METROPOLITAN VIRUS

A strategic planning framework to improve the resilience of the Metropolitan Region Amsterdam in the aftermath of the COVID-19 pandemic

P5 Presentation | Yaqi Wang | 5089131 | Masters Thesis | Msc Urbanism | TU Delft

2018

Fig. 2.2.9. Prosperous city of Amsterdam. Source: www.european-business.com, 2018.

2020

Fig. 2.2.10. Quiet city of Amsterdam. Source: www.amsterdam.nl, 2020.

What makes the world vulnerable to COVID-19?

What can planners do to solve this problem and improve the urban resilience to pandemics?

TABLE OF CONTENTS

1 | INTRODUCTION

SARS

Zika

H1N1

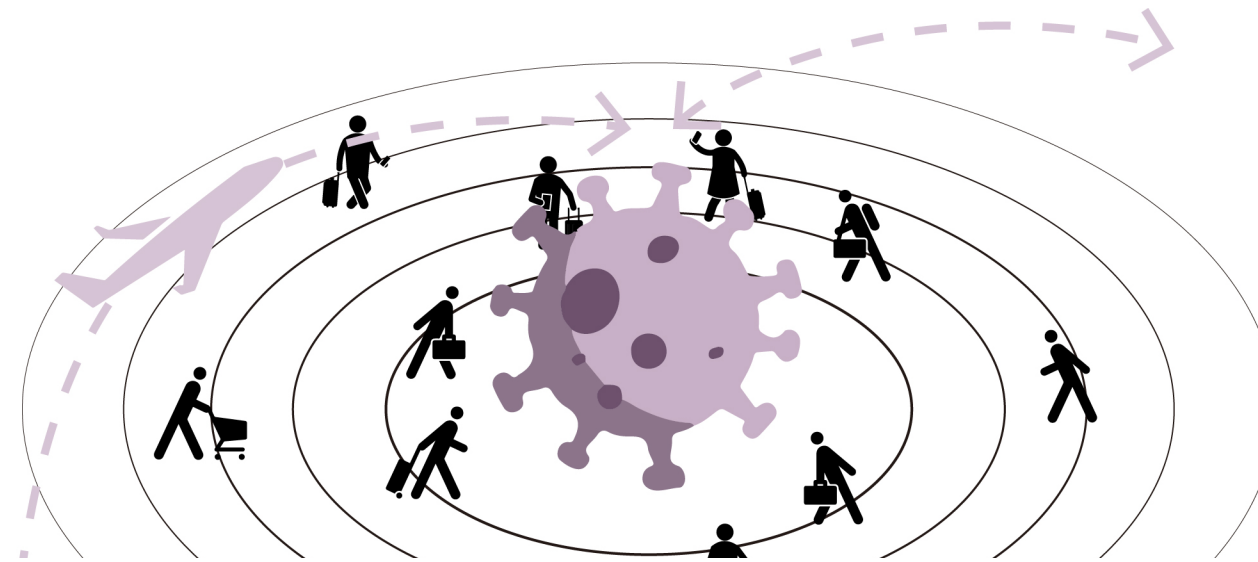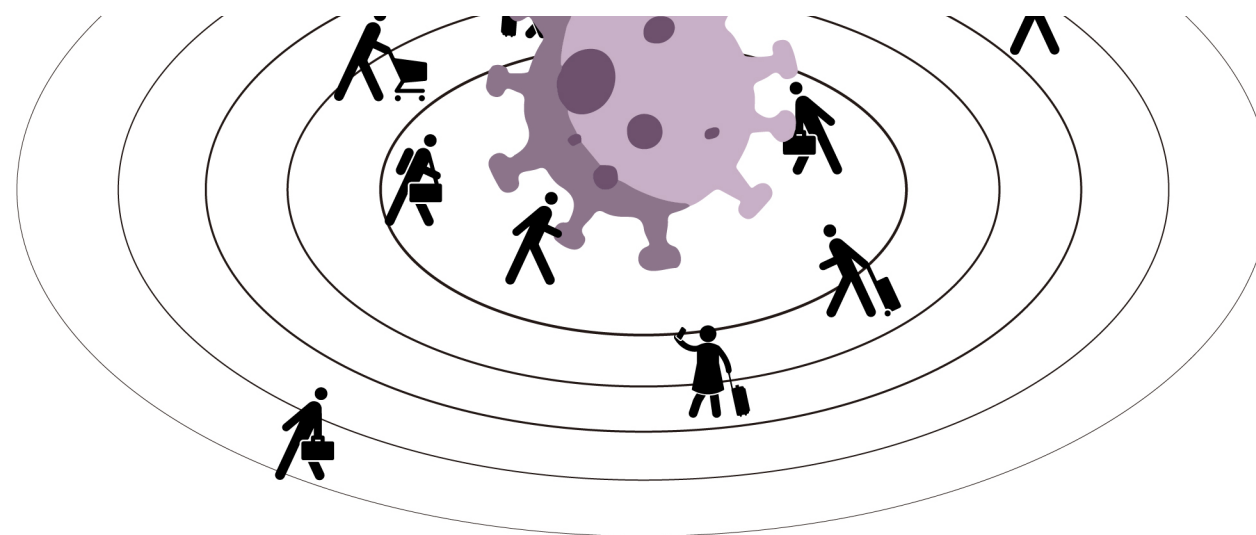"Just as we have got used to the idea that metropolises are good for us, we find ourselves confronted by a global pandemic that exposes their inherent vulnerability." (Clark, 2020)

Fig. 1.1.1. Motivation diagram of the project. Made by author.

1.1 Metro Areas and COVID-19

As of 7:00 pm CEST, 11 May 2021, there have been 158,651,638 confirmed cases in 220 countries, resulting in 3,299,764 deaths (CSSE, 2021).

Corona cases March 2020

>10,000

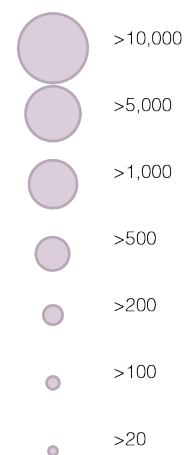>5,000

>1,000

>500

>200

>100

>20

Fig. 2.1.4. Corona cases in European cities until March 2020.
Made by author by data source from official municipalities

Amsterdam

Berlin

London

Paris

Milan

Madrid

Rome
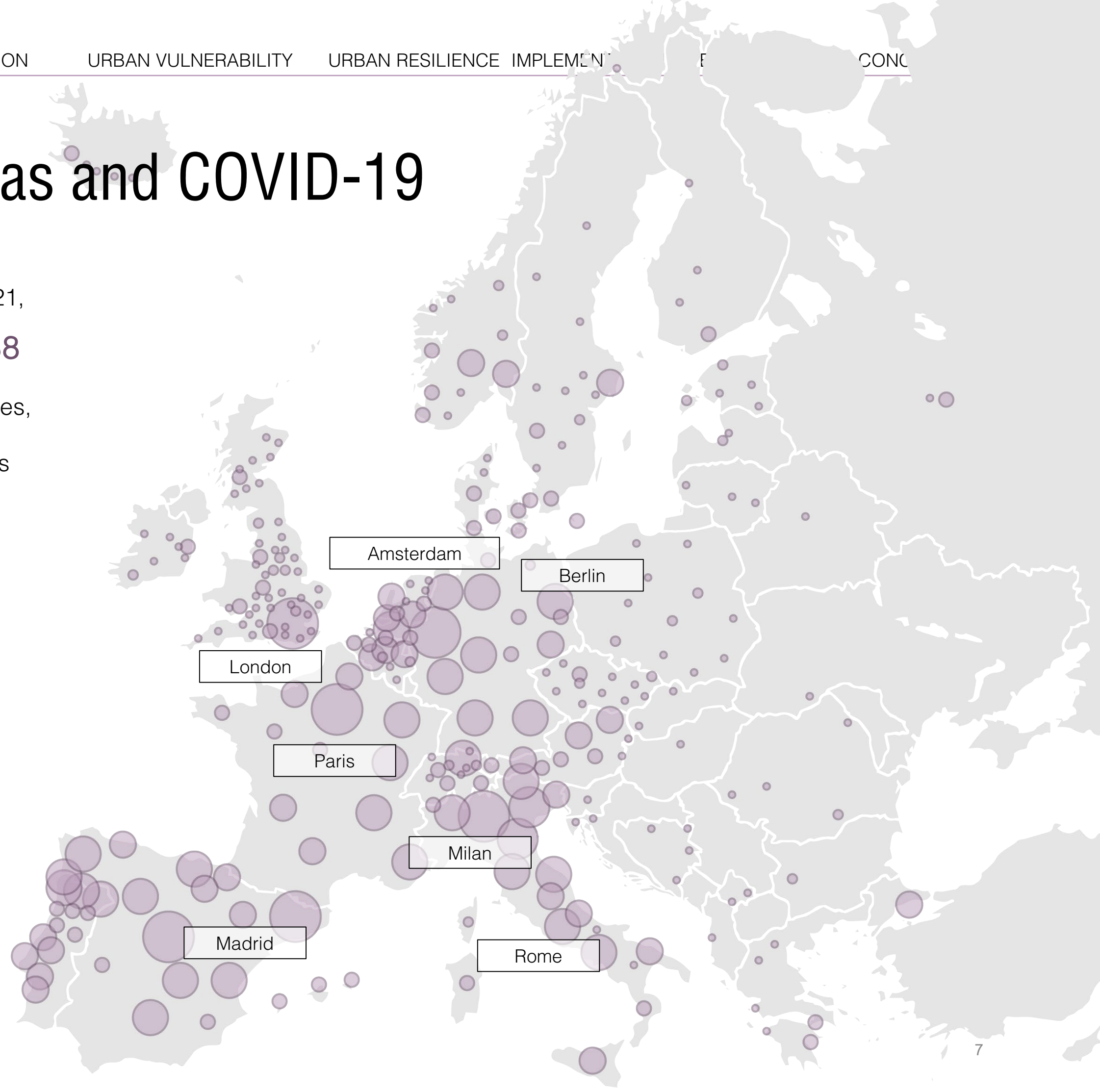
1.2 Metropolitan Region Amsterdam (MRA)

• Impact of COVID-19

MRA has become one of the most seriously attacked regions including around 10% confirmed cases of the Netherlands (GGD, 2020).

Percentage of bankruptcies from 2018 to 2020

Fig. 2.2.6. Percentage of bankruptcies of the Netherlands from January 2018 to July 2020. Made by author based on data source: CBS, 2020.

Fig. 2.2.3. Global trajectories of the coronavirus. Illustrated by author based on RIVM.

1.2 Metropolitan Region Amsterdam
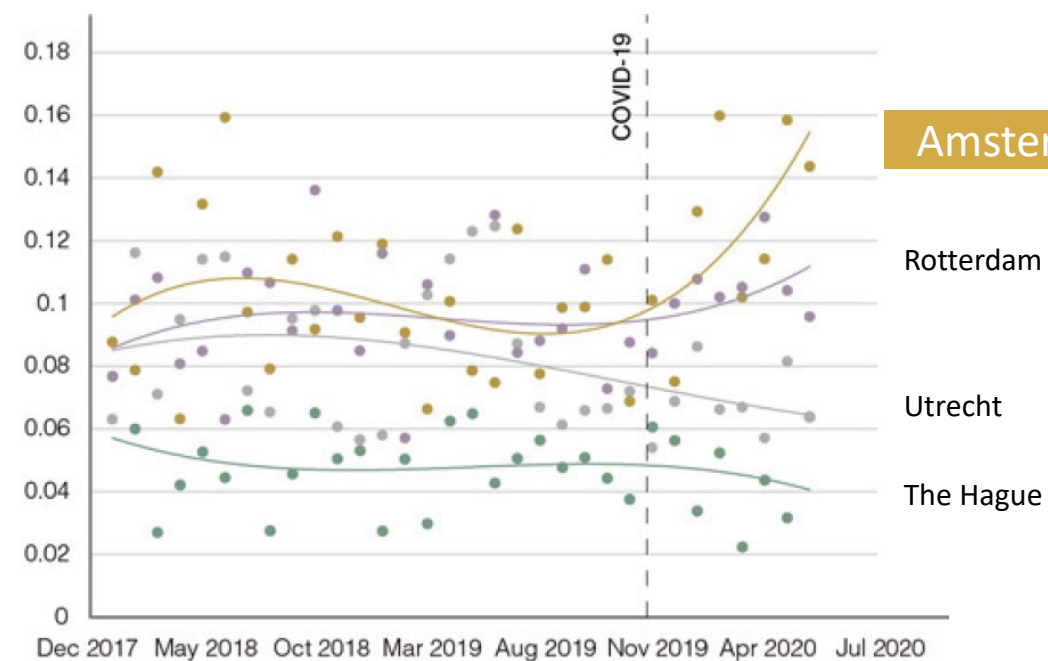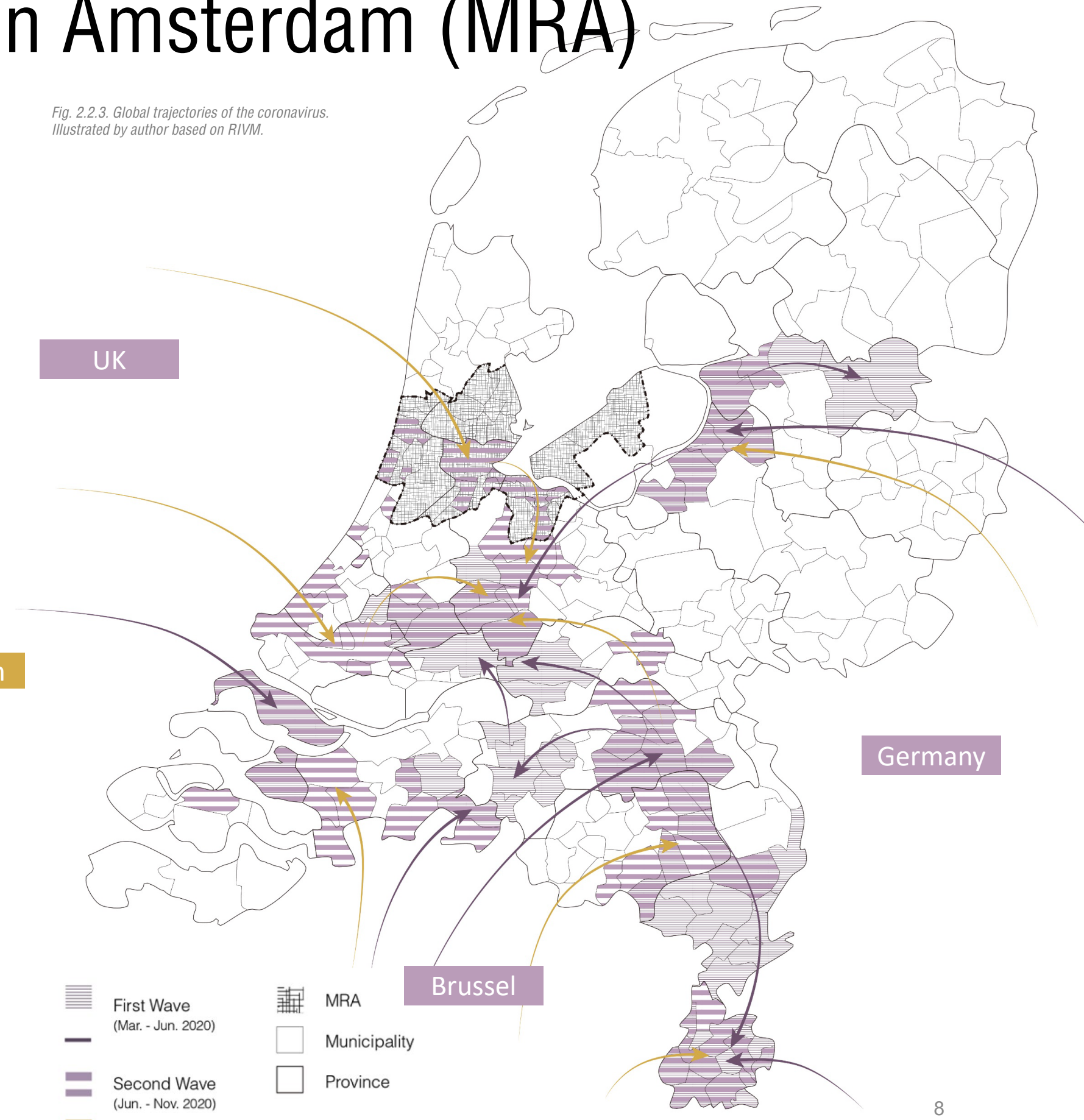
• Policy Responses

Short term:

Intelligent Lockdown

→ Emergency strategies are not sustainable due to the negative impacts.

Long term:

Doughnut Economic Model

→ The general model cannot respond quickly from bottom-up, and ignores the role of technology.

