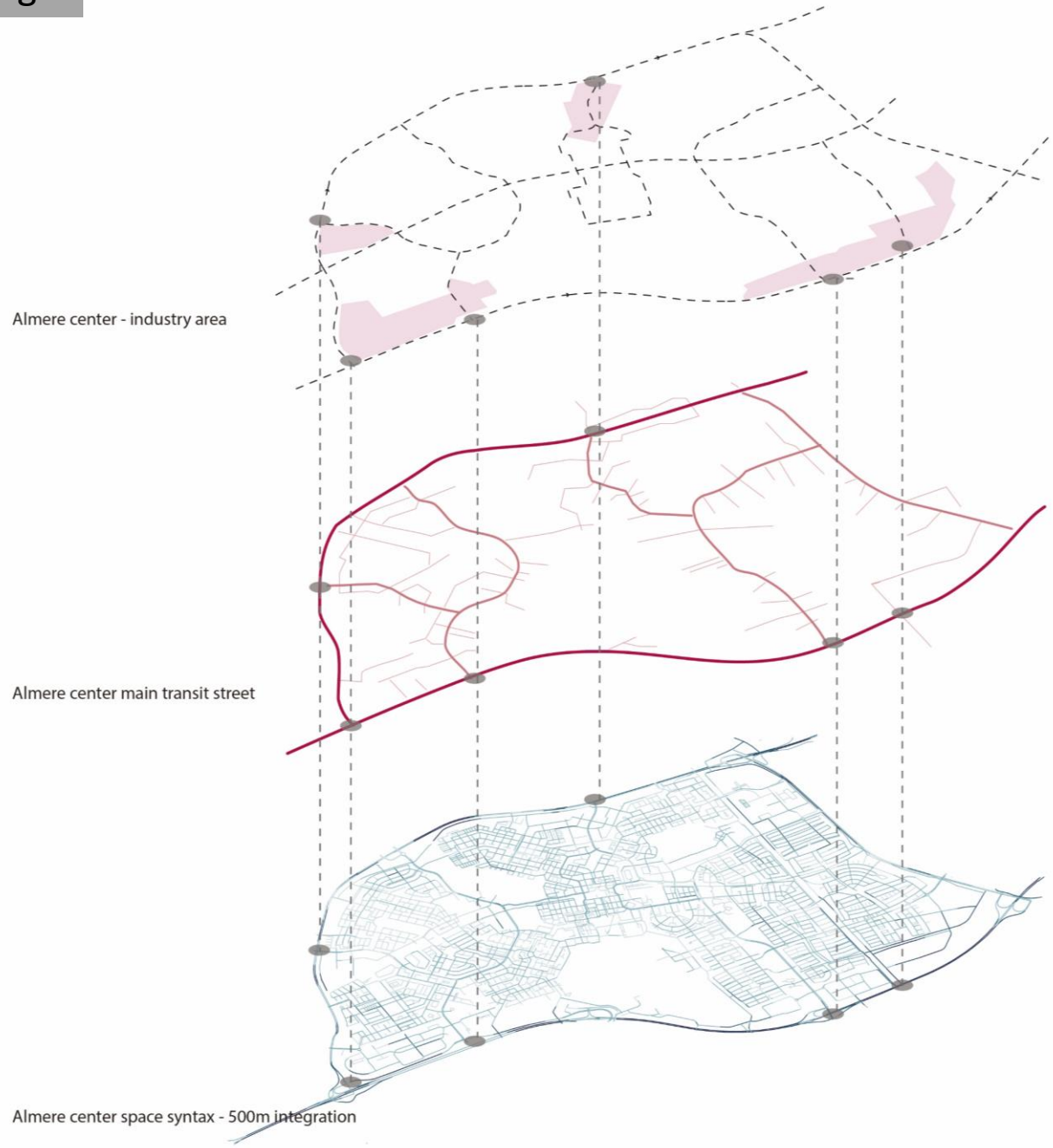
10%

AV private parking
(personal preference)

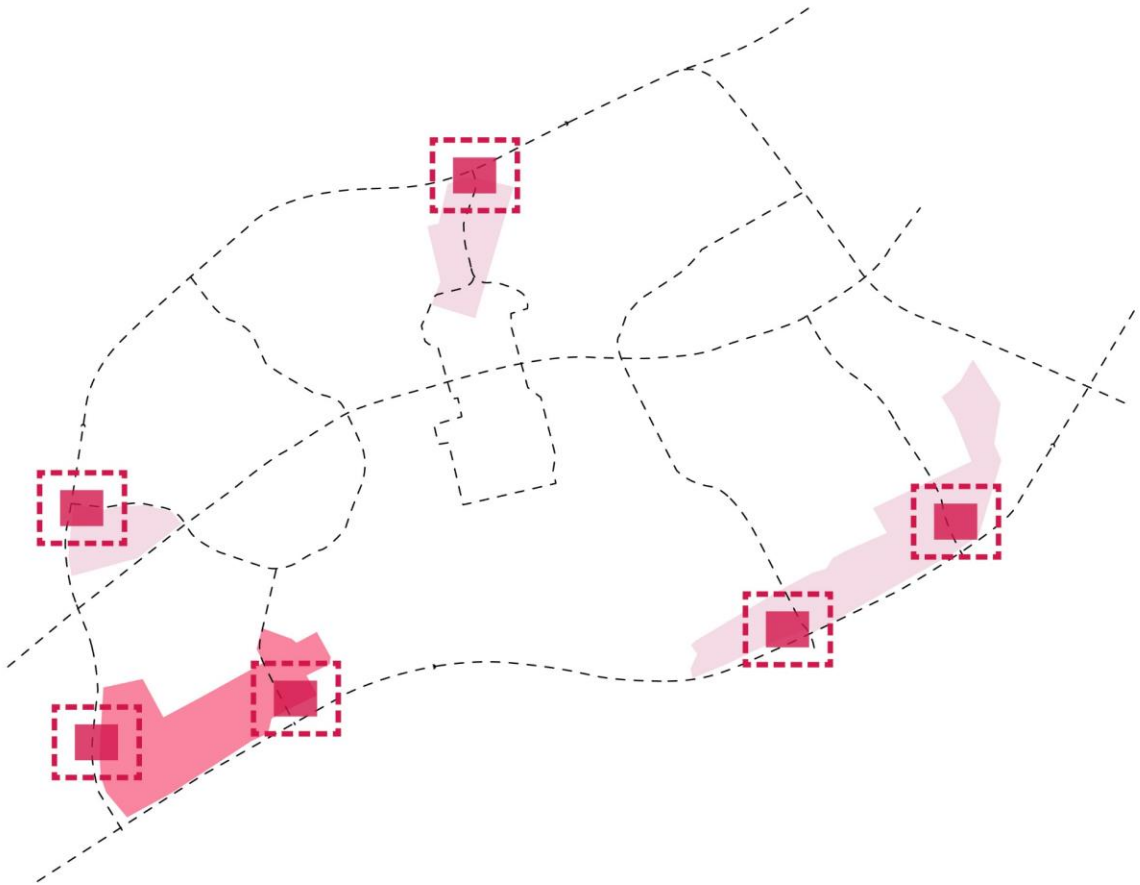
33,000 m²



Potential spots for AV parking garage



Scheme for AV garage in periphery

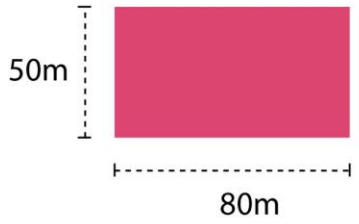


potential AV garage position
current industrial area
design area
main transit street
traffic dispersion flow

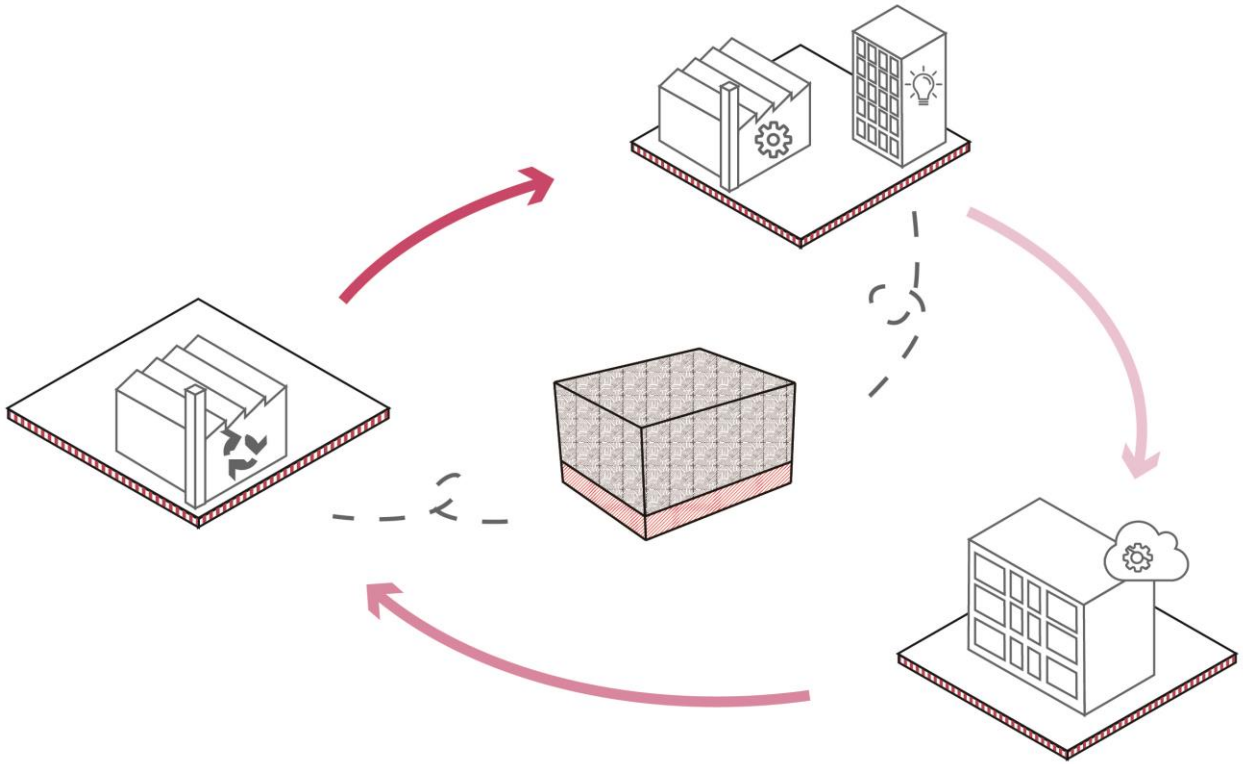
To place 166,500 m² AV parking garage

6 AV parking garage + 7 floor

4000 m² floor area in average



Automotive industry transformation



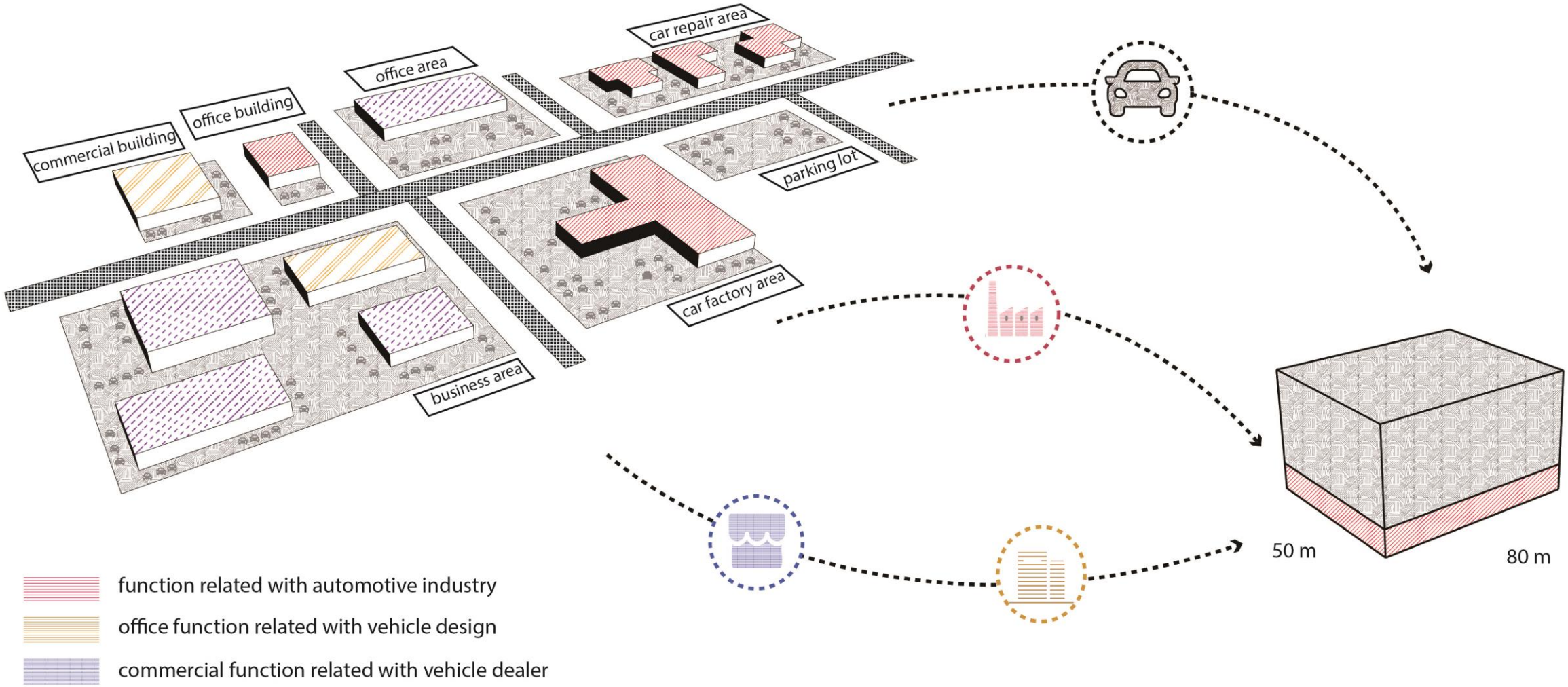
automobile researcher and designer

AV production industry

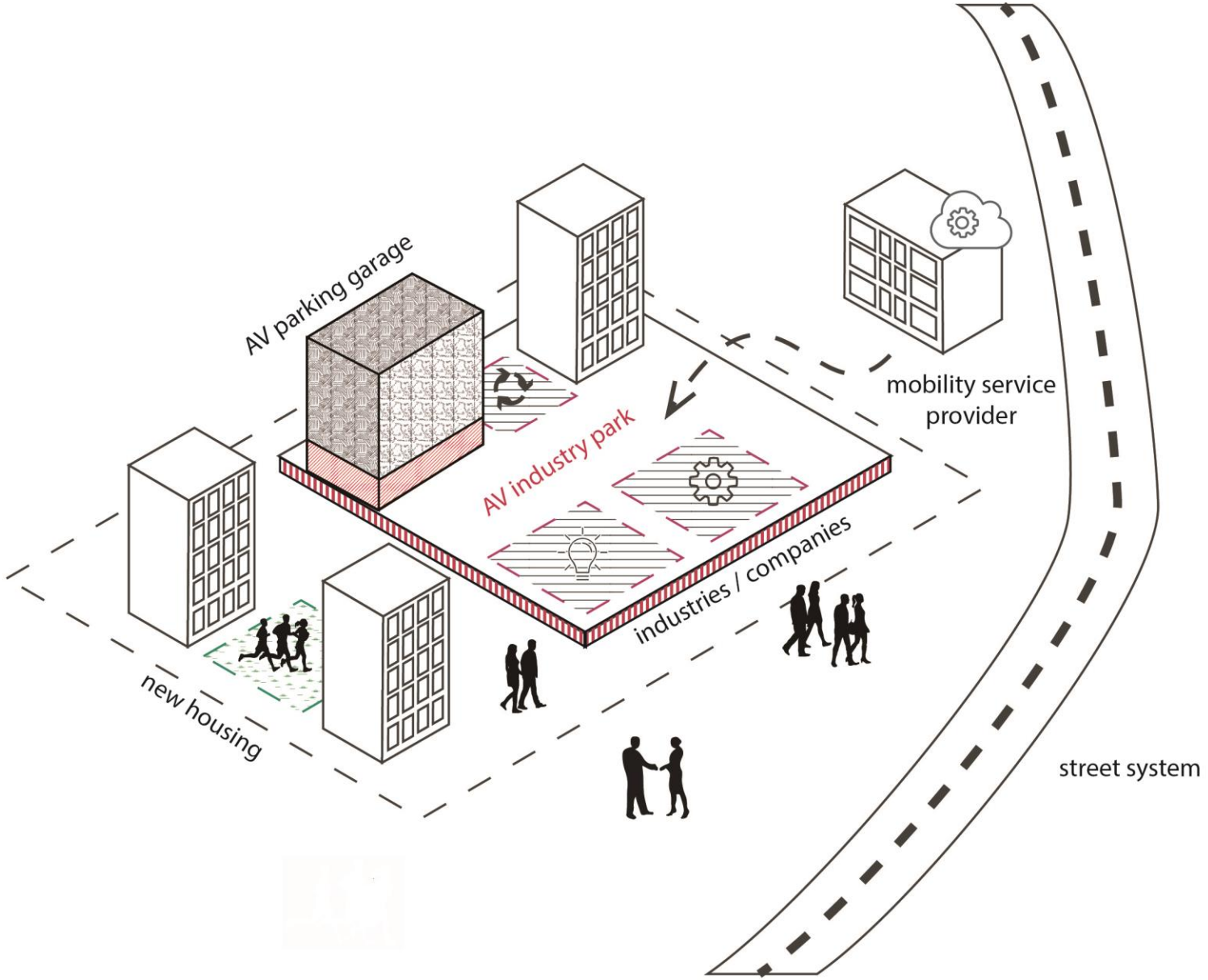
AV repair and maintainence industry