Social Foundation	Ecological Ceiling
Water	Climate change
Food	Ocean acidification
Health	Chemical pollution
Education	Nitrogen & phosphorus loading
Income & work	Freshwater withdrawals
Peace & justice	Land conversion
Political voice	Biodiversity loss
Social equity	Air pollution
Gender equality	Ozone layer depletion
Housing	
Networks	
Energy	

Fig. 2.2.15. The Doughnut's social and planetary boundaries of Amsterdam. Illustrated by author based on iAmsterdam, 2020.
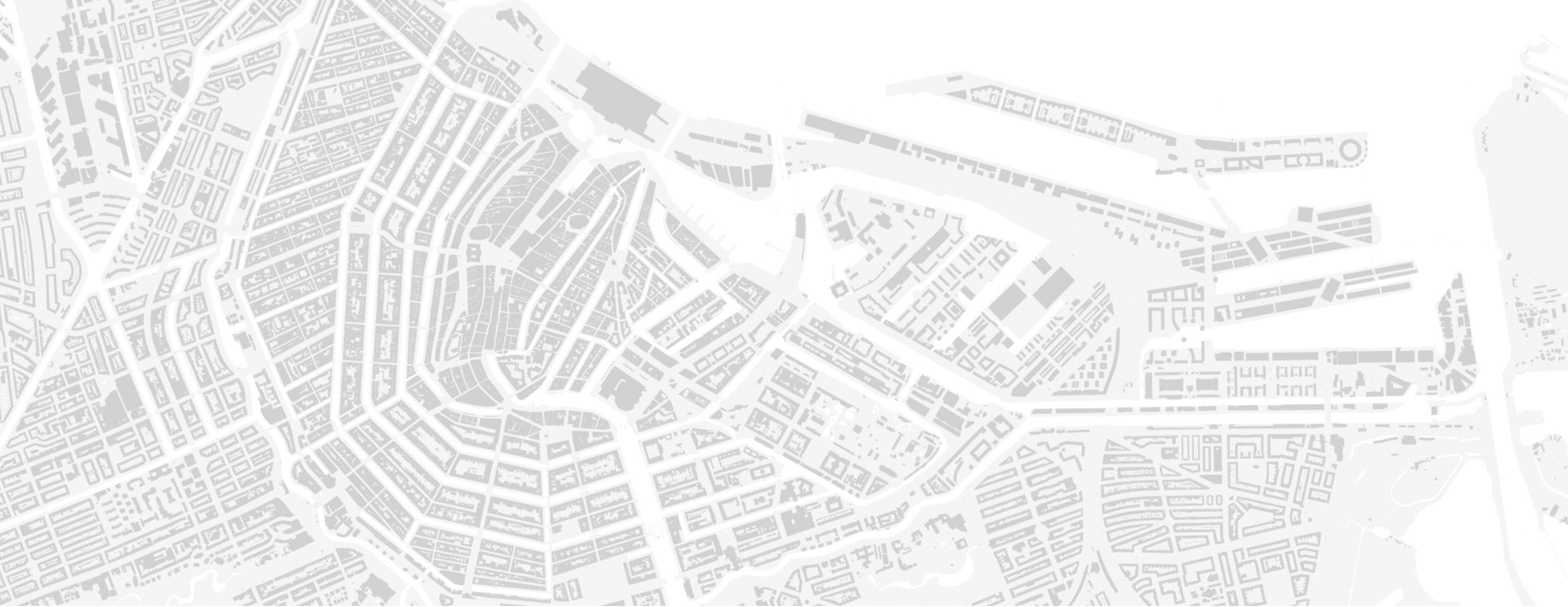
2 | PROBLEMATIZATION

2.1 Problem statement

Fig. 2.3.1. A vicious cycle of urban pandemic vulnerability. Made by author.

2.2 Research questions and aims

How can a **multi-scale** planning strategy in MRA **reduce the vulnerability** of the region to **global pandemics** to **improve the regional resilience** of various areas, groups, and institutions to COVID-19?
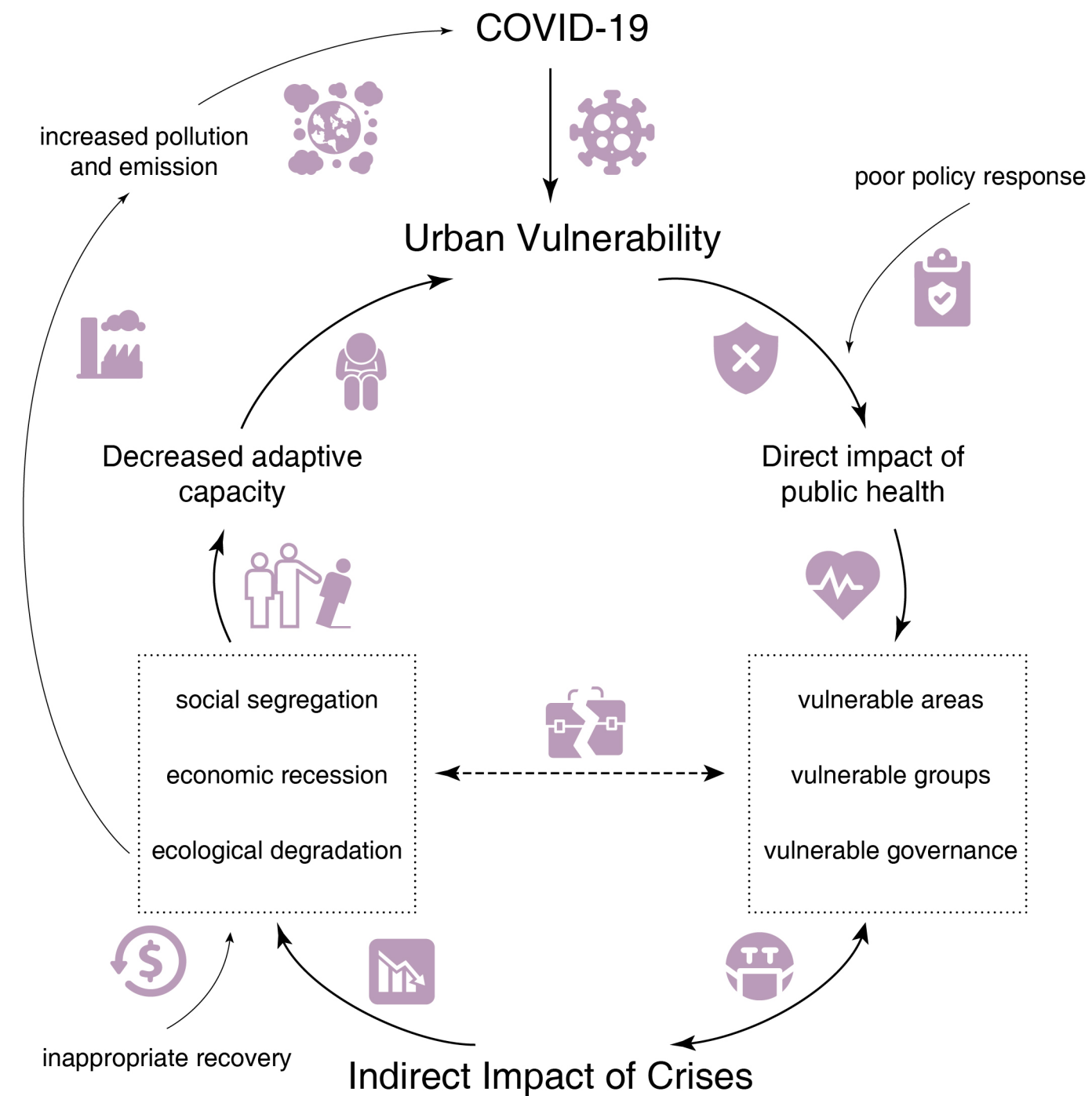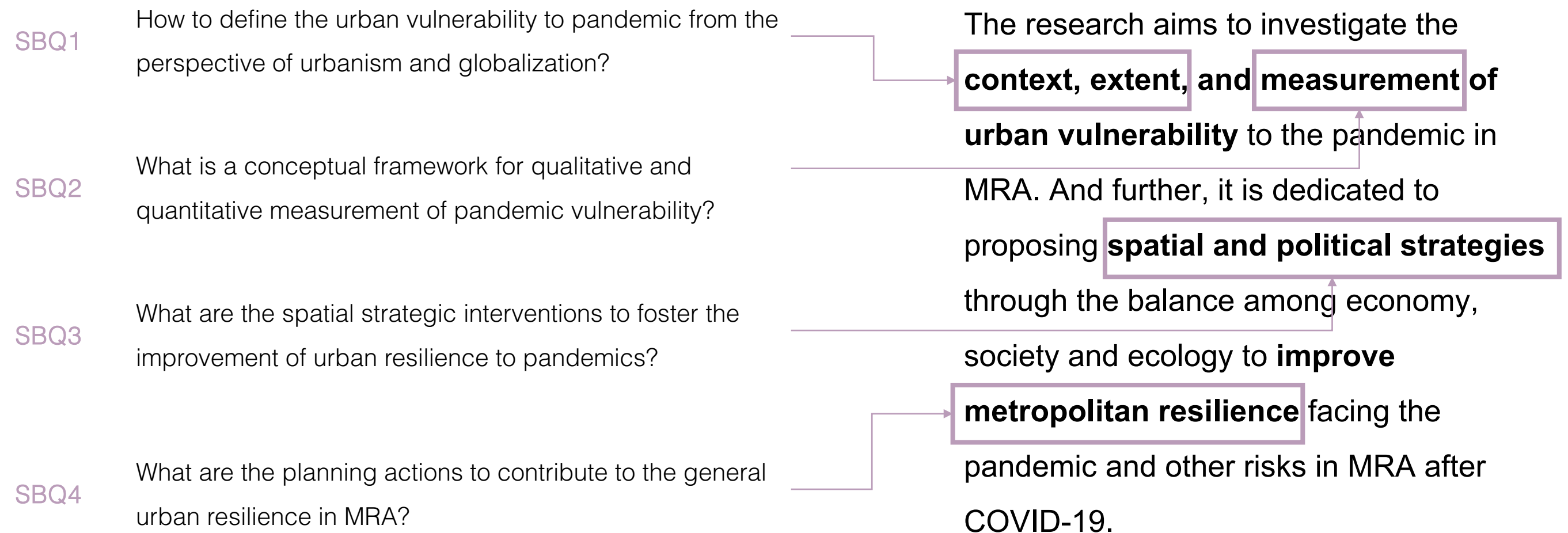
SBQ1 How to define the urban vulnerability to pandemic from the perspective of urbanism and globalization?

SBQ2 What is a conceptual framework for qualitative and quantitative measurement of pandemic vulnerability?

SBQ3 What are the spatial strategic interventions to foster the improvement of urban resilience to pandemics?

SBQ4 What are the planning actions to contribute to the general urban resilience in MRA?

The research aims to investigate the **context, extent, and measurement of urban vulnerability** to the pandemic in MRA. And further, it is dedicated to proposing **spatial and political strategies** through the balance among economy, society and ecology to **improve metropolitan resilience** facing the pandemic and other risks in MRA after COVID-19.

2.2 Research questions and aims

How can a **multi-scale** planning strategy in MRA **reduce the vulnerability** of the region to **global pandemics** to **improve the regional resilience** of various areas, groups, and institutions to COVID-19?

SBQ1   How to define the urban vulnerability to pandemic from the perspective of urbanism and globalization?

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SBQ3   What are the spatial strategic interventions to foster the improvement of urban resilience to pandemics?

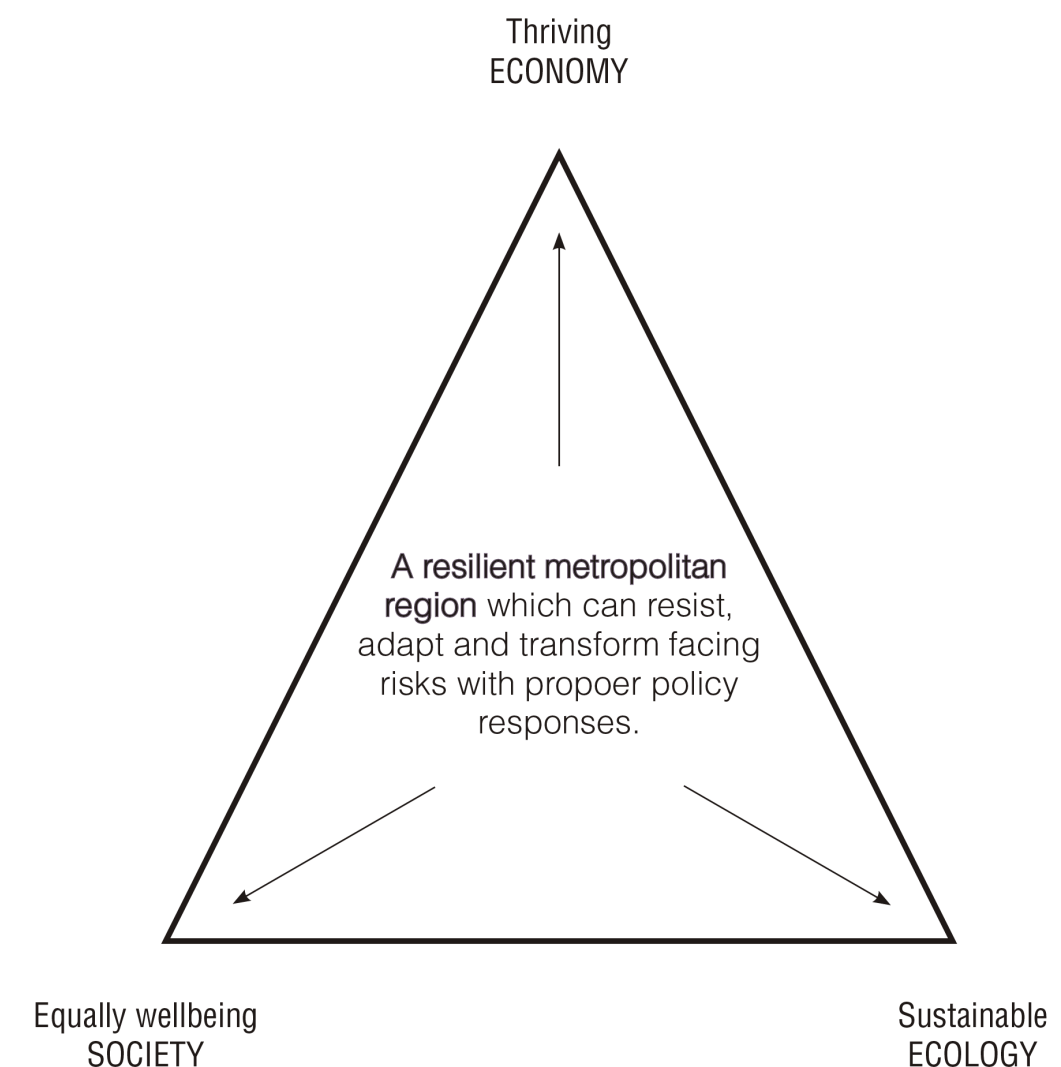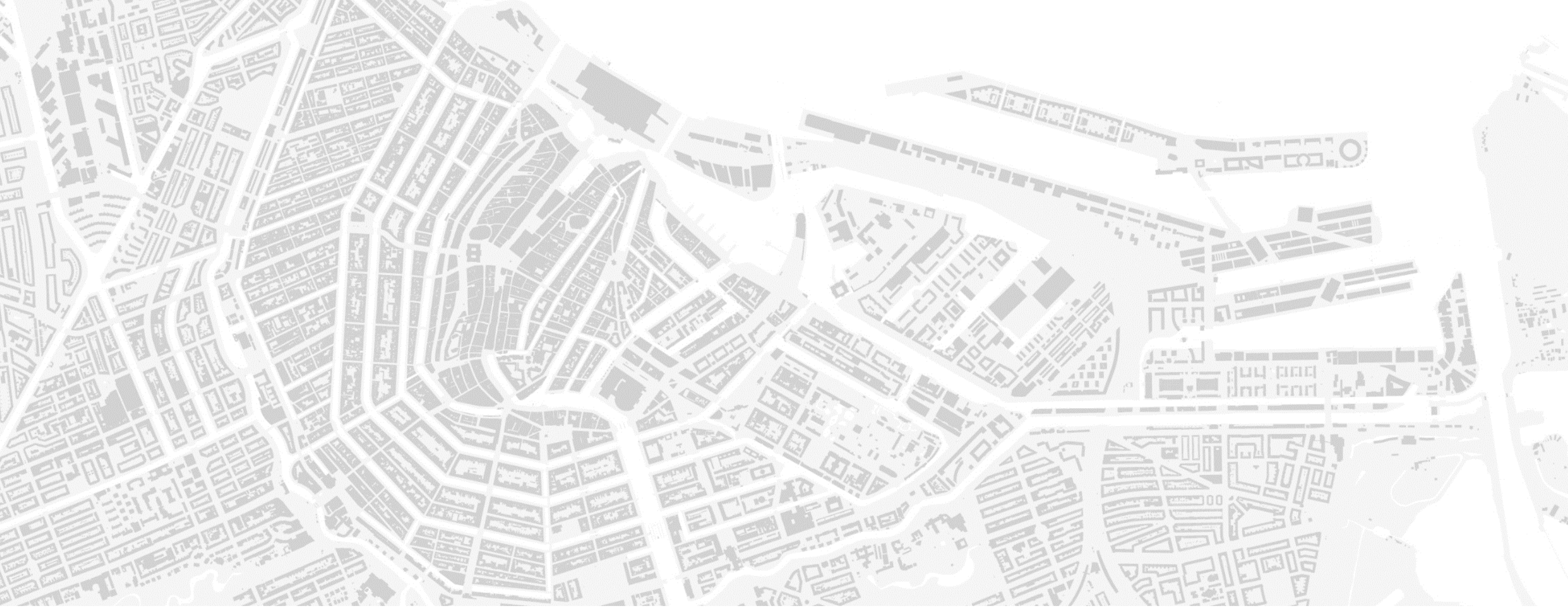SBQ4   What are the planning actions to contribute to the general urban resilience in MRA?