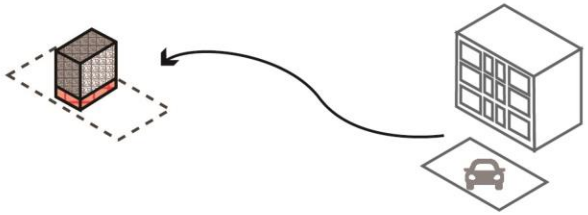
Mobility service provider

Automotive industry transformation

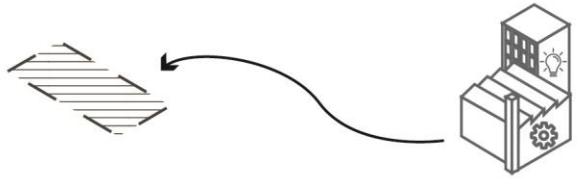


Scheme for AV industry park



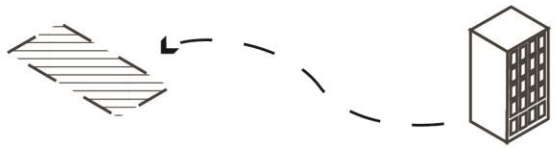


- replacement of current parking function and automobile production



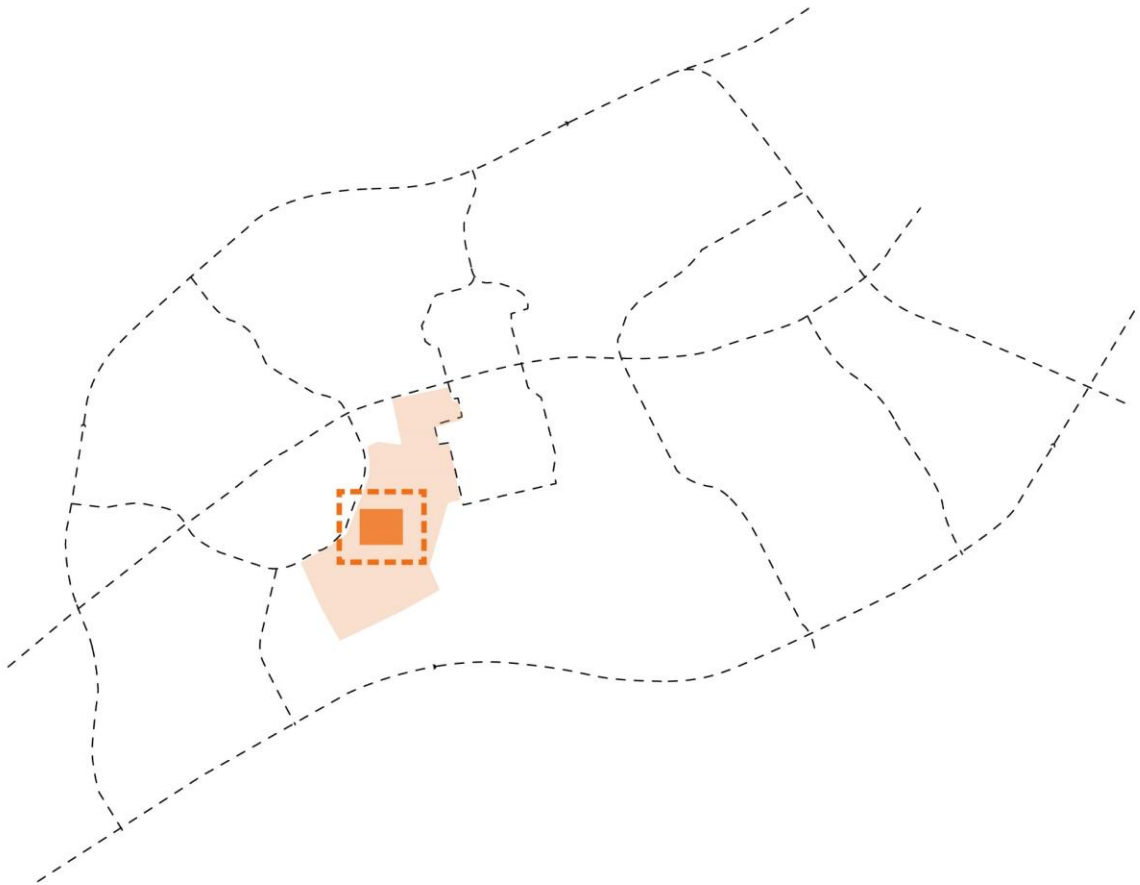
- appearance of the new industrial chain for automated vehicles

- involvement of mobility service provider



- compact development for housing project

AV floor parking in community



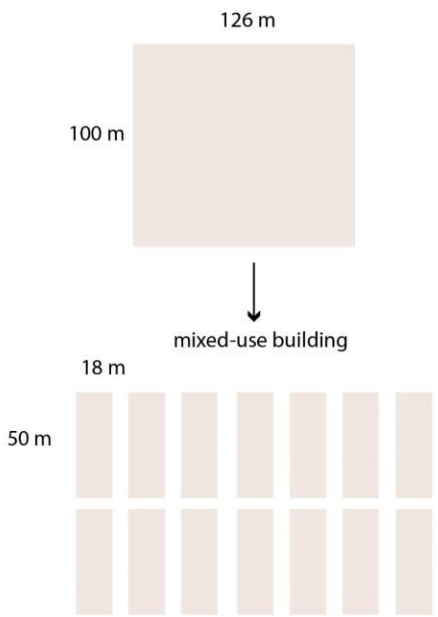
potential AV floor parking position

Stedenwijk neighborhood

Total AV floor parking in Almere center communities
133,000 m²

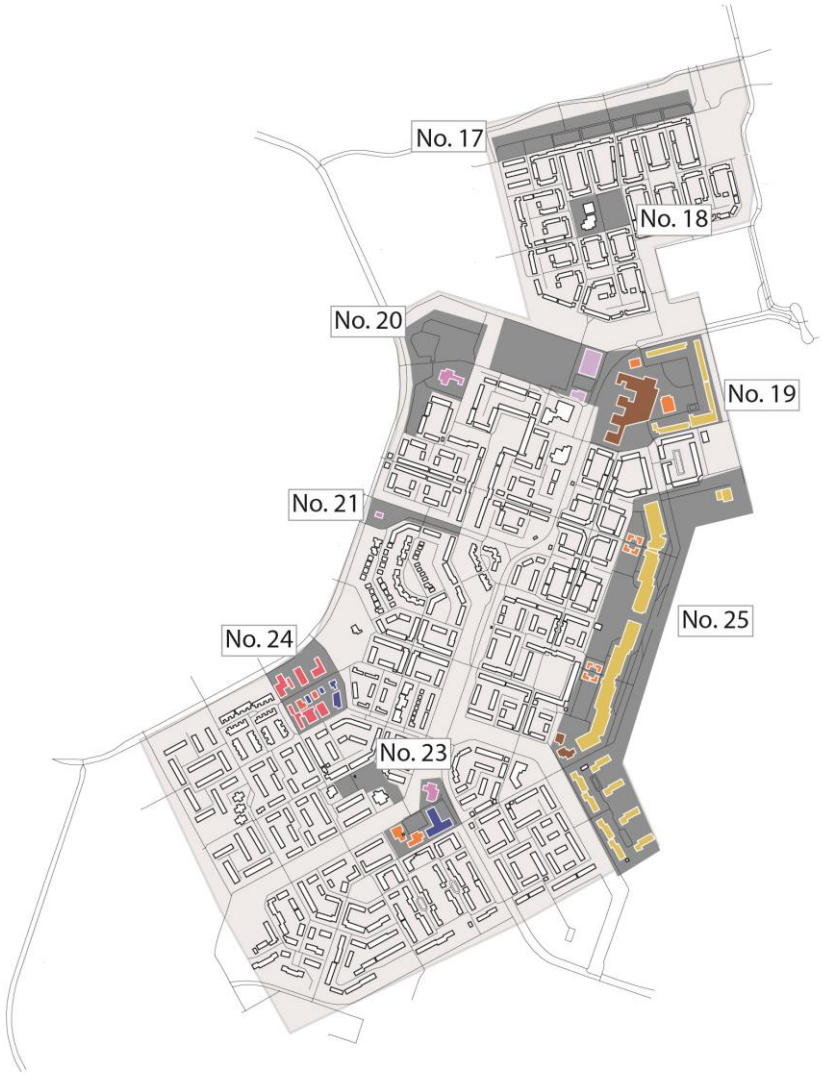
Population percentage 9.5%

To place 12,600 m² AV floor parking in design area



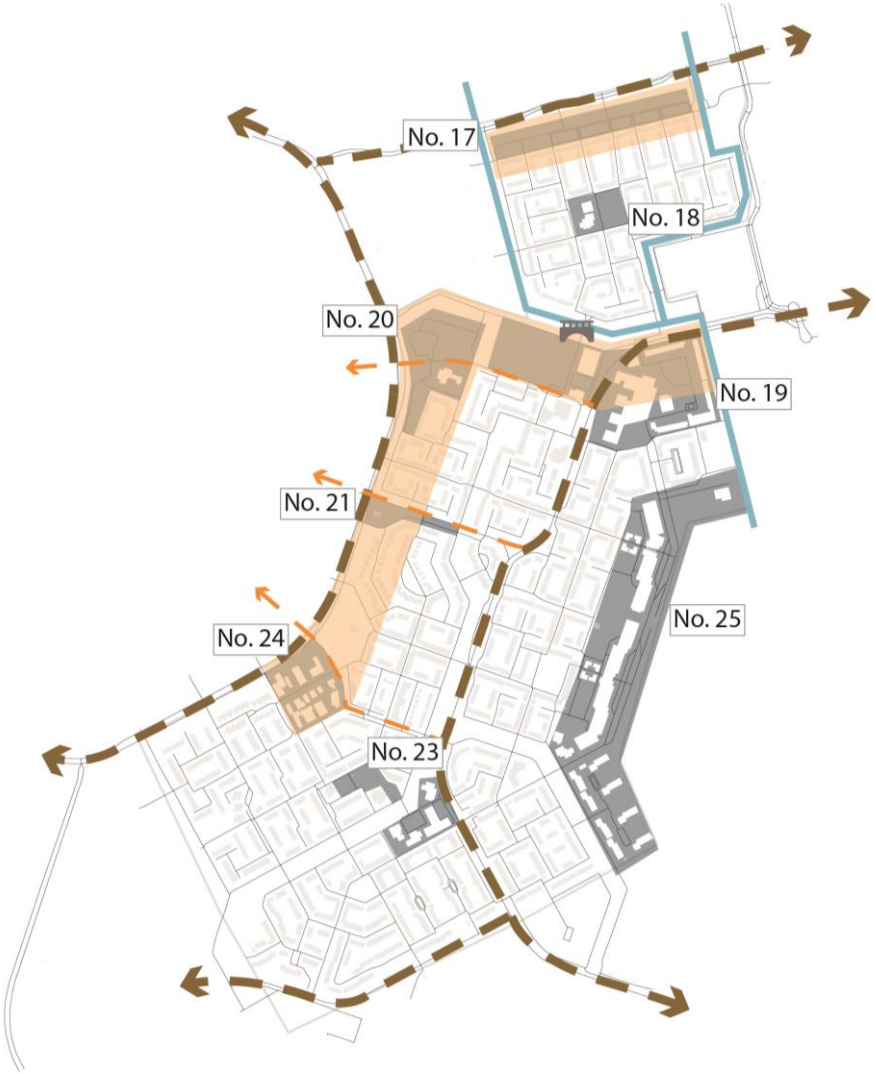
Aerial image for design neighborhood

Function analysis of redevelop blocks



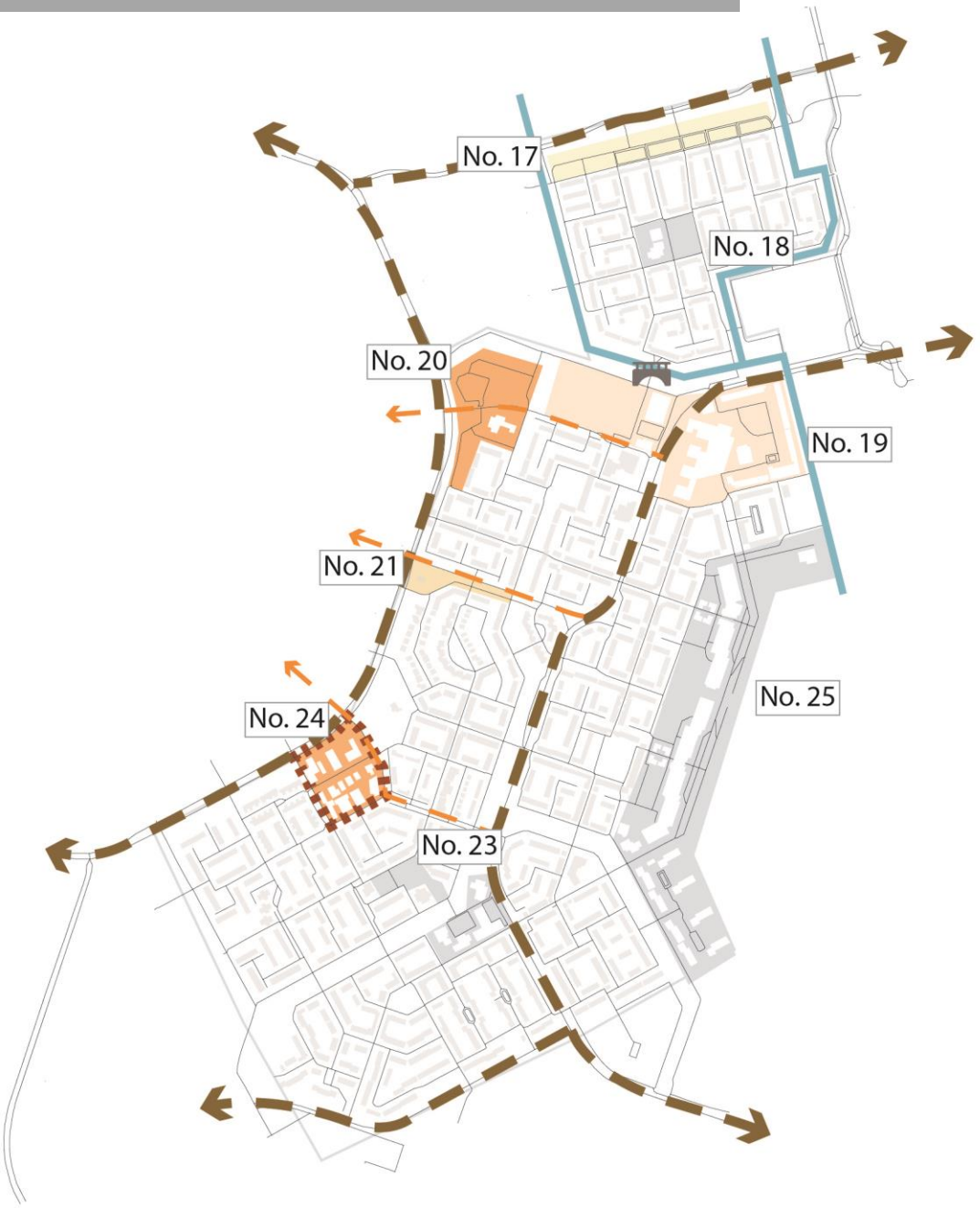
residential function
multiple public function
educational function
healthcare function
industrial function
shops function
office function
sports function