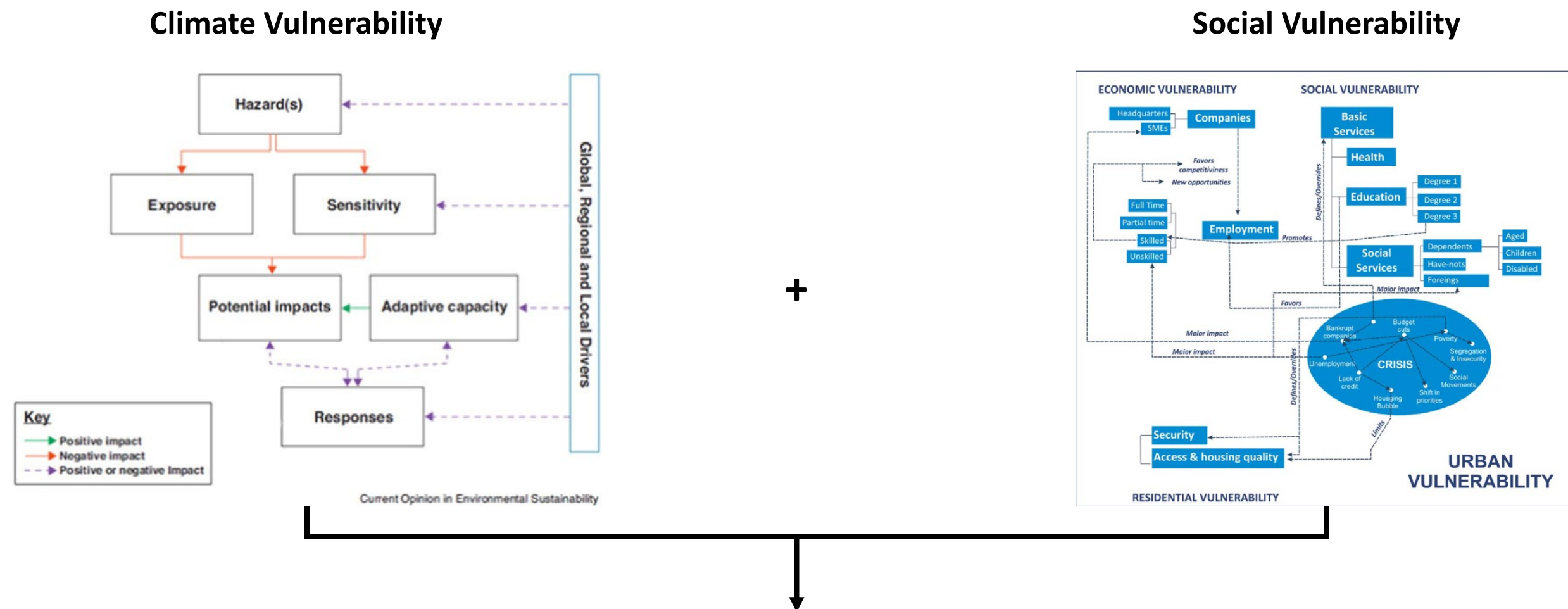Thriving
ECONOMY

A resilient metropolitan region which can resist, adapt and transform facing risks with propoer policy responses.

Equally wellbeing
SOCIETY

Sustainable
ECOLOGY

Fig. 2.4.2. Research aim. Made by author.

3 | URBAN VULNERABILITY

3.1 Theoretical framework

Climate Vulnerability   **Social Vulnerability**

The pandemic vulnerability of a city means **the severity** to which a system is **susceptible to suffer from the pandemic**, when the urban spaces, social groups, and institutions are **negatively affected** in the challenge of human health and its following crises.
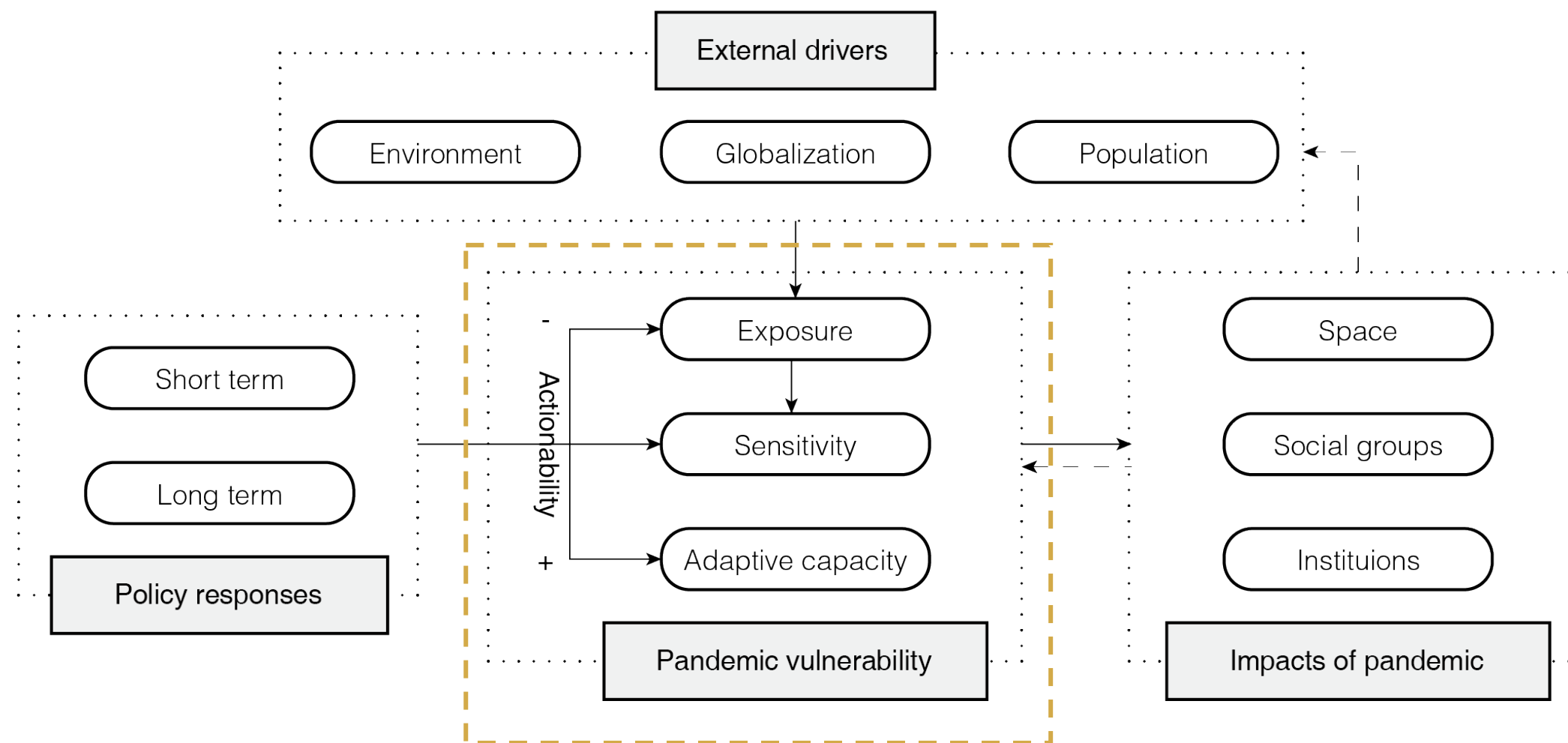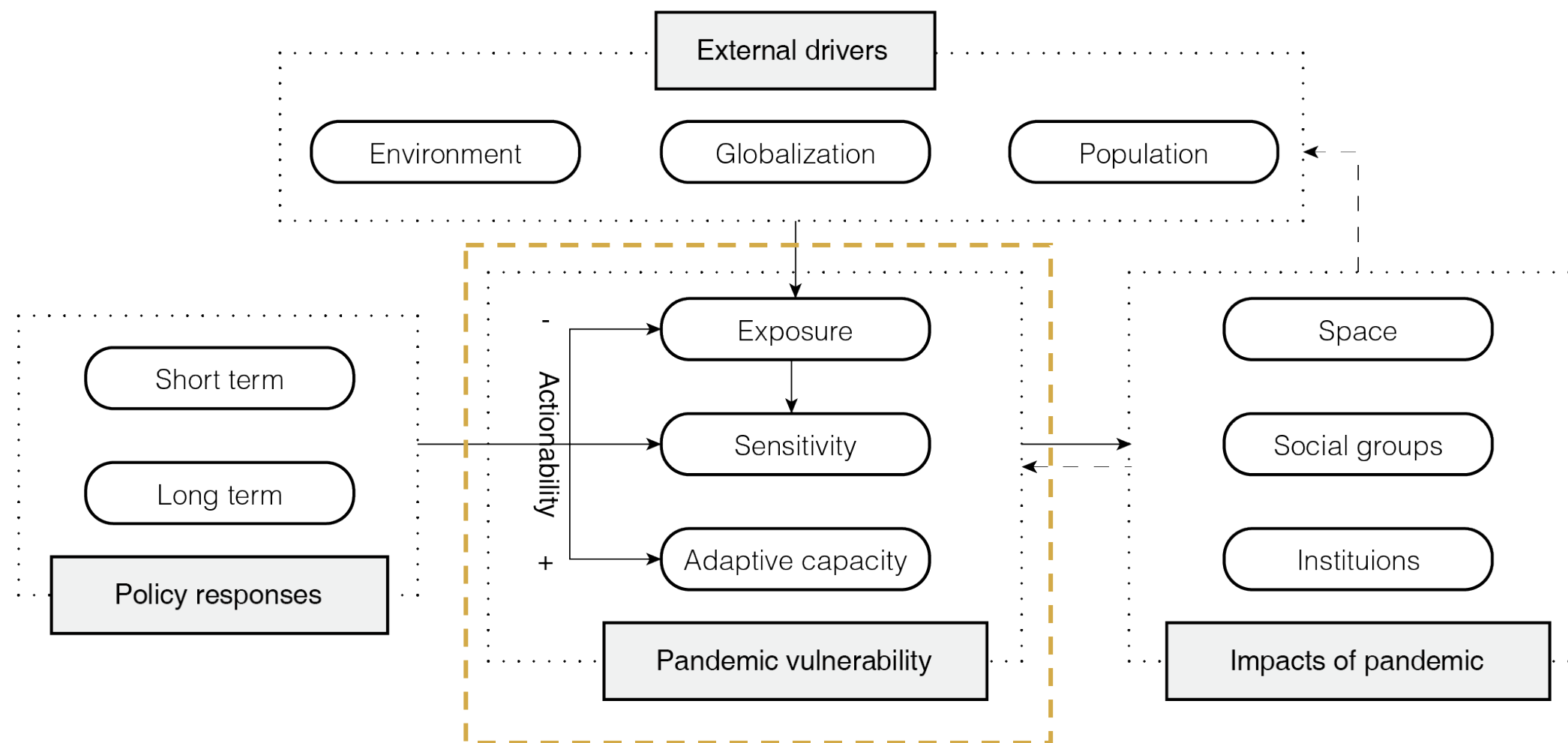
Pandemic Vulnerability

3.1 Theoretical framework

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a system is **susceptible to suffer from the pandemic**, when the

urban spaces, social groups, and institutions are **negatively**

affected in the challenge of human health and its following crises.

Pandemic Vulnerability

3.1 Theoretical framework

Exposure means the pandemic context the system is subject to, which can be influenced by external drivers.

Sensitivity is the extent to which the city is influenced by risks that the population cannot absorb.

Adaptive capacity is the potential and ability of a system that can adjust to a pandemic crisis and cope with its consequences.

3.1 Theoretical framework
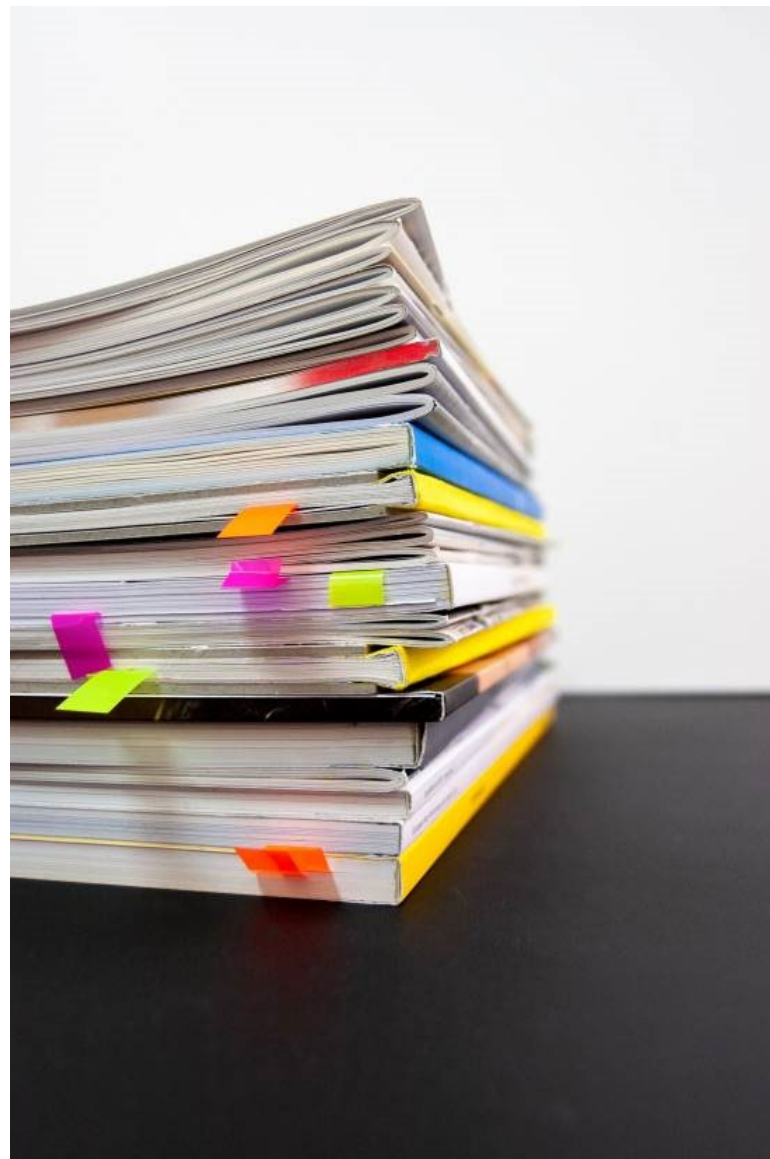
Table 2.1: System of urban vulnerability indicators; indication of development time: ■ short term/done, ■ medium term, ■ long term

	Exposure			Sensitivity				Response capacity			
	Climatic drivers	Hydro-/morpholo-gical drivers	Human drivers	Social	Economic	External services and infrastructure	Biophysical	Generic			Hazard specific ([3])
								Awareness	Ability	Action	
Heat	Combined hot days/tropical nights	Share of urban green spaces incl. fringes([1])	Population density (proxy UHI)	% population > 65 yrs		Cooling water demand	Low priority compared to UHI ([1])	Education level	Dwellings without basic amenities	GDP/cap	(Policies to) increase % green space
	Effective Temp (Thermal comfort)			% low income households				Awareness of climate change	Hospital beds	Effec-tiveness gover-nance	(Policies to) decrease soil sealing
				Demographic dependency ratio				Equity/risk perception ([2])	Health (life expectancy)	Insurance penetration	(Policies to) decrease dependency
Floods	Area prone to flooding (fluvial and coastal floods)	% soil sealing (pluvial floods)		Flood-prone population	Industrial/ commercial flood-prone	Transport infrastructure flood-prone		See heat ([2])			(Policies to) increase % green space/ soil sealing,
											Technical flood defenses
											Early warning policies
Water scarcity/ droughts	Standard Precipitatio n Index	Water exploitation index		Water use/cap.			Share green space ([2])	See heat([2])			Water supply diversity, efficiency
				Sensitive groups see heat above							Water cuts ([2])
Forest fires	Fire probability index			% residential in high risk zone	% buildings in high risk zone	% transport infras. in high risk zone	Share green space([2])	See heat([2])			Accessibility in peri-urban areas
				% population > 65 in high risk zone	% industrial/ commercial high risk zone						

[1] green space decreasing the UHI is considered as more important than sensitivity of vegetation itself; [2] suggests low priority - weak link with demonstrable vulnerability or confusing message; [3] this column is not exhaustive: in principle, if data were available on policies reducing exposure and sensitivity, these would all qualify.

Literature review on COVID-19 and metropolises   **Framework of climate vulnerability indicators. Source: EEA**

3.1 Theoretical framework

Aspect	Exposure		Sensitivity				Adaptive capacity	
	Environment	Flow	Social	Economic	Infrastructural	Biophysical	Awareness	Ability
Space	air pollution	import/ export nodes	residential density		traffic density	open space		hospital beds
	air dryness	delivery system			hospital accessibility	green space		
					amenity accessibility			
Social groups		daily passengers	age distribution	household income	motorized dependency		risk perception	insurance
			immigrants	migrant workers			education level	healthy
			discriminated foreigners					ability to use technology
Institutions				tourism/ mining/ manufacture			government trust	government integration
		international corporations		small-sized businesses				government efficiency

Short term Long term

Table 4.2.1 System of pandemic vulnerability factors in different stages; indication in stages.