Traffic condition analysis



main street - neighborhood access
internal street - local access
basic street system
canal system
bridge
redevelop block
high value area for traffic efficiency

Possible position for AV floor parking



	Service range	Current function	Redevelop space for building surface (㎡)
No. 24 mix border			20000 * 35% = 7,000
No. 20 mix border			26000 *35% = 9,100
No. 21 community parking			5000 * 50% = 2,500
No. 19 mix border			83000 *35% = 29,050
No. 17 community parking			12000 *35% = 4,200

main street - neighborhood access

internal street - local access

basic street system

bridge

canal system

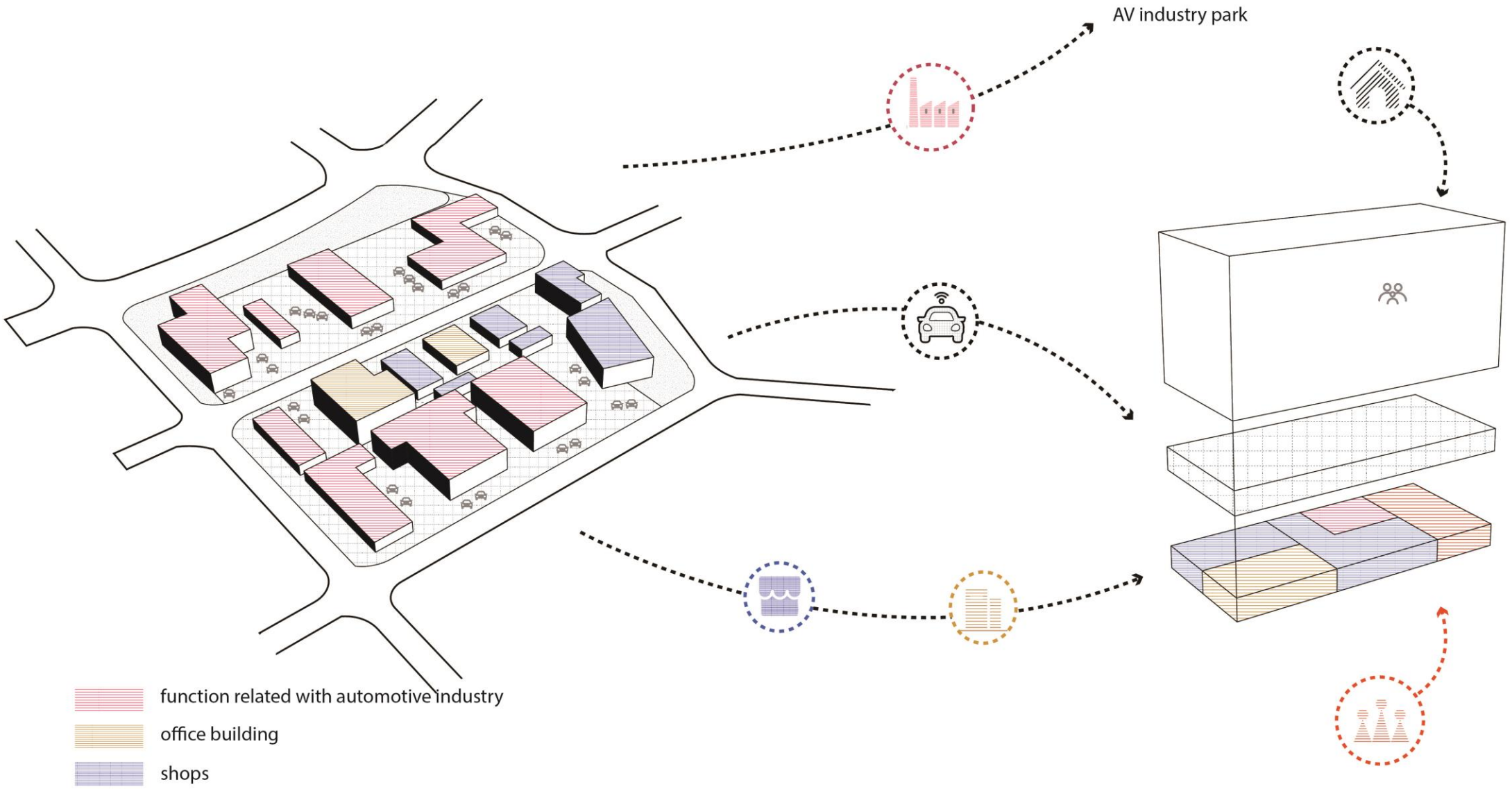
low — high

value to place mixed-use building with AV floow parking

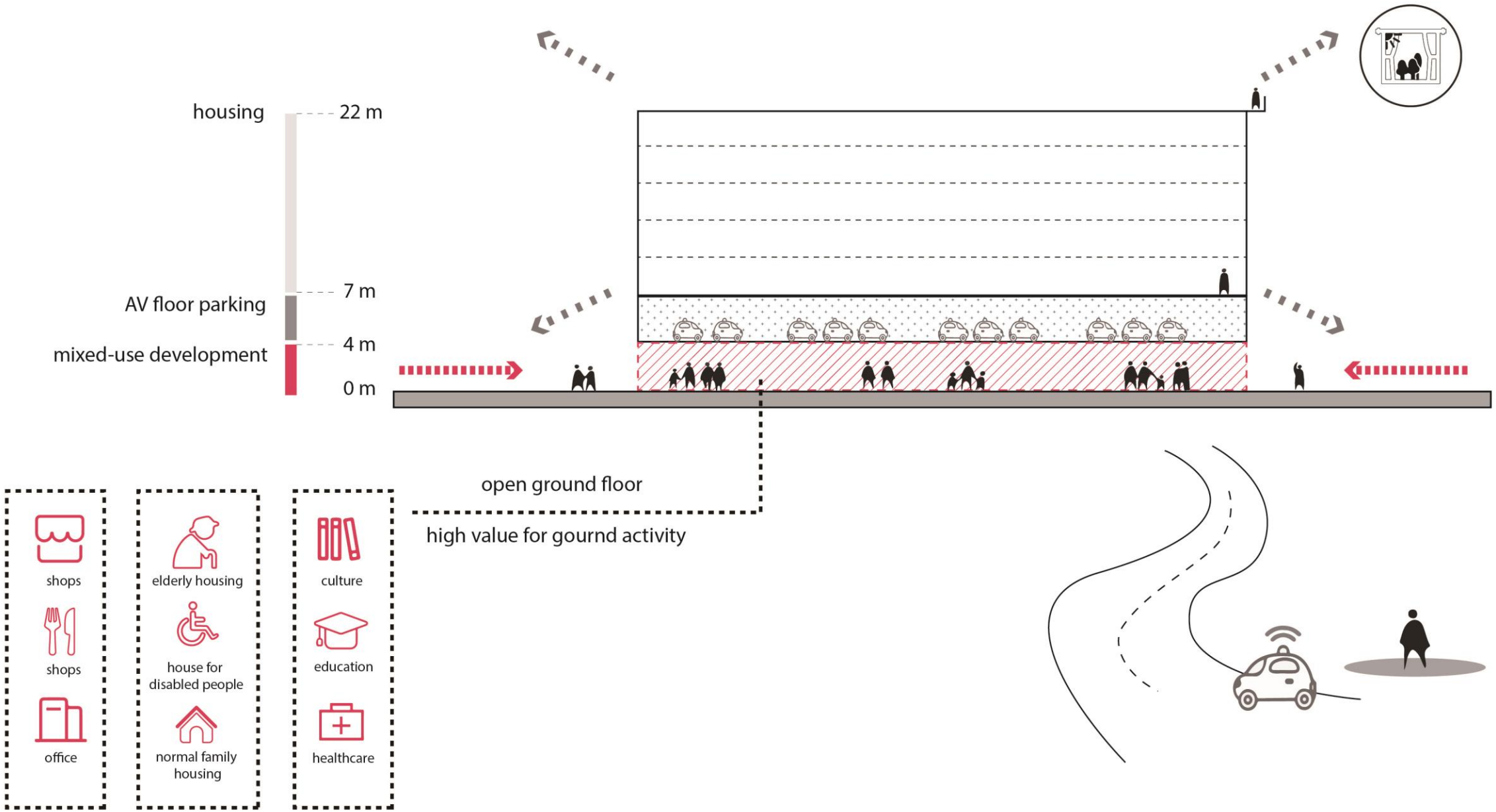
transform parking function

design area

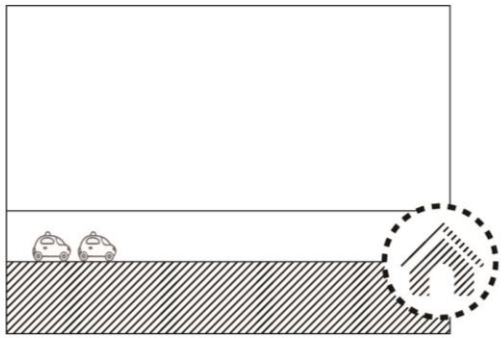
Function transformation



Building function design

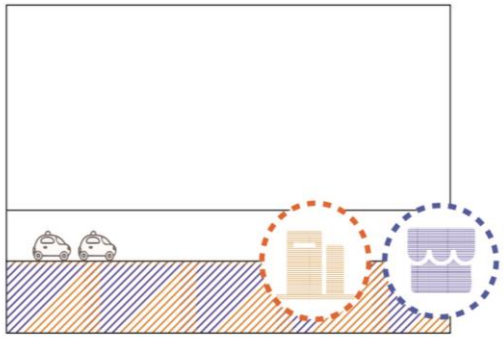


Mixed land use



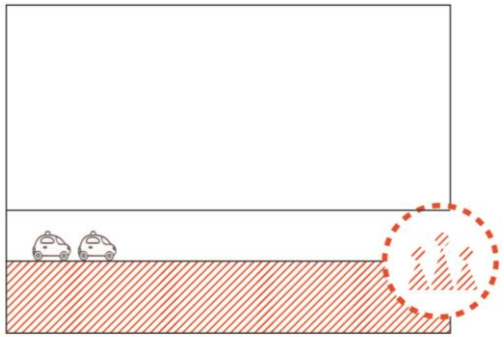
residential fucntion

- elderly housing
- house for disabled people
- normal family housing



mixed-use residential building
with commercial fucntion

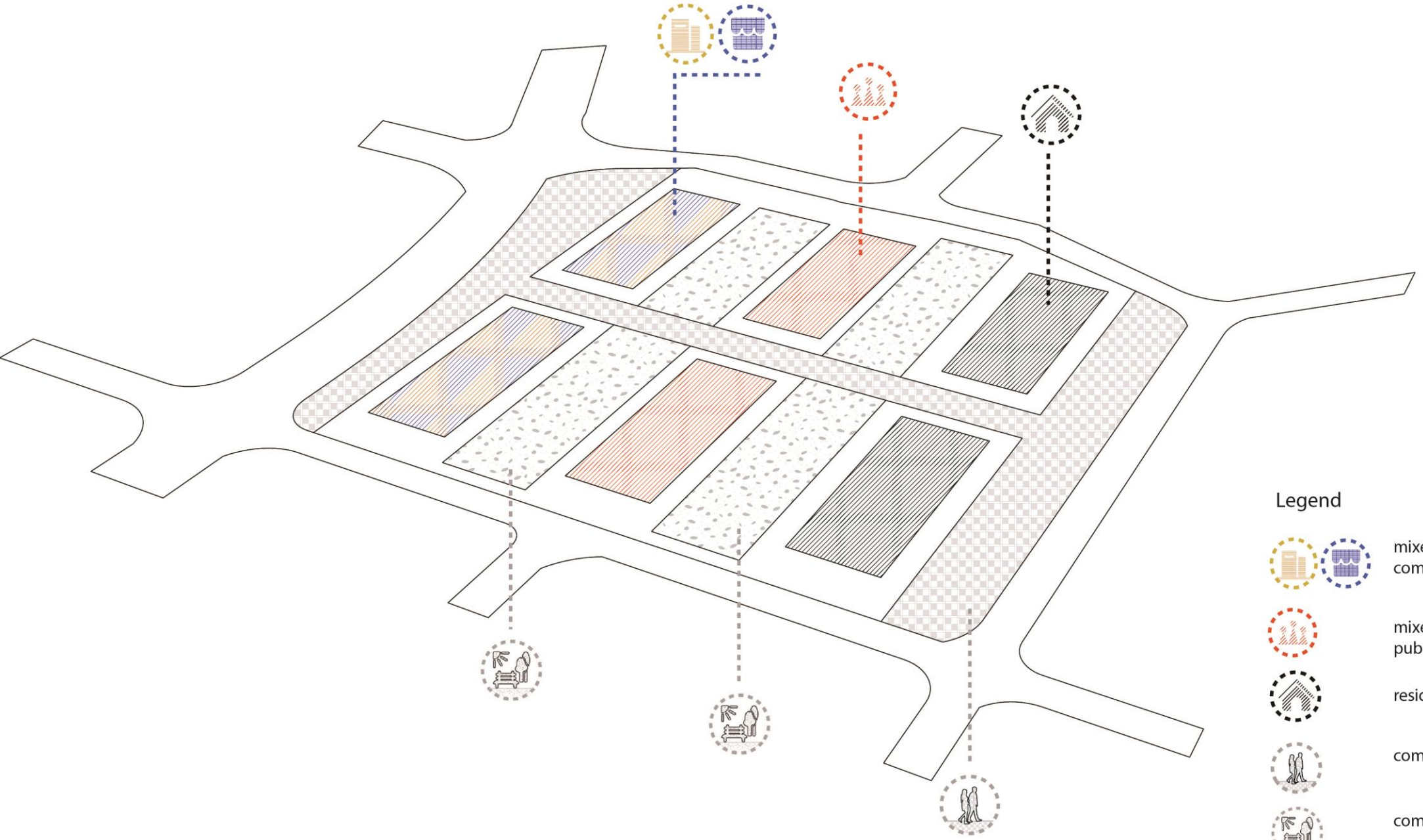
- shops
- restaurant
- office
- start-ups