3.2 Spatial analysis in MRA

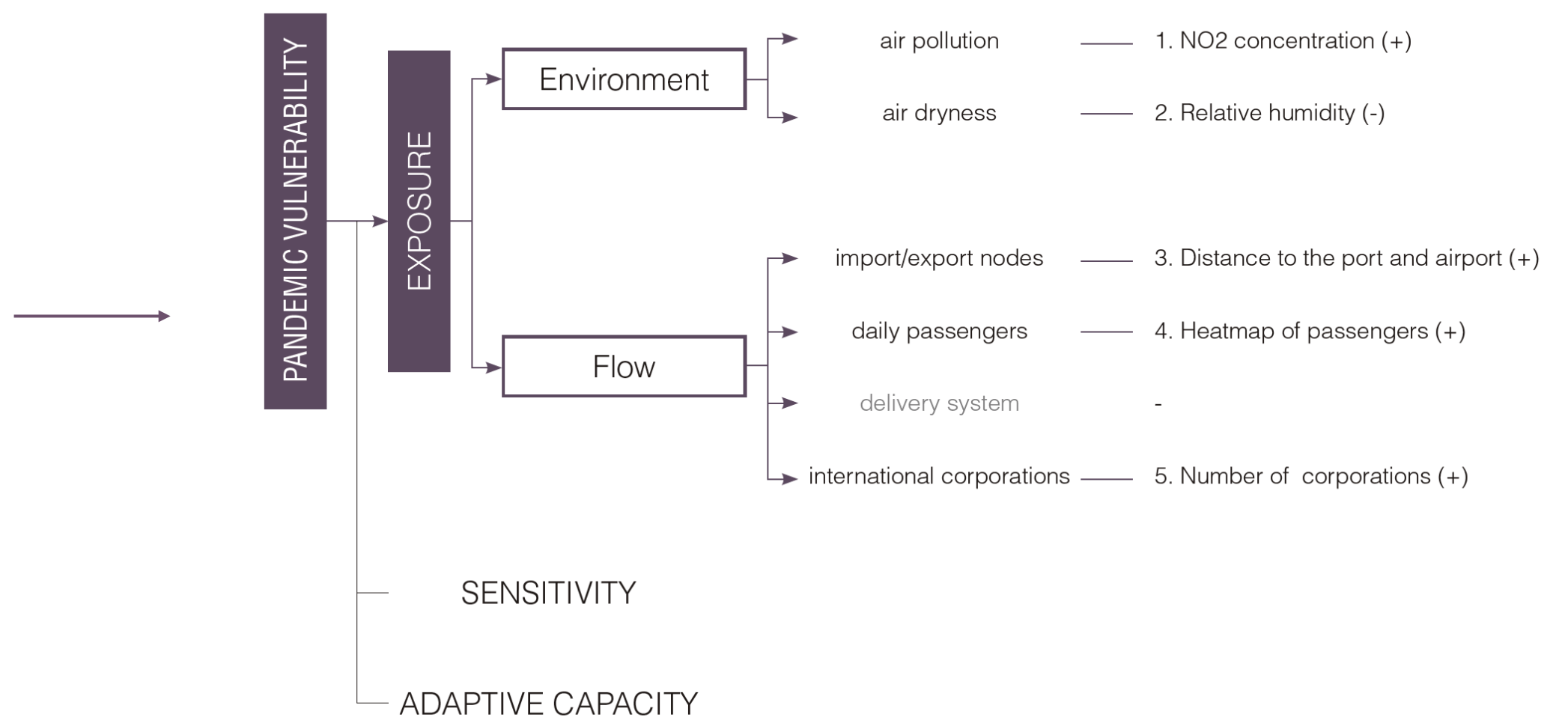| Aspect	Exposure	
	Environment	Flow
Space	air pollution	import/ export nodes
	air dryness	delivery system
Social groups		daily passengers
Institutions		
		international corporations

- • Layers of exposure

Fig. 5.3.1. Available indicators of exposure in pandemic vulnerability ("+" negative impact; "-" positive impact). Made by author.
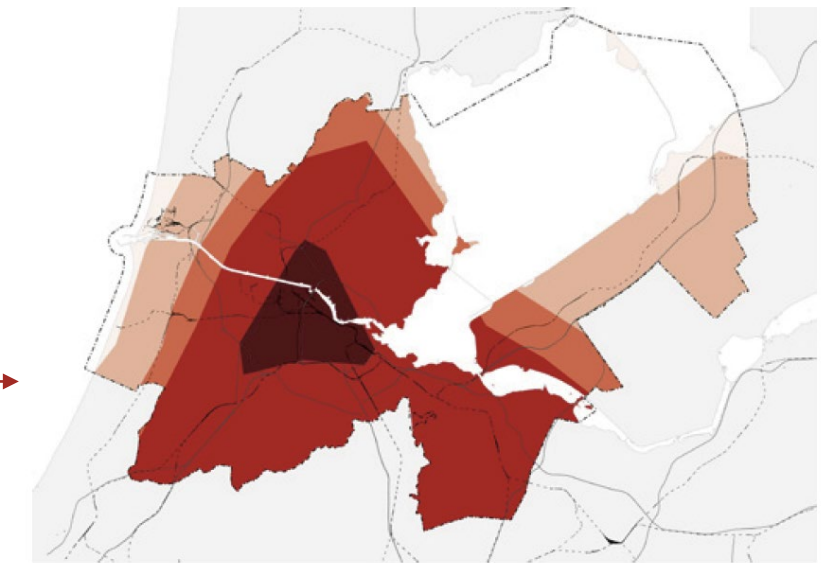
3.2 Spatial analysis in MRA

• Layers of exposure
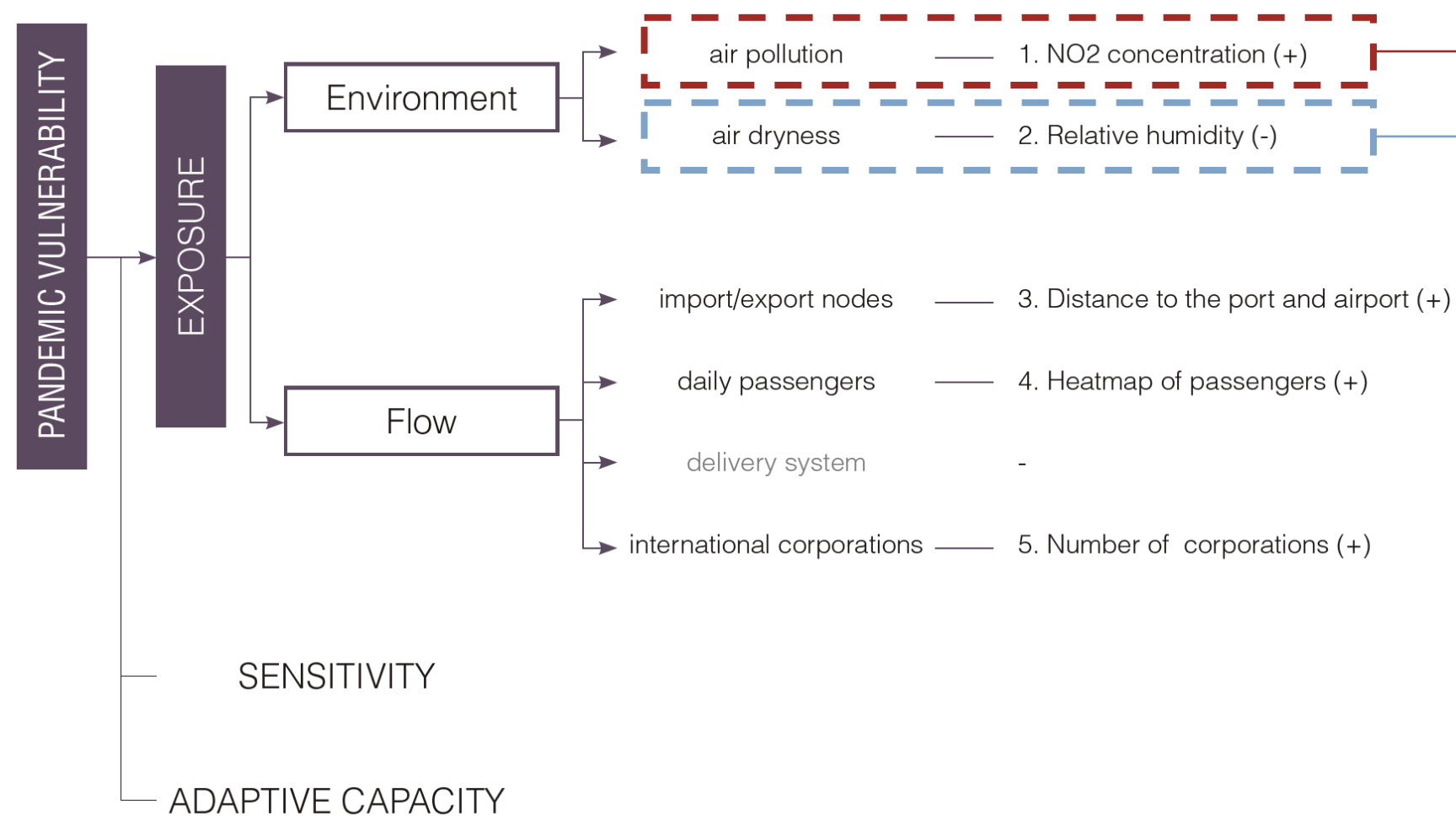
Fig. 5.3.2. Air pollution: NO2 concentration (ug/m3), 17:00 27.11.2020. Illustrated by author based on Meteobule.

Legend: 20   30   40   50   60

PANDEMIC VULNERABILITY

EXPOSURE

Environment
- air pollution ——— 1. NO2 concentration (+)
- air dryness ——— 2. Relative humidity (-)

Flow
- import/export nodes ——— 3. Distance to the port and airport (+)
- daily passengers ——— 4. Heatmap of passengers (+)
- delivery system ——— -
- international corporations ——— 5. Number of corporations (+)

SENSITIVITY

ADAPTIVE CAPACITY

Fig. 5.3.1. Available indicators of exposure in pandemic vulnerability ("+" negative impact; "-" positive impact). Made by author.

Fig. 5.3.3. Air dryness: Relative humidity (%), 17:00 27.11.2020. Illustrated by author based on Meteobule.

Legend: 75   80   85
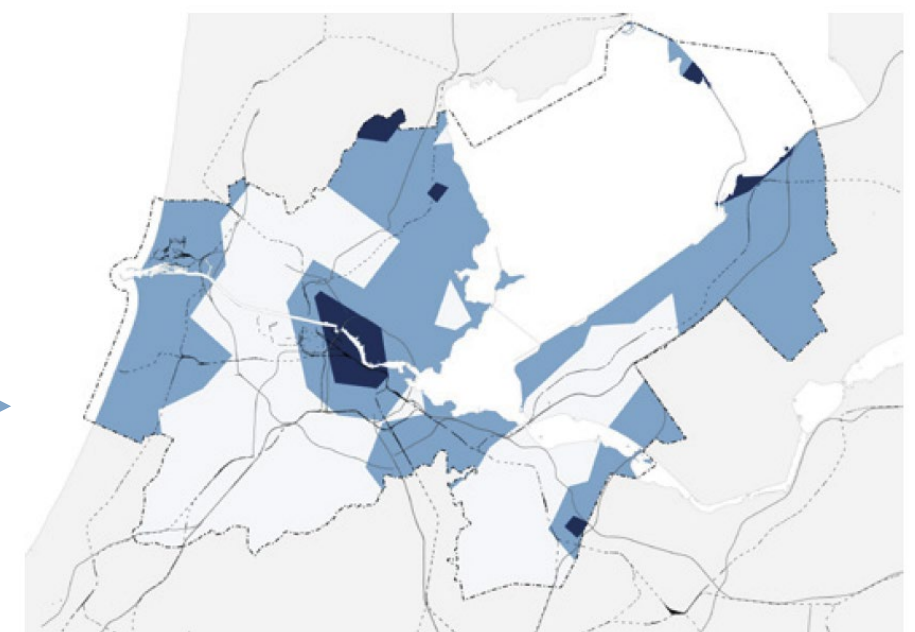
3.2 Spatial analysis in MRA

• Exposure in MRA

Exposure Index= (air pollution- air dryness+ import/export nodes+ daily passengers+ international corporations)/ 5
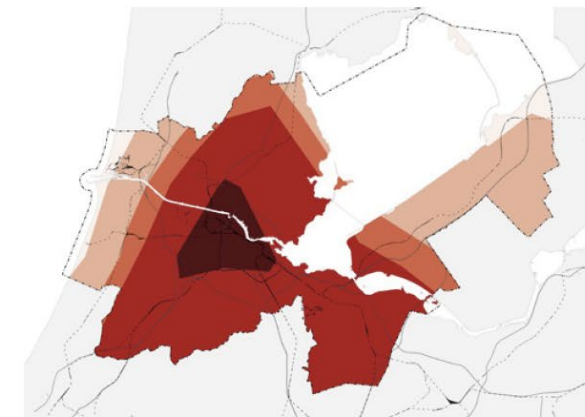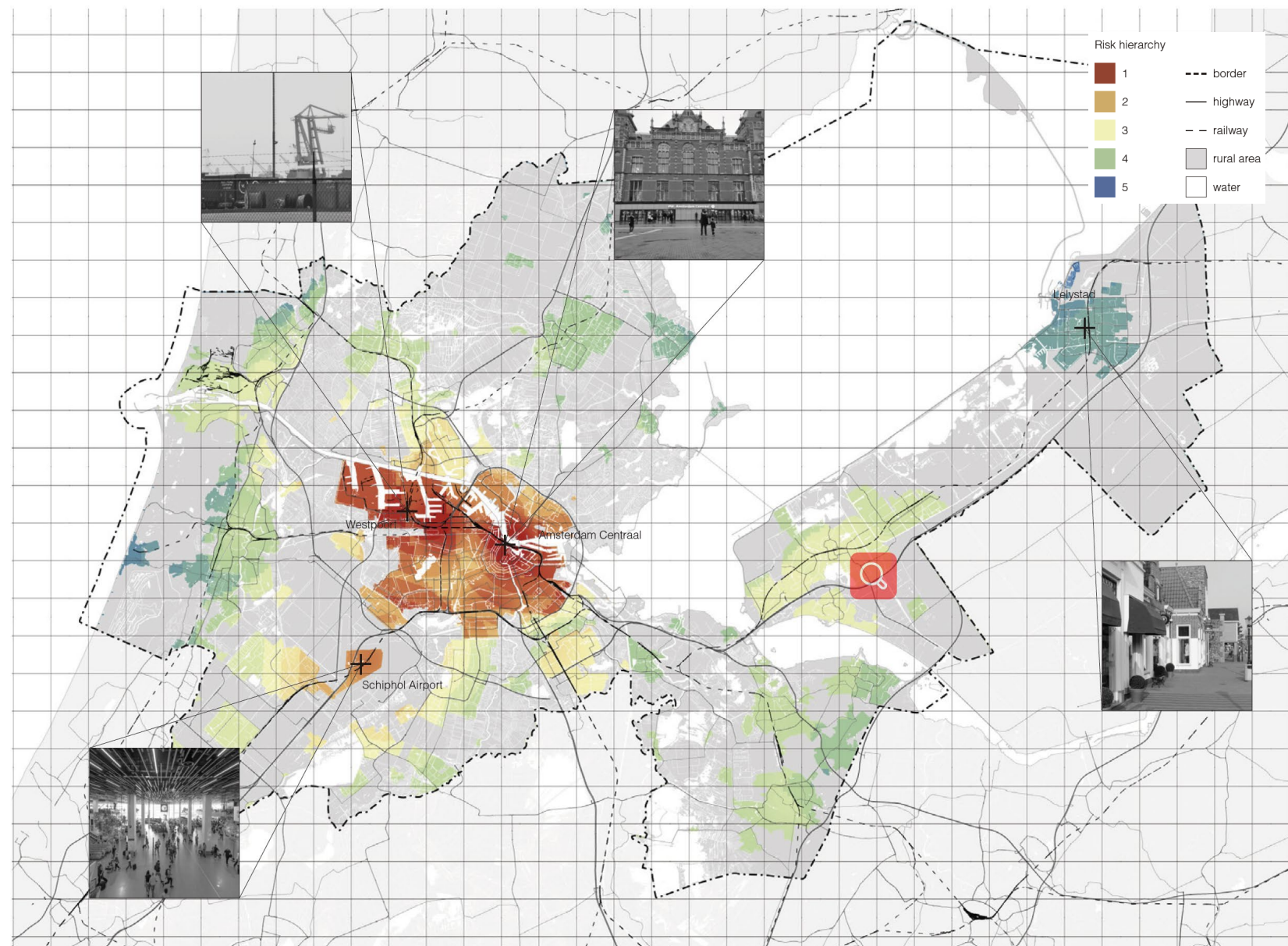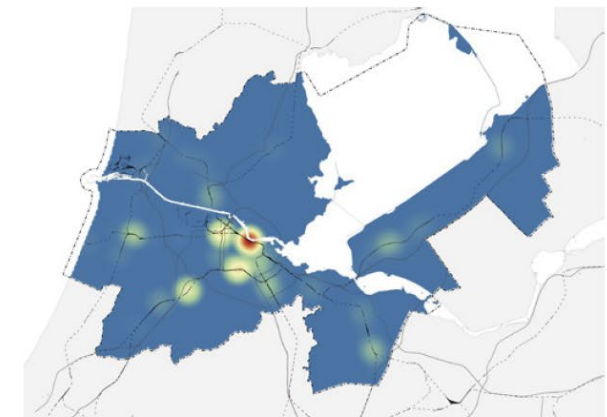

Risk hierarchy
1
2
3
4
5
border
highway
railway
rural area
water

Fig. 5.3.2. Air pollution: NO2 concentration (ug/m3), 17:00 27.11.2020. Illustrated by author based on Meteobule.

20   30   40
50   60

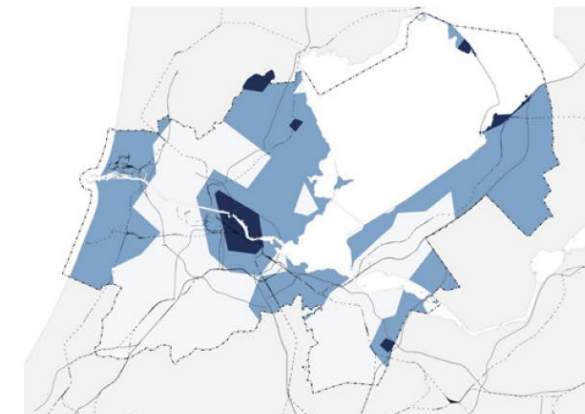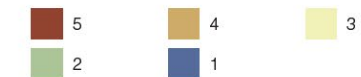Fig. 5.3.5. Daily passengers: Heatmap of railway stations weight by passengers. Illustrated by author data based on CBS.

5   4   3
2   1

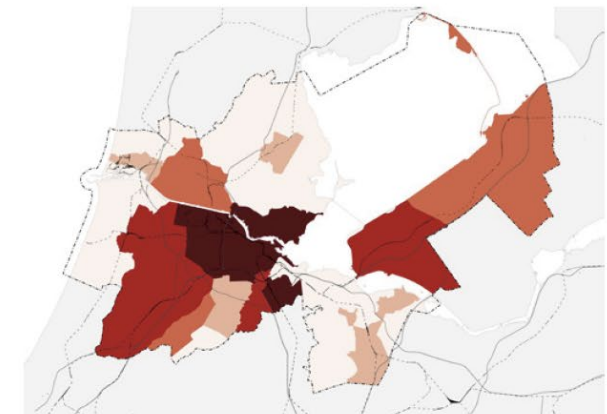Fig. 5.3.3. Air dryness: Relative humidity (%), 17:00 27.11.2020. Illustrated by author based on Meteobule.

75   80   85

Fig. 5.3.6. International connection: Number of international corporations, 2015. Illustrated by author based on OSM.
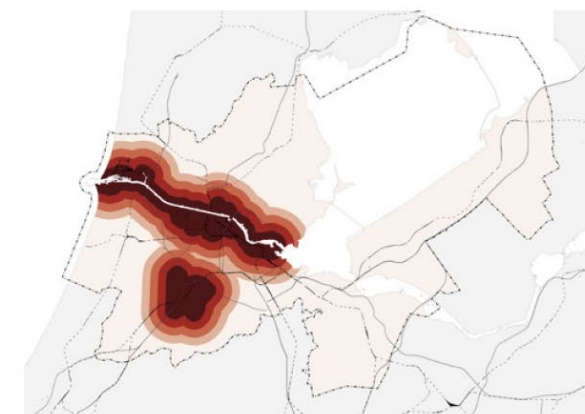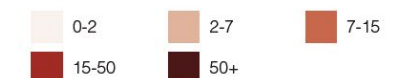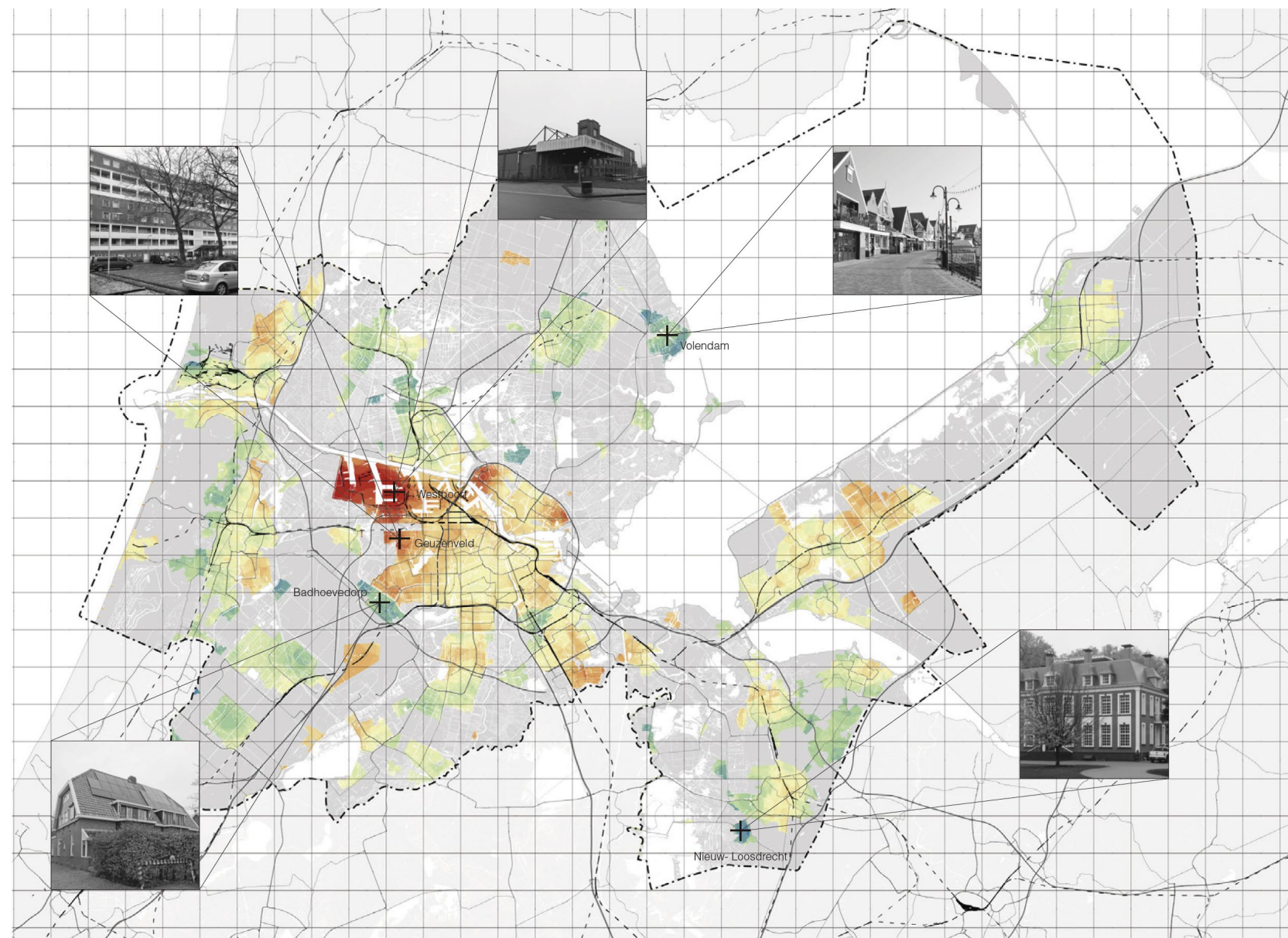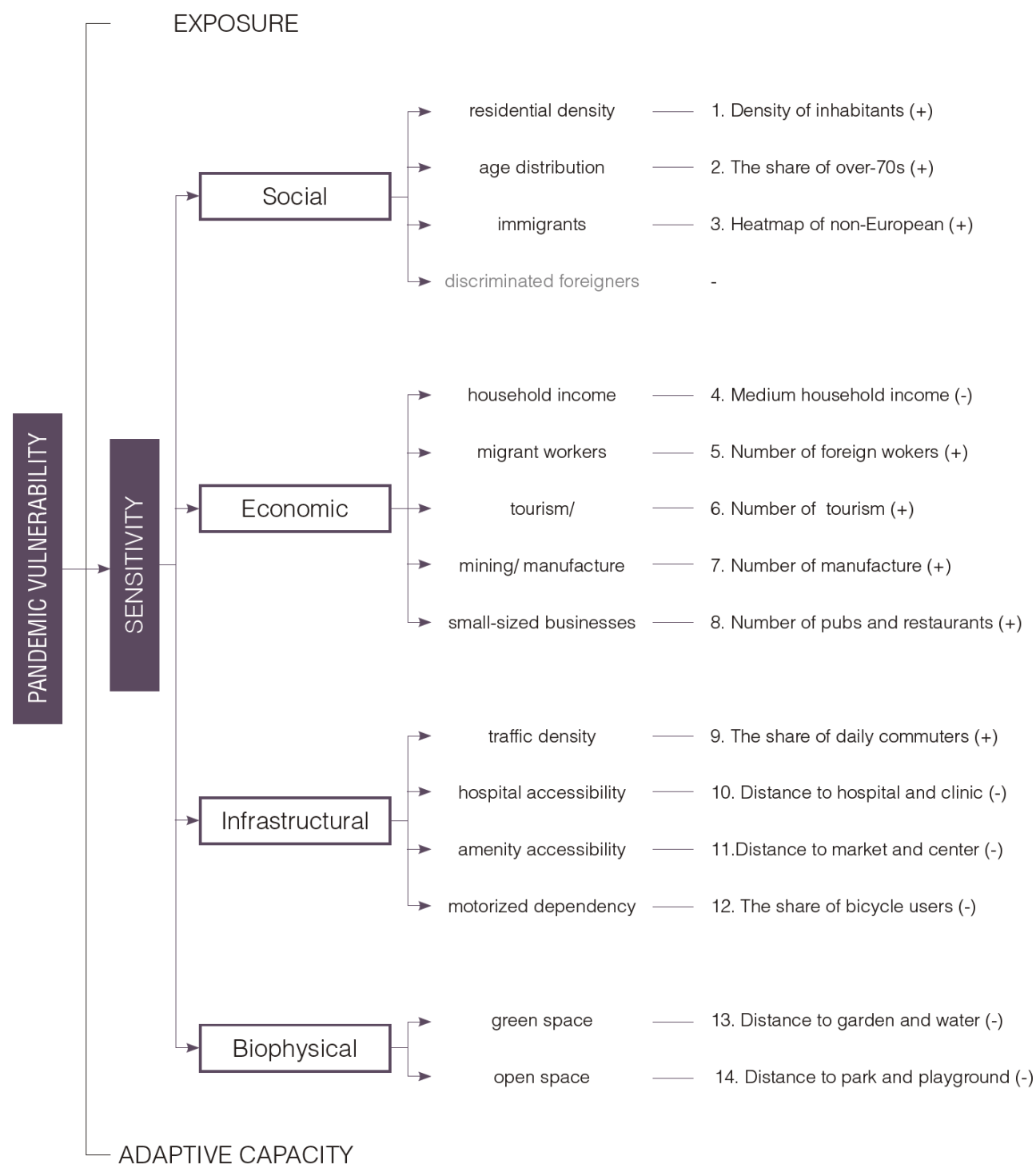
0-2   2-7   7-15
15-50   50+

Fig. 5.3.4. Import/export: Distance to port and airport(m). Illustrated by author based on OSM.

8000+   6000-8000   4000-6000
2000-4000   0-2000

22

3.2 Spatial analysis in MRA

EXPOSURE

PANDEMIC VULNERABILITY | SENSITIVITY

Social
- residential density —— 1. Density of inhabitants (+)
- age distribution —— 2. The share of over-70s (+)
- immigrants —— 3. Heatmap of non-European (+)
- discriminated foreigners —— -

Economic
- household income —— 4. Medium household income (-)
- migrant workers —— 5. Number of foreign wokers (+)
- tourism/ —— 6. Number of tourism (+)
- mining/ manufacture —— 7. Number of manufacture (+)
- small-sized businesses —— 8. Number of pubs and restaurants (+)

Infrastructural
- traffic density —— 9. The share of daily commuters (+)
- hospital accessibility —— 10. Distance to hospital and clinic (-)
- amenity accessibility —— 11.Distance to market and center (-)
- motorized dependency —— 12. The share of bicycle users (-)

Biophysical
- green space —— 13. Distance to garden and water (-)
- open space —— 14. Distance to park and playground (-)

ADAPTIVE CAPACITY

• Sensitivity in MRA

Fig. 5.4.1. Available indicators of sensitivity in pandemic vulnerability ('+' negative impact; '-' positive impact). Made by author.
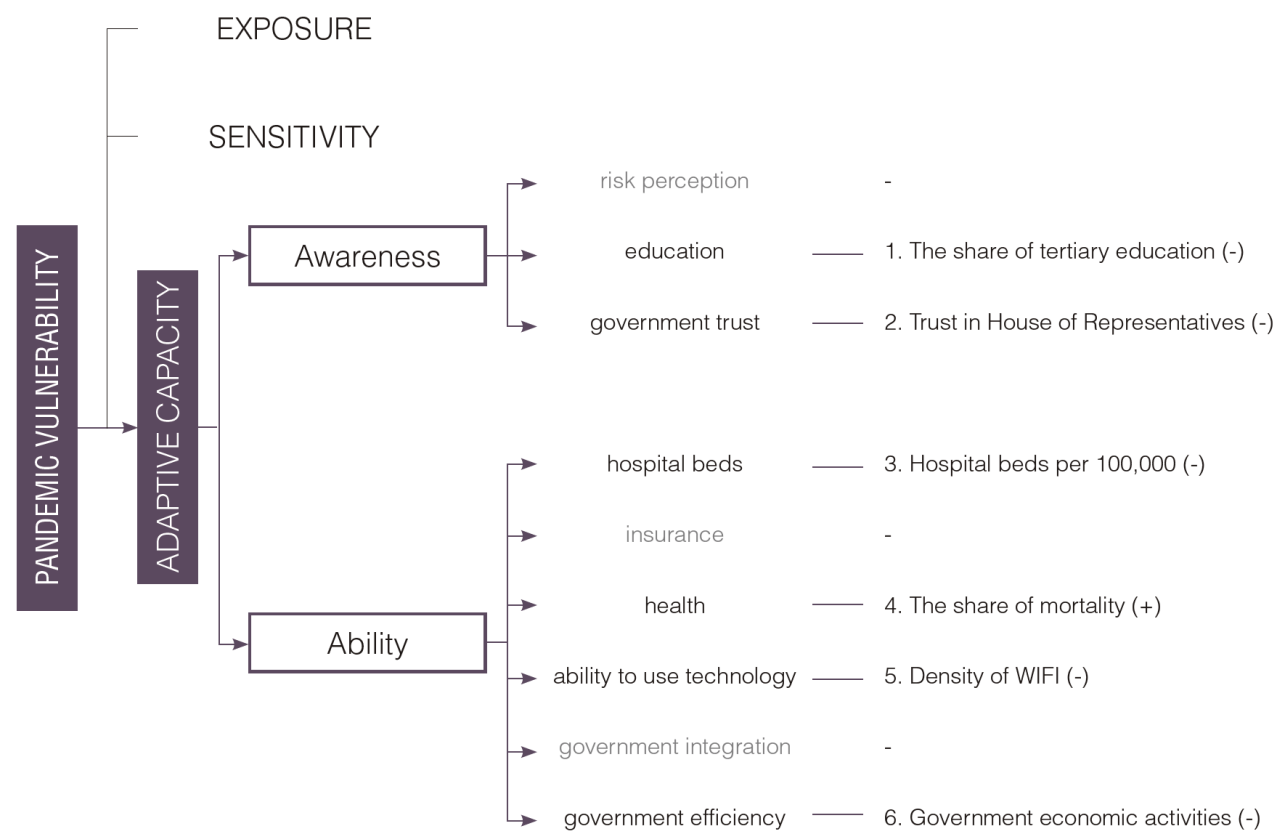
3.2 Spatial analysis in MRA

- Adaptive capacity in MRA

EXPOSURE

SENSITIVITY

PANDEMIC VULNERABILITY | ADAPTIVE CAPACITY

Awareness
- risk perception — -
- education — 1. The share of tertiary education (-)
- government trust — 2. Trust in House of Representatives (-)

Ability
- hospital beds — 3. Hospital beds per 100,000 (-)
- insurance — -
- health — 4. The share of mortality (+)
- ability to use technology — 5. Density of WIFI (-)
- government integration — -
- government efficiency — 6. Government economic activities (-)

Fig. 5.5.1. Available indicators of adaptive capacity in pandemic vulnerability ("+" negative impact; "-" positive impact). Made by author.