mixed-use residential building
with public fucntion

- health care
- education
- cultural center
- entertainment

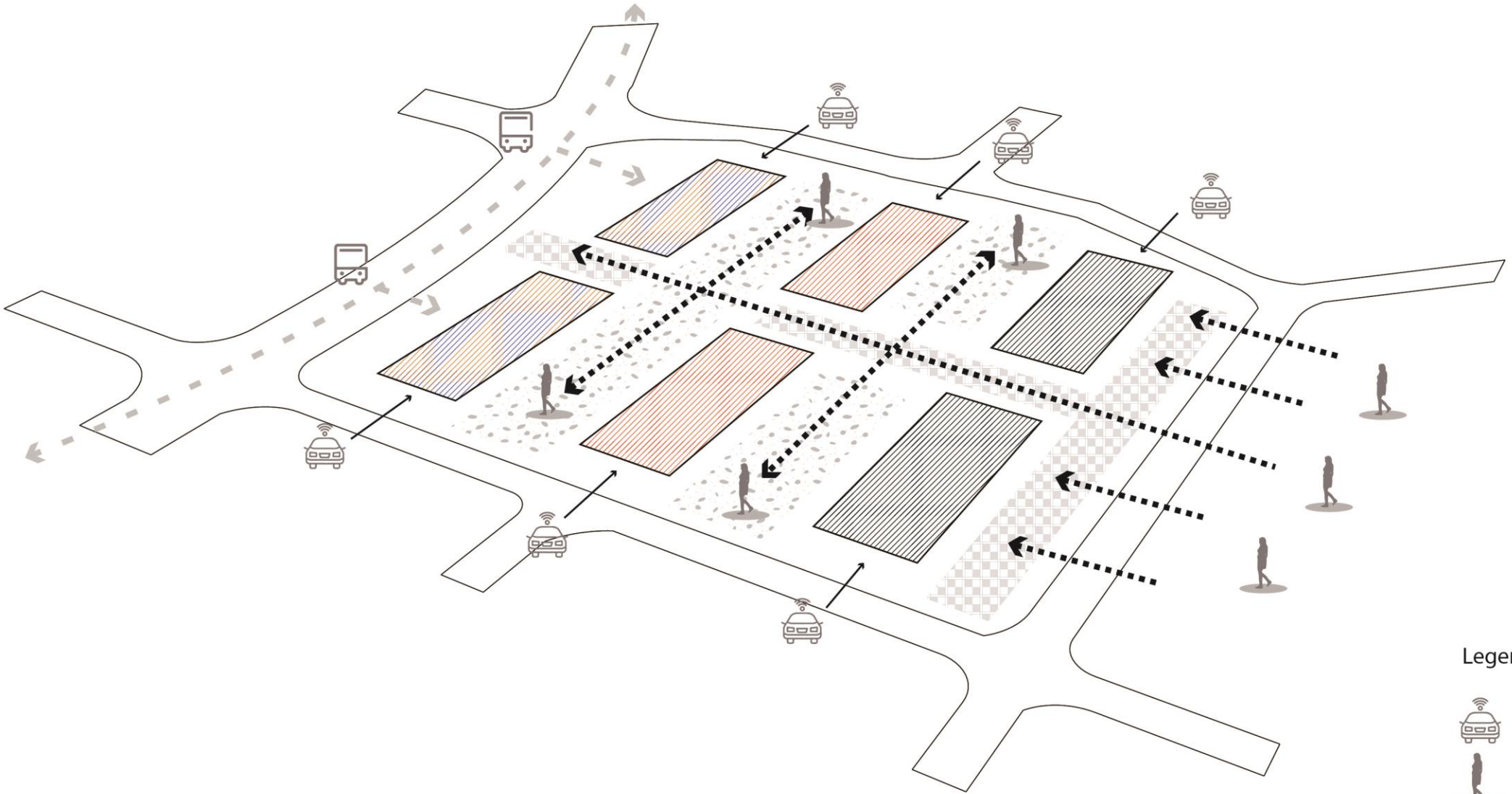
Mixed land use



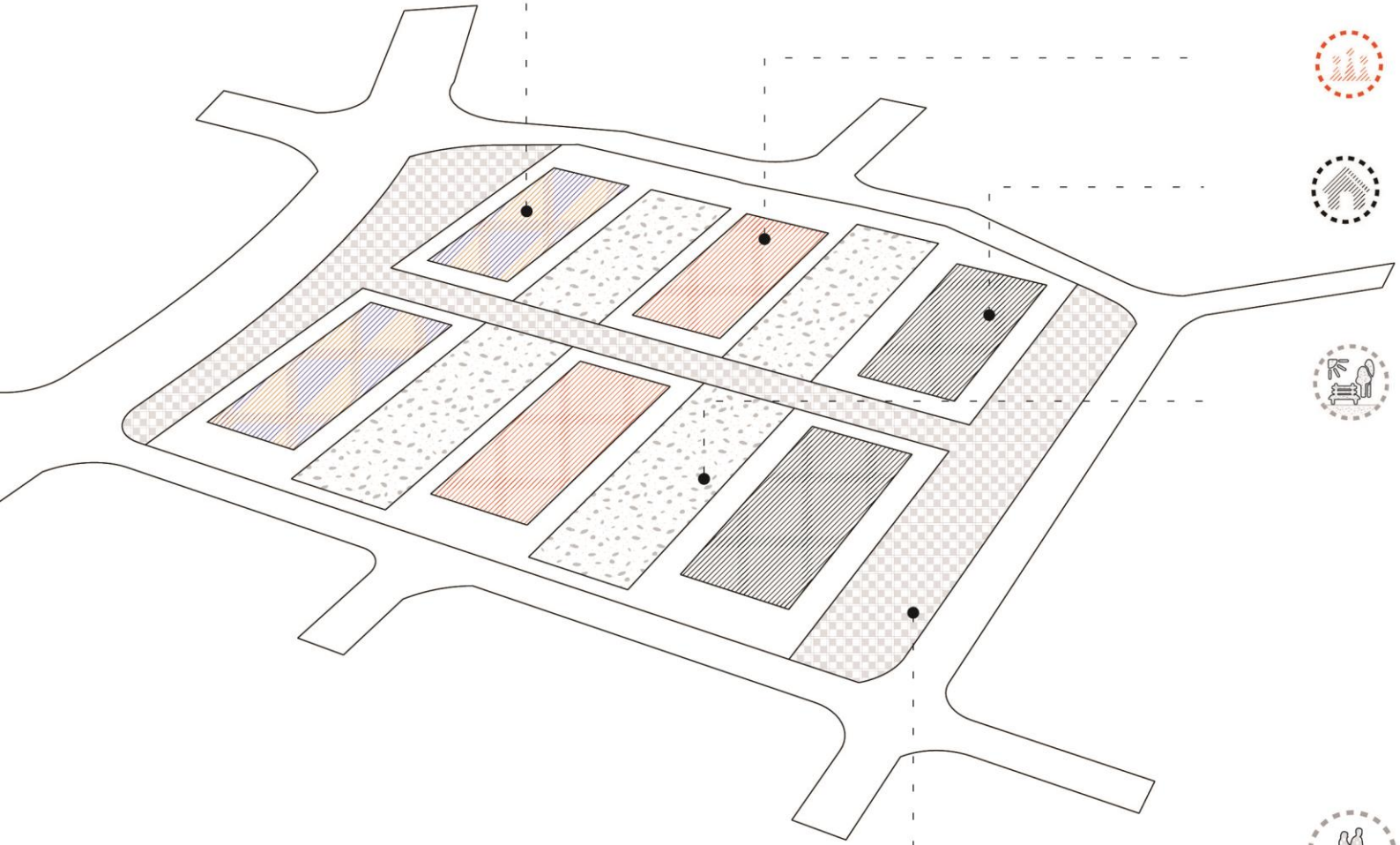
Legend

- mixed-use residential building with commercial fucntion
- mixed-use residential building with public fucntion
- residential building
- community pavements
- community open space