3.2 Spatial analysis in MRA

The typology of pandemic vulnerability is calculated based on the results of exposure, sensitivity, and adaptive capacity.
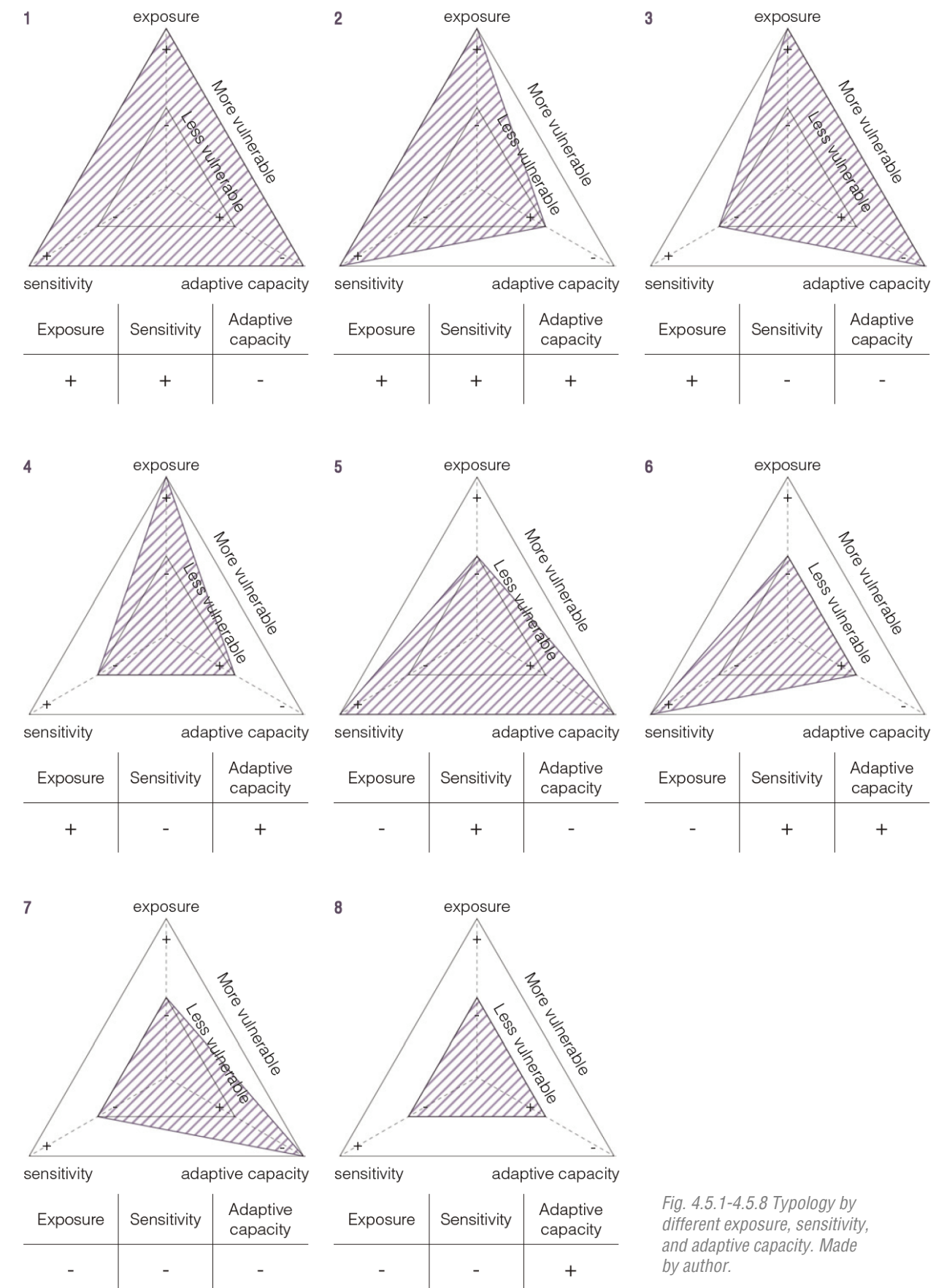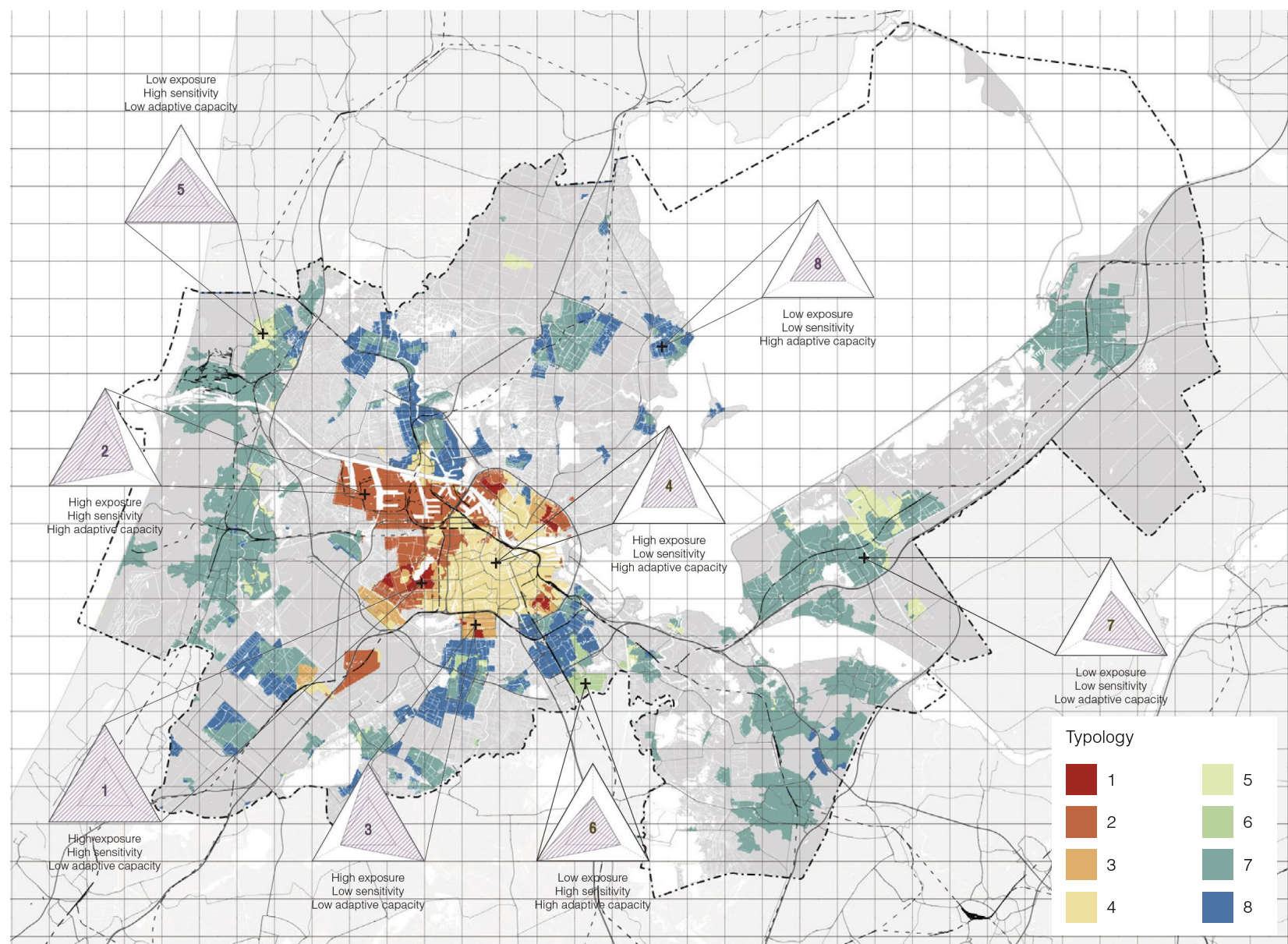
4 | URBAN RESILIENCE

4.1 Theoretical underpinning

• Definition of urban resilience
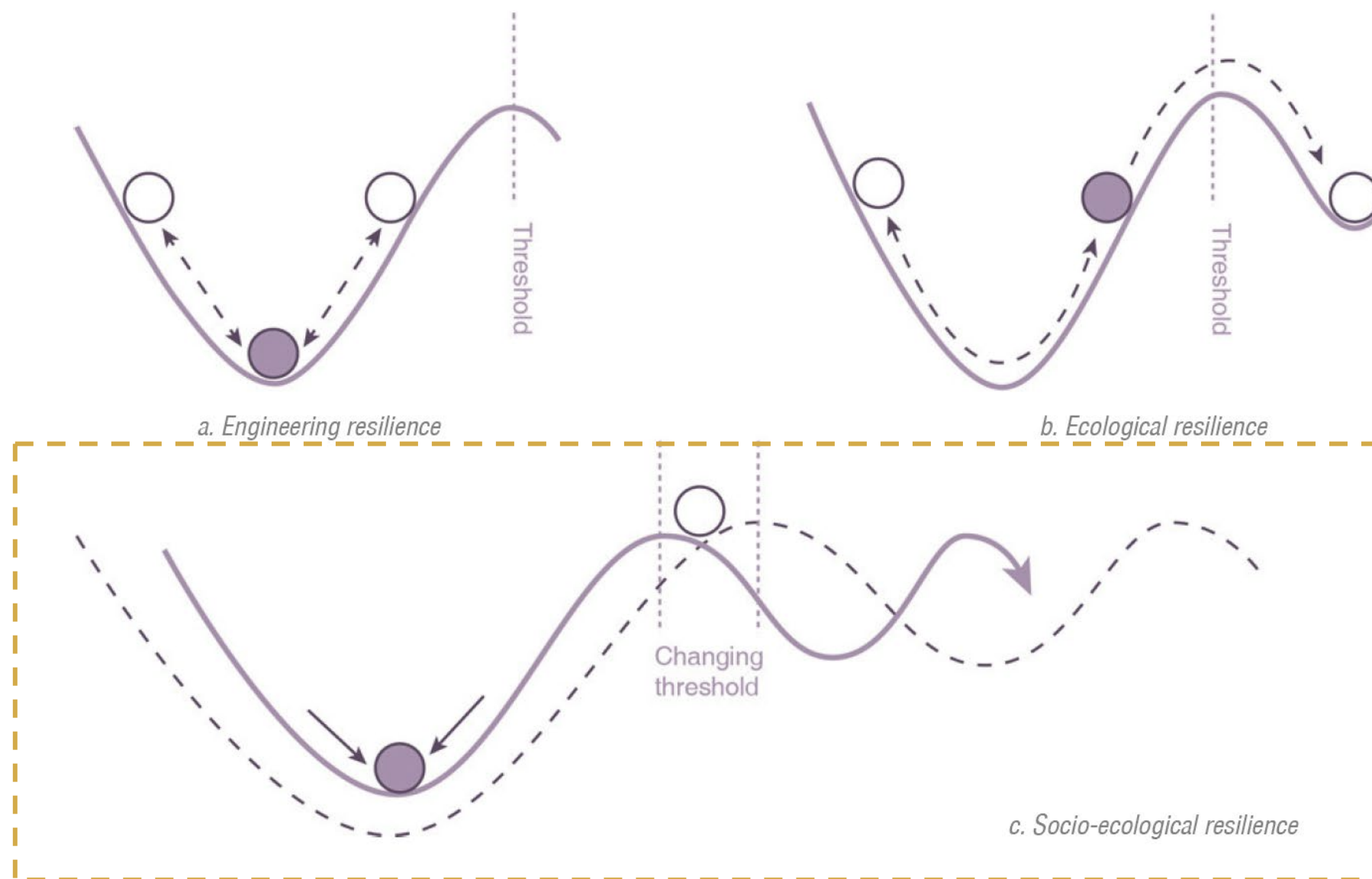
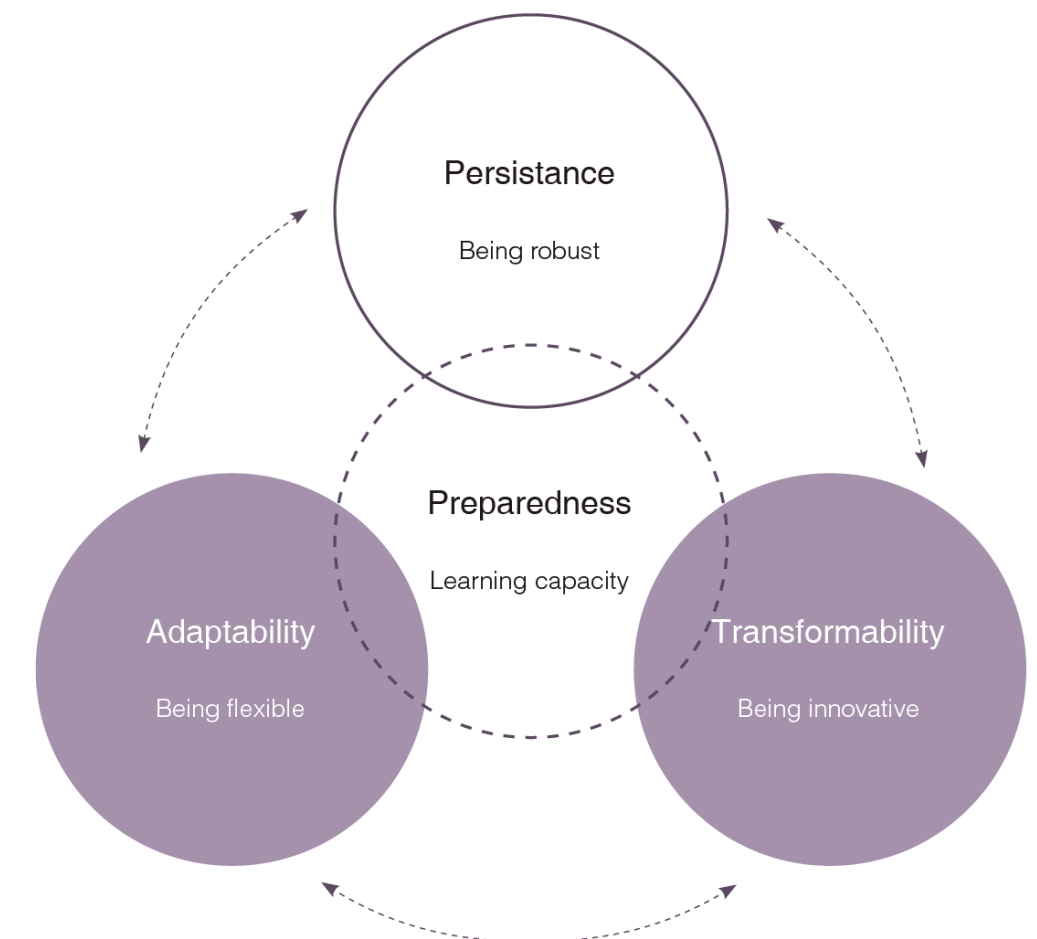*Fig. 5.1.1."Cup and ball" schematic diagrams illustrating the common concept. Source: Young et al, 2018.*

Fig. 5.1.2 Dimensional framework for evolutionary resilience. Made by author, adapted from "Evolutionary Resilience and Strategies for Climate Adaptation" by Davoudi, 2013.

4.1 Theoretical underpinning

• Adaptive cycle

• Panarchy
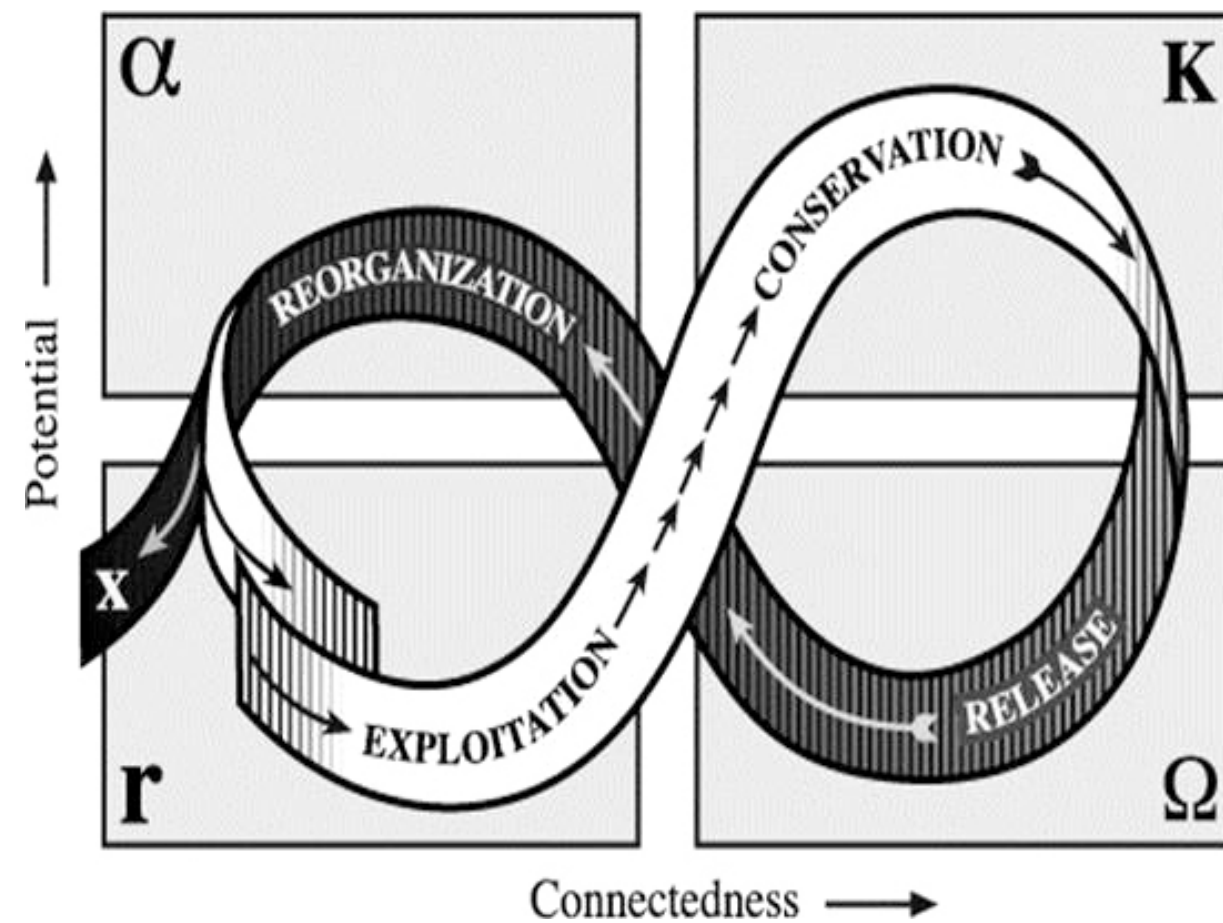
Fig. 5.2.1 Adaptive cycle for ecosystem. Source: Folke et al., 2010.
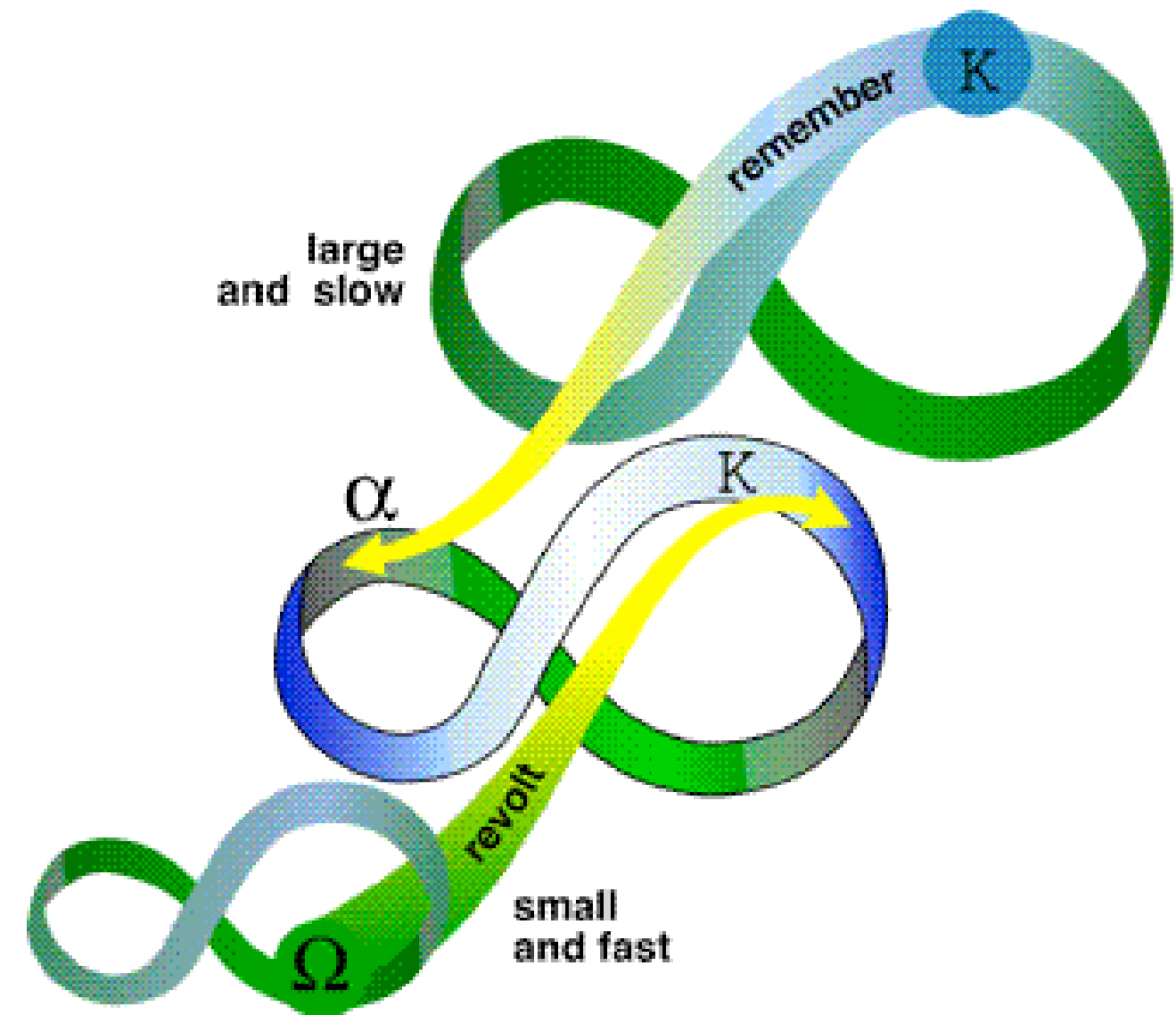
Fig. 5.2.2 Panarchy of adaptive cycle. Source: Gunderson & Holling, 2002.