Traffic flow analysis



Diverse indoor and outdoor activities



commercial function

office

cafe

public function

healthcare

community library

day care

residential function

roof garden

open space

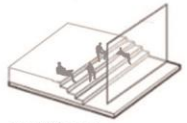
playgrounds

sports courts

exercise circuit

garden

sculptures


amphitheater

picnic area

performance space

community activity space

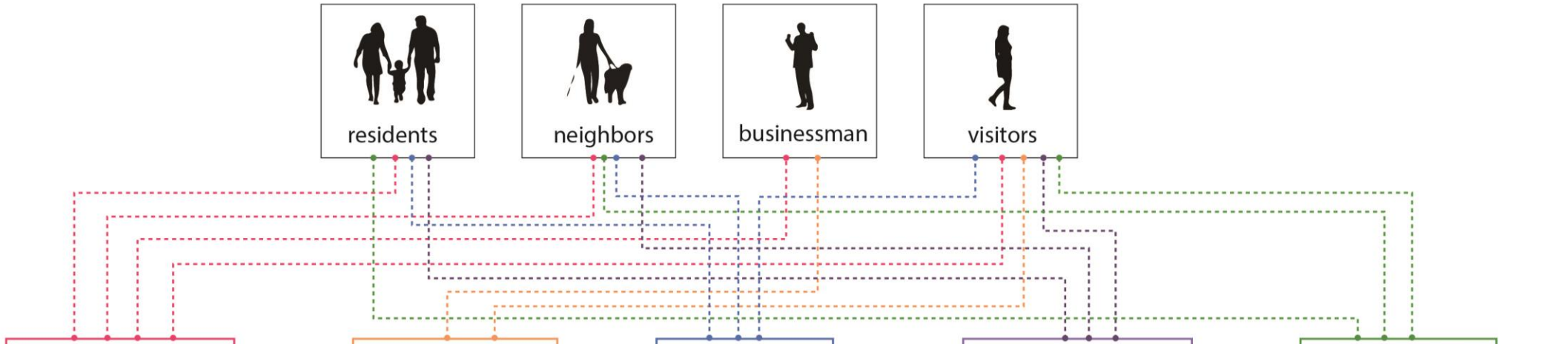
pavement

drop-off area

jogging

cycling

Actors and activity programs



- cafe
- street store
- fast food
- shopping

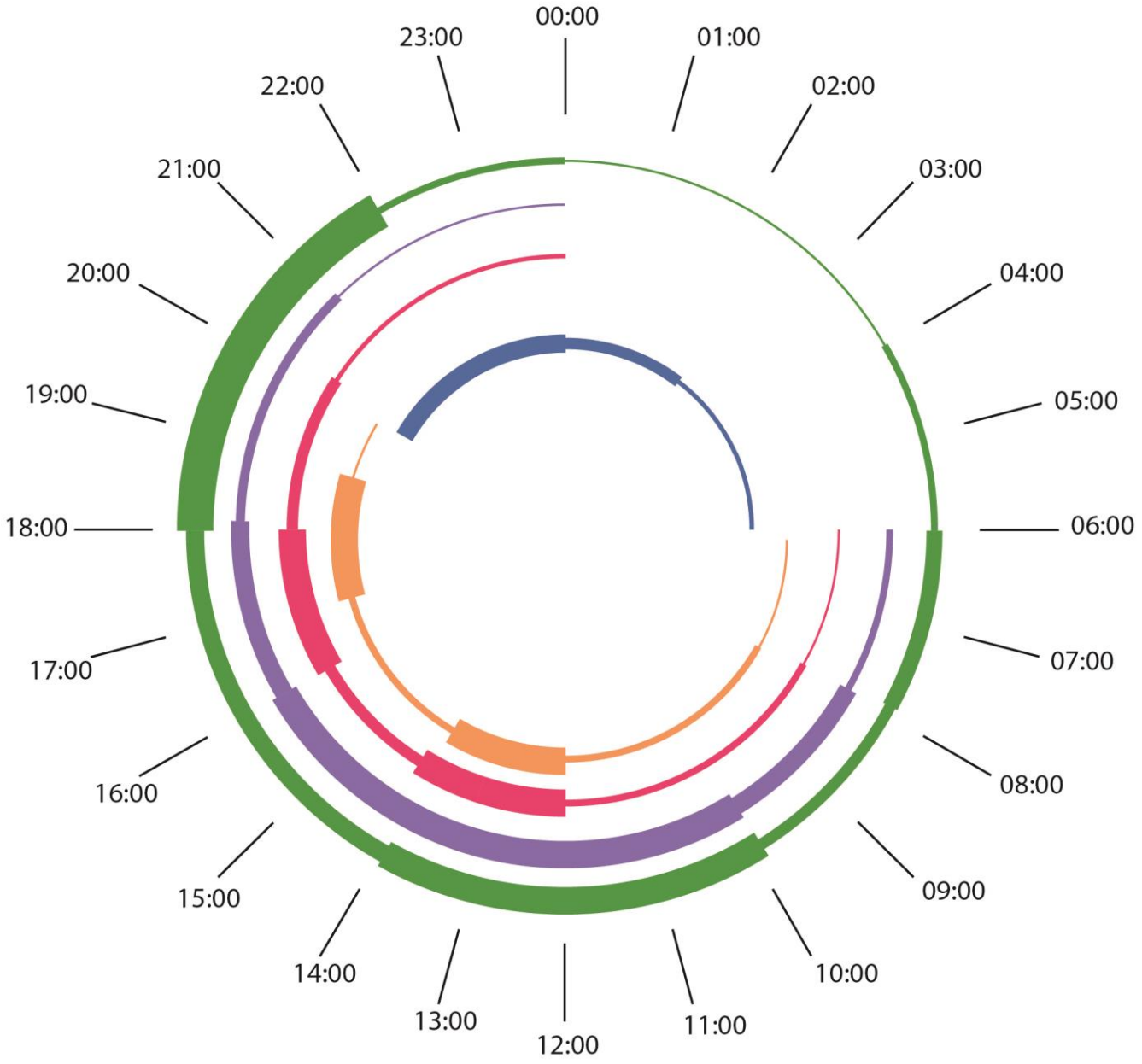
- start-ups
- business exchange
- local business

- night lectures
- community movie night
- community quiz night

- childcare and day care
- community library
- community celebration
- healthcare service
- local exhibition
- artistic performance
- give and take market

- garden visit
- children recreational activities
- family party
- barbeque / picnic
- outdoor workouts
- jogging
- cycling
- walking

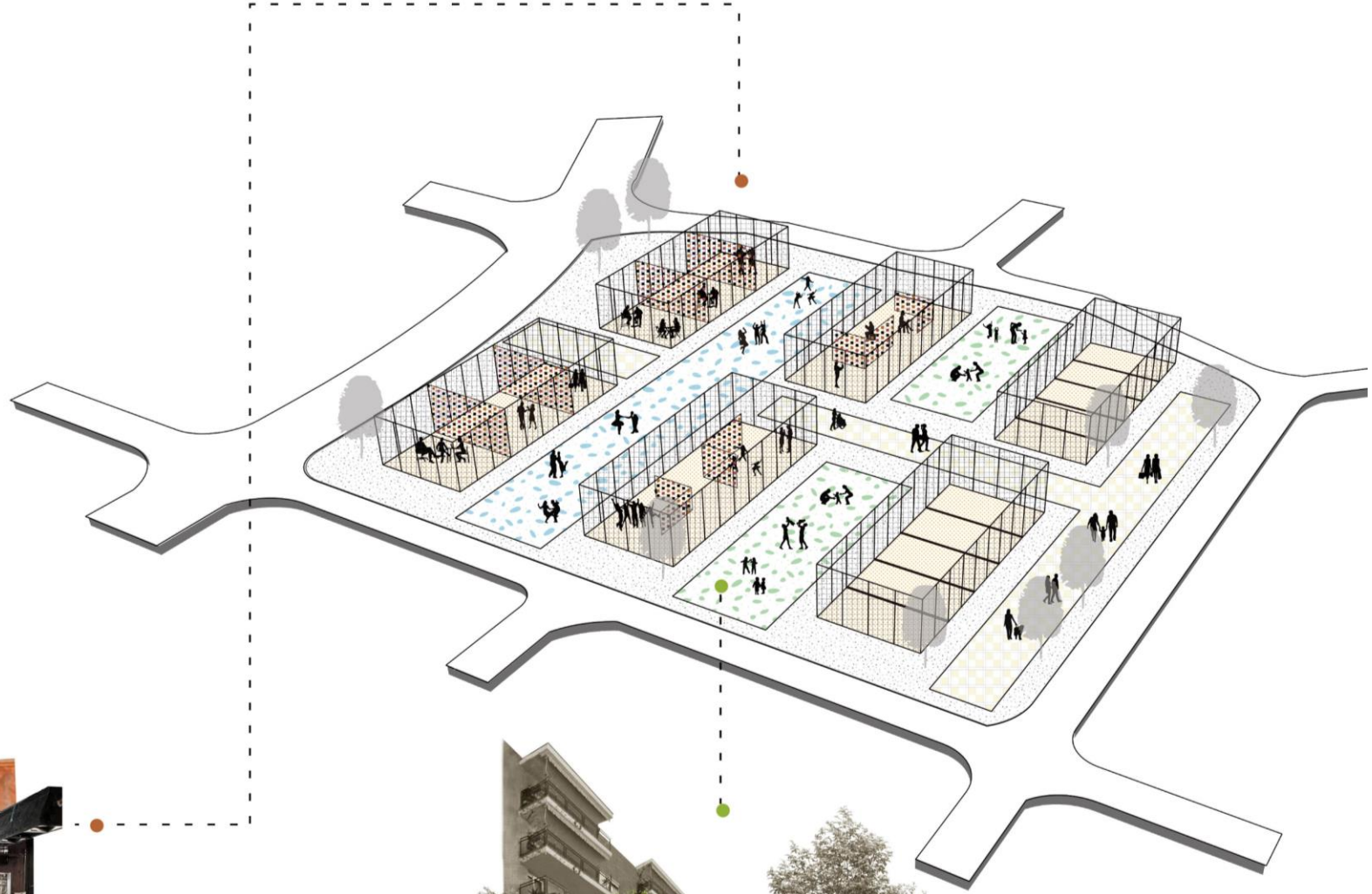
Dynamic activity programs all day long



Legend

- Commercial activities
- Business activities
- Night activities
- Community activities
- Outdoor activities

Activity design



THANKS FOR LISTENING