Pandemic

Socio-ecological resilience

- Unpredictable →
- Periodic →
- Evolutionary →
- Lasting effects →
- Multiple scales →
- Social issue →

- Robust
- Flexible
- Innovative
- Learning capacity
- Multiple levels
- Socio-ecological system

Dynamic Planning

4.2 "Dynamic planning"

• Dynamic time

A **process-oriented** method that a system can develop to change in-between adaptive cycles in different levels through **adaptability** and **transformability** **without defining a fixed state**.
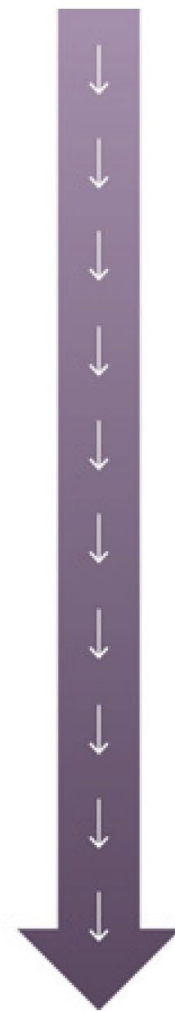
Fig. 5.4.1 Traditional linear planning. Made by author.
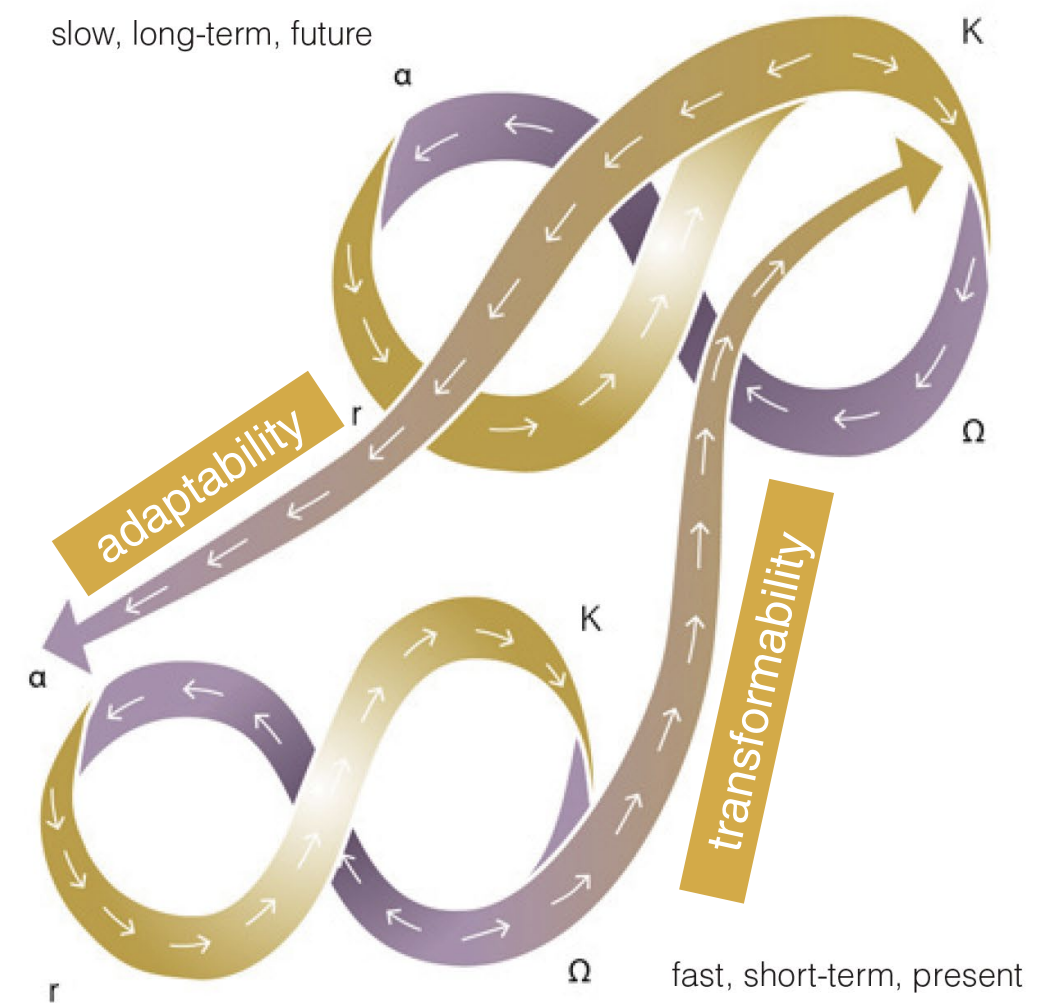
Fig. 5.4.2 Dynamic temporal planning. Made by author, adapted from Holling and Gunderson (2002, pp. 34–41).

4.2 "Dynamic planning"

• Dynamic space

Adaptability:

Reducing the population flow through self-contain areas

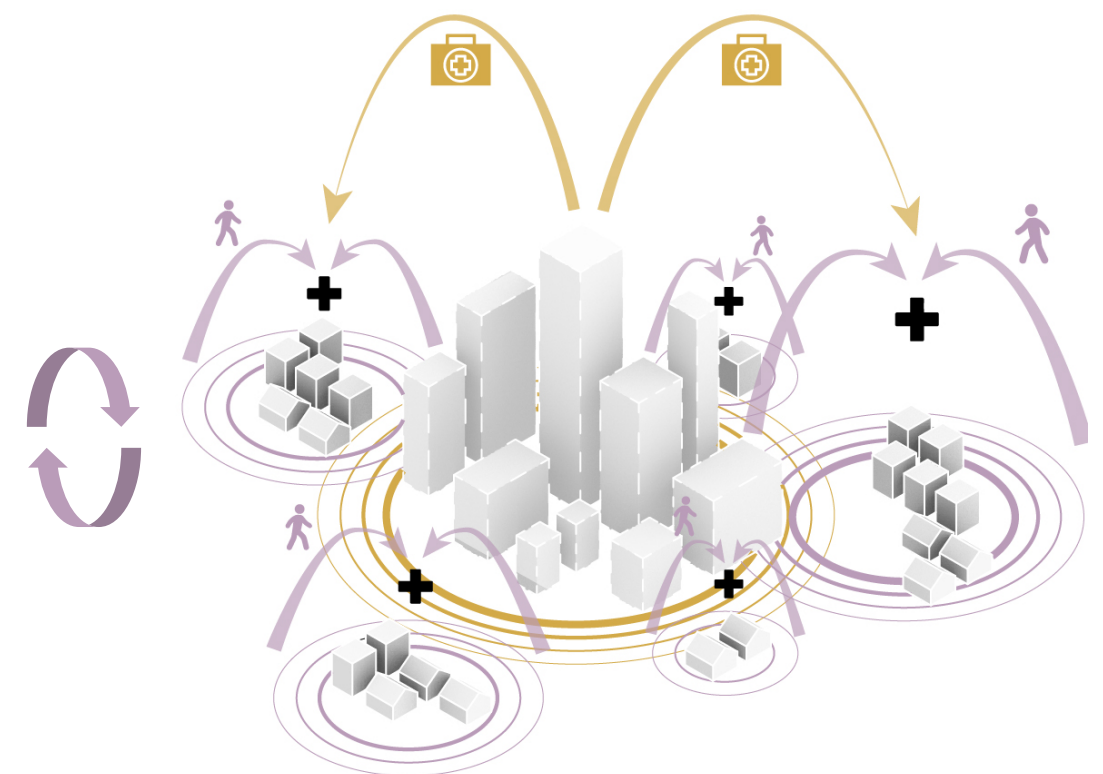*Fig. 5.4.3 Process of metropolitan region. Made by author.*
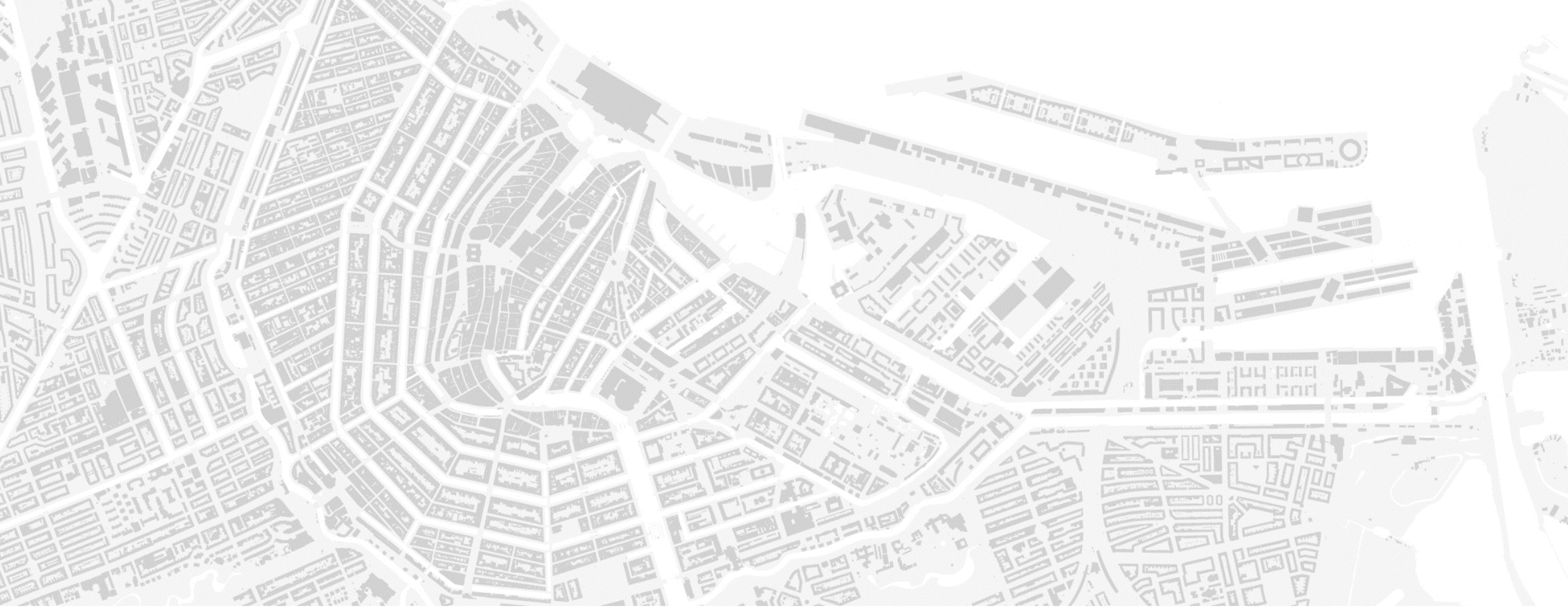

Fig. 5.4.4 Process of small cities. Made by author.

Transformability:

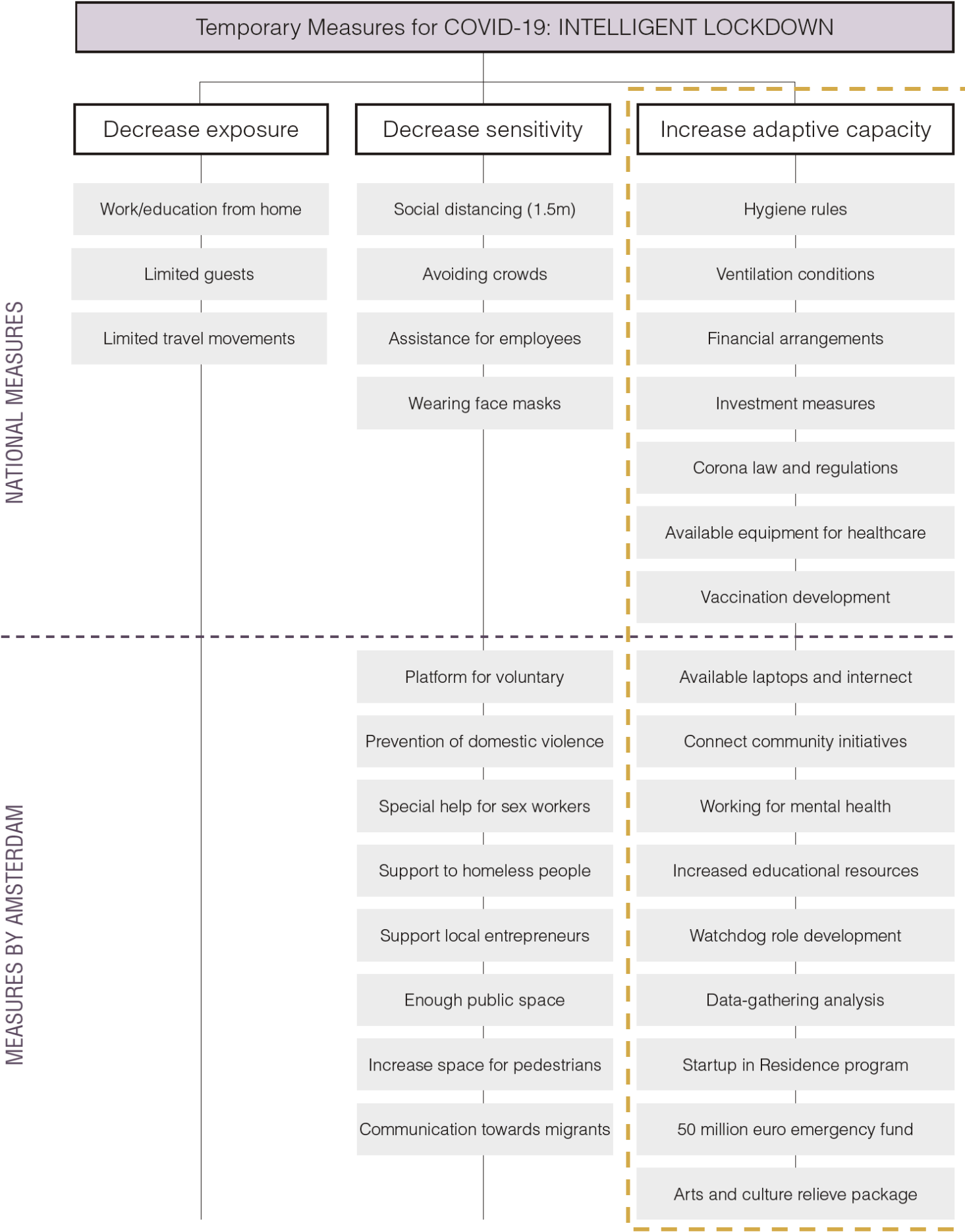Recovering pandemic-resilient networks

Fig. 5.4.5 Outcome of dynamic network. Made by author.

5 | IMPLEMENTATION

5.1 Site selection

2

exposure

More vulnerable

Less vulnerable

sensitivity   adaptive capacity

Exposure	Sensitivity	Adaptive capacity
+	+	+

Temporary Measures for COVID-19: INTELLIGENT LOCKDOWN

Decrease exposure	Decrease sensitivity	Increase adaptive capacity

NATIONAL MEASURES

Work/education from home	Social distancing (1.5m)	Hygiene rules
Limited guests	Avoiding crowds	Ventilation conditions
Limited travel movements	Assistance for employees	Financial arrangements
	Wearing face masks	Investment measures
		Corona law and regulations
		Available equipment for healthcare
		Vaccination development

MEASURES BY AMSTERDAM

	Platform for voluntary	Available laptops and internect
	Prevention of domestic violence	Connect community initiatives
	Special help for sex workers	Working for mental health
	Support to homeless people	Increased educational resources
	Support local entrepreneurs	Watchdog role development
	Enough public space	Data-gathering analysis
	Increase space for pedestrians	Startup in Residence program
	Communication towards migrants	50 million euro emergency fund
		Arts and culture relieve package

Fig. 2.2.12. Summary of city measures to COVID-19 in different levels. Made by author based on Rijksoverheid, and City of Amsterdam, 2020.12.07.

Low exposure
High sensitivity
Low adaptive capacity

5

8

Low exposure
Low sensitivity
High adaptive capacity

2

High exposure
High sensitivity
High adaptive capacity

4

High exposure
Low sensitivity
High adaptive capacity

7

Low exposure
Low sensitivity
Low adaptive capacity

1

High exposure
High sensitivity
Low adaptive capacity

3

High exposure
Low sensitivity
Low adaptive capacity

6

Low exposure
High sensitivity
High adaptive capacity

Typology

🟥	1	🟩	5
🟧	2	🟩	6
🟧	3	🟩	7
🟨	4	🟦	8

34

5.1 Site selection

Fig. 5.7.1. Typological vulnerability in metropolitan scale. Made by author.

Fig. 5.7.2. Typological vulnerability in urban scale. Made by author.

Fig. 5.7.3. Typological vulnerability in local scale. Made by author.

Metropolitan scale: MRA

Urban scale: Amsterdam Nieuw-West

Local scale: Geuzenveld-Slotermeer

5.1 Site selection

• Corona in Amsterdam Nieuw-West
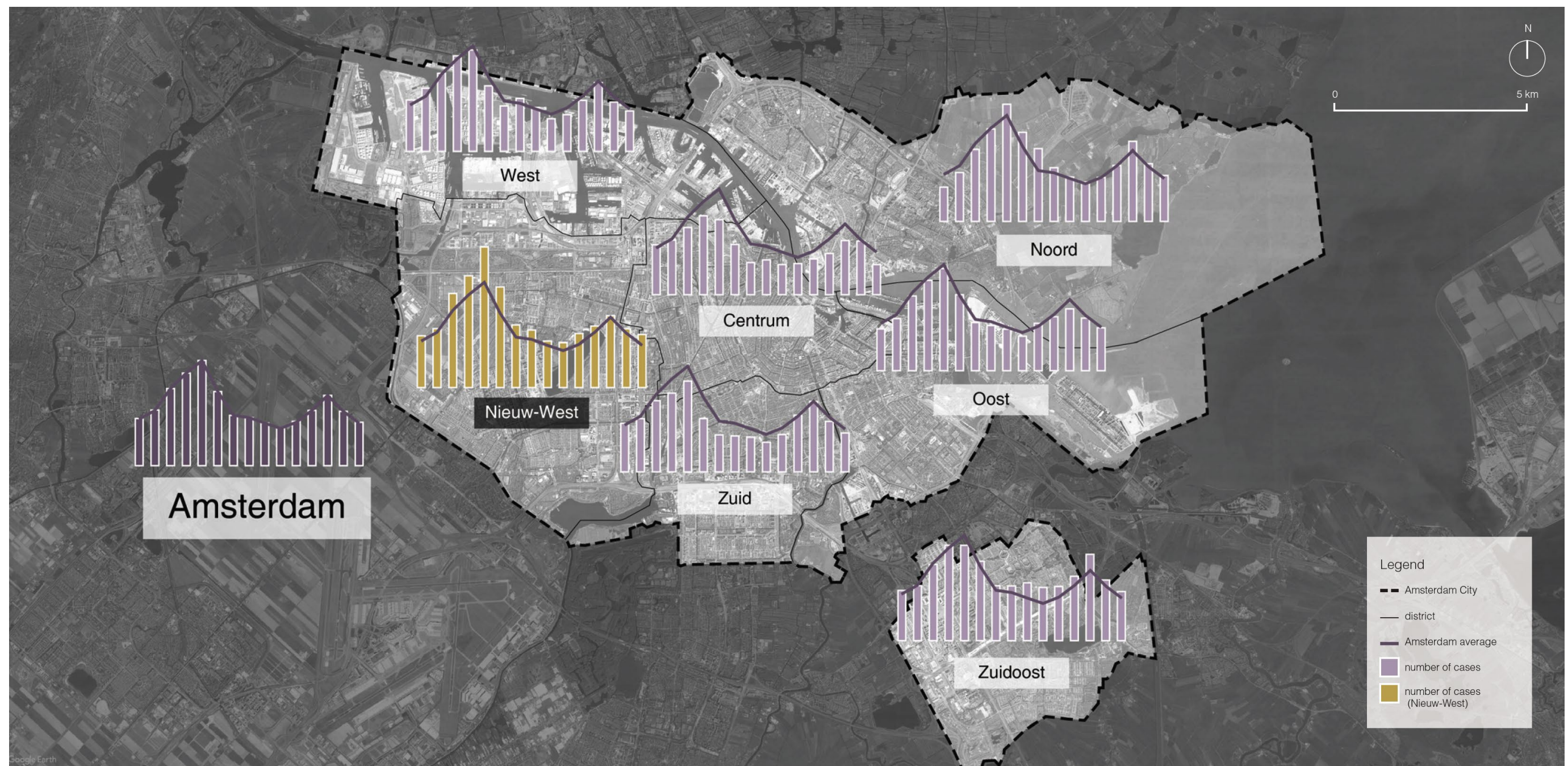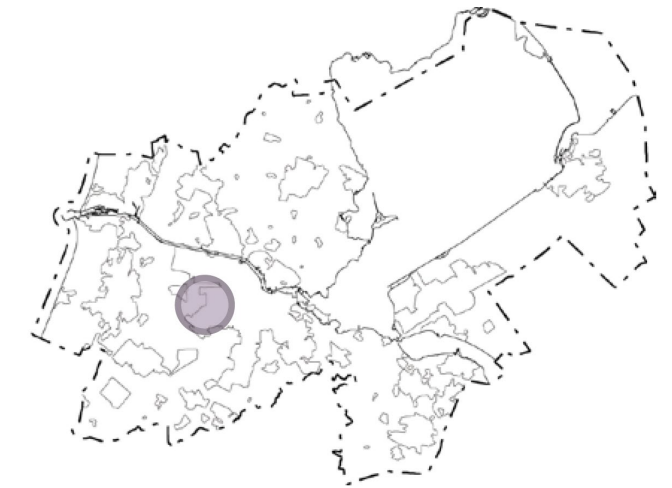
Fig. 6.2.1. The positive-tested people per municipalities per 100,000 inhabitants. Made by author, data source: GGD Amsterdam, 24/10/2020.

5.1 Site selection

- Geuzenveld-Slotermeer

Car dependency

Immigrant community

Health issue

Legend

- Geuzenveld-Slotermeer
- neighborhood
- highway
- living street
- railway
- buildings
- water
- metro station
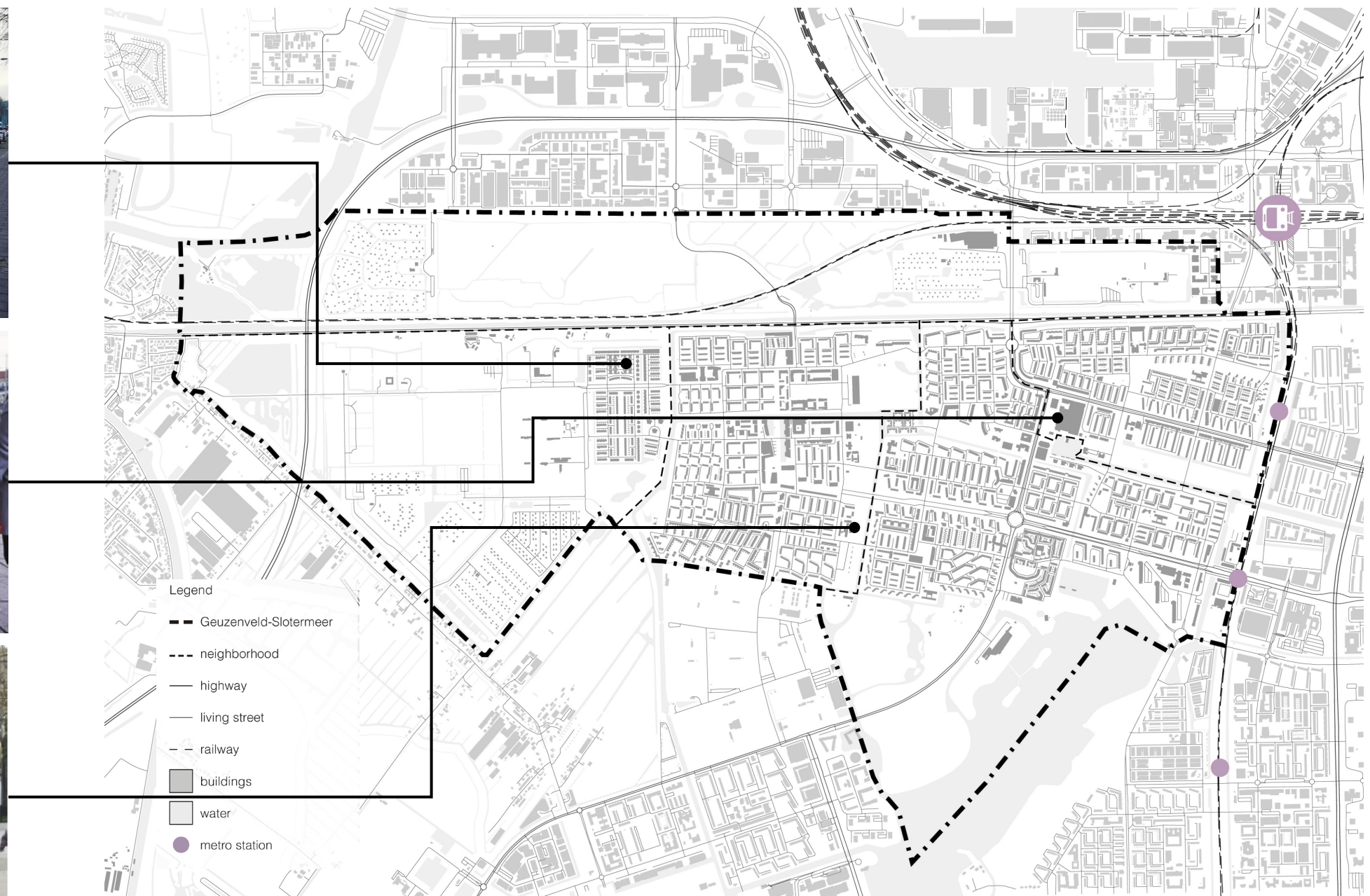
Fig. 6.3.6 Basic conditions of Geuzenveld-Slotermeer. Made by author.
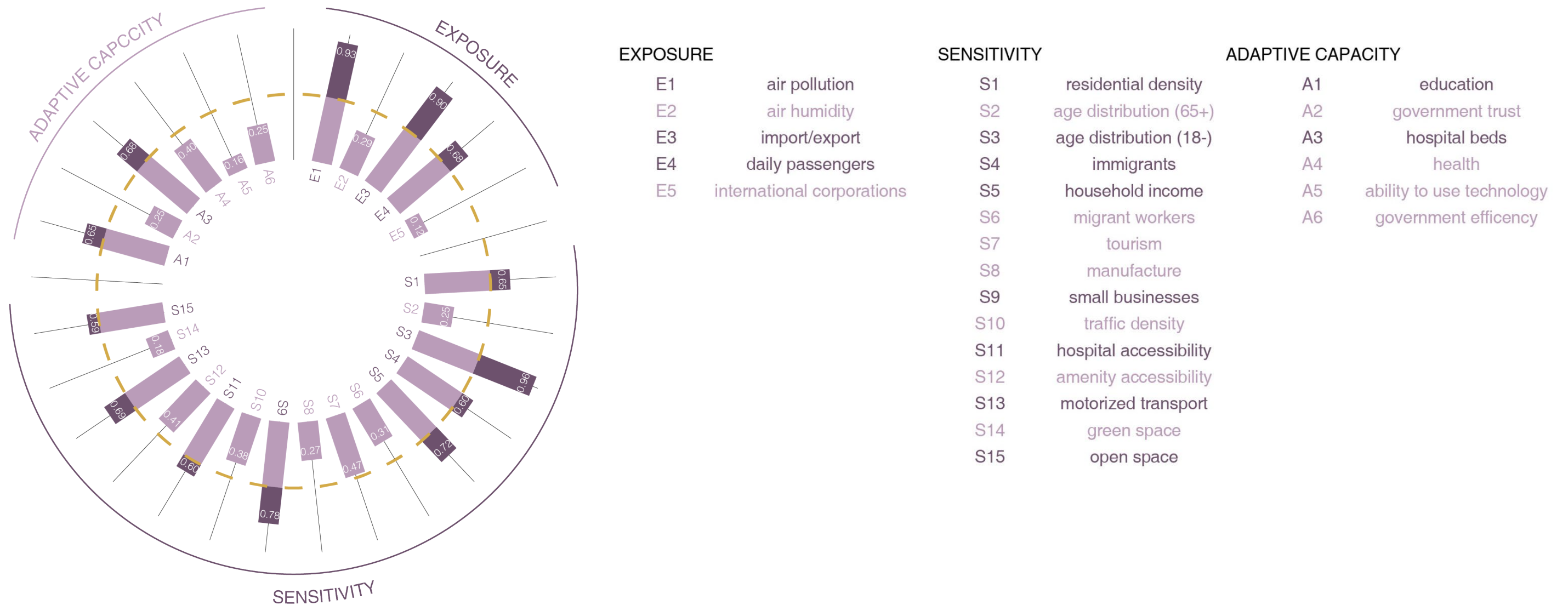
5.2 Micro design principles

• Quantitative index

EXPOSURE		SENSITIVITY		ADAPTIVE CAPACITY	
E1	air pollution	S1	residential density	A1	education
E2	air humidity	S2	age distribution (65+)	A2	government trust
E3	import/export	S3	age distribution (18-)	A3	hospital beds
E4	daily passengers	S4	immigrants	A4	health
E5	international corporations	S5	household income	A5	ability to use technology
		S6	migrant workers	A6	government effcency
		S7	tourism		
		S8	manufacture		
		S9	small businesses		
		S10	traffic density		
		S11	hospital accessibility		
		S12	amenity accessibility		
		S13	motorized transport		
		S14	green space		
		S15	open space		

Fig. 6.3.7 Analytical indicators of pandemic vulnerability in Geuzenveld-Slotermeer. Made by author.

5.2 Micro design principles

• Quantitative index
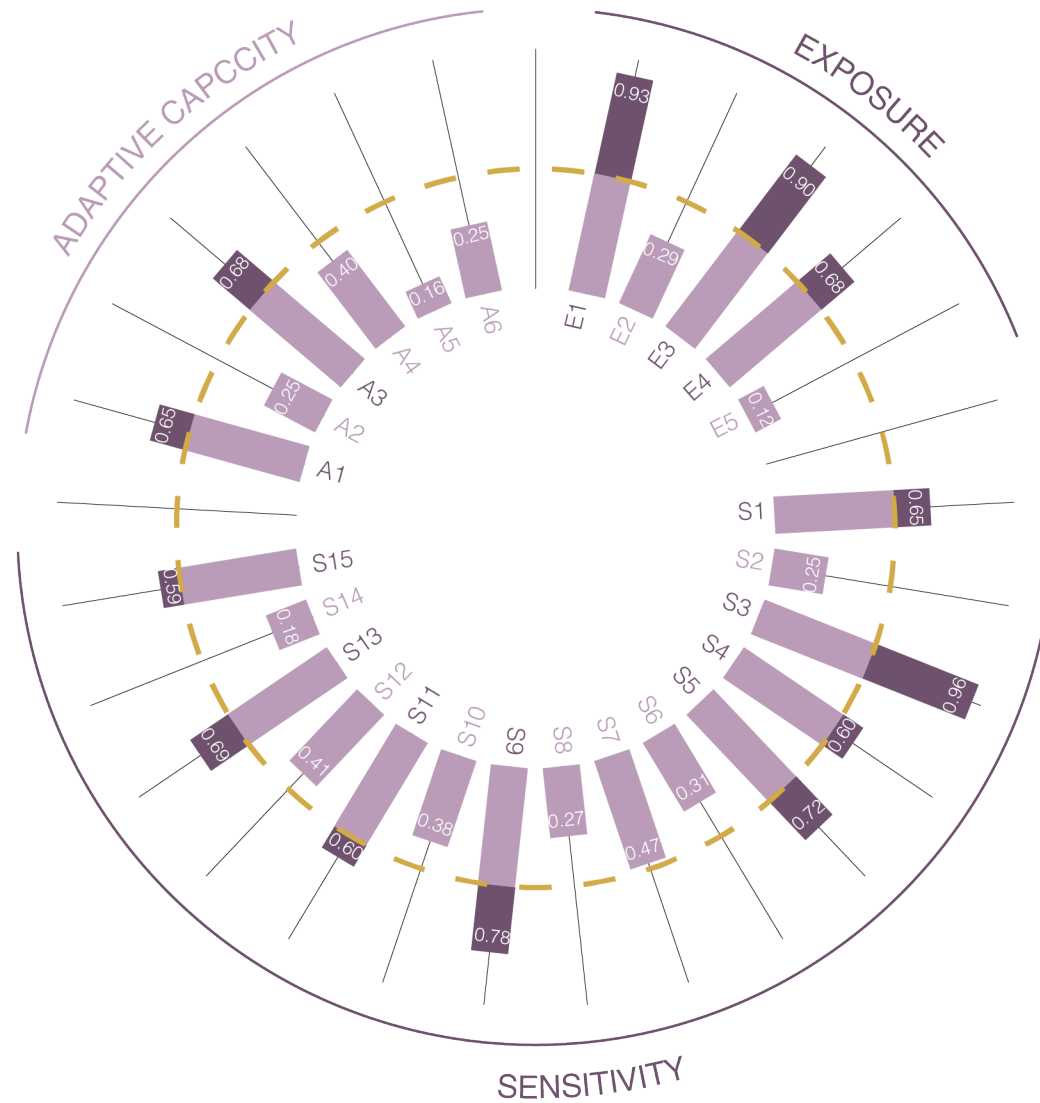
Fig. 6.6.4 The evaluated indicators of adaptability in Geuzenveld- Slotermeer. Made by author.

Fig. 6.3.7 Analytical indicators of pandemic vulnerability in Geuzenveld-Slotermeer. Made by author.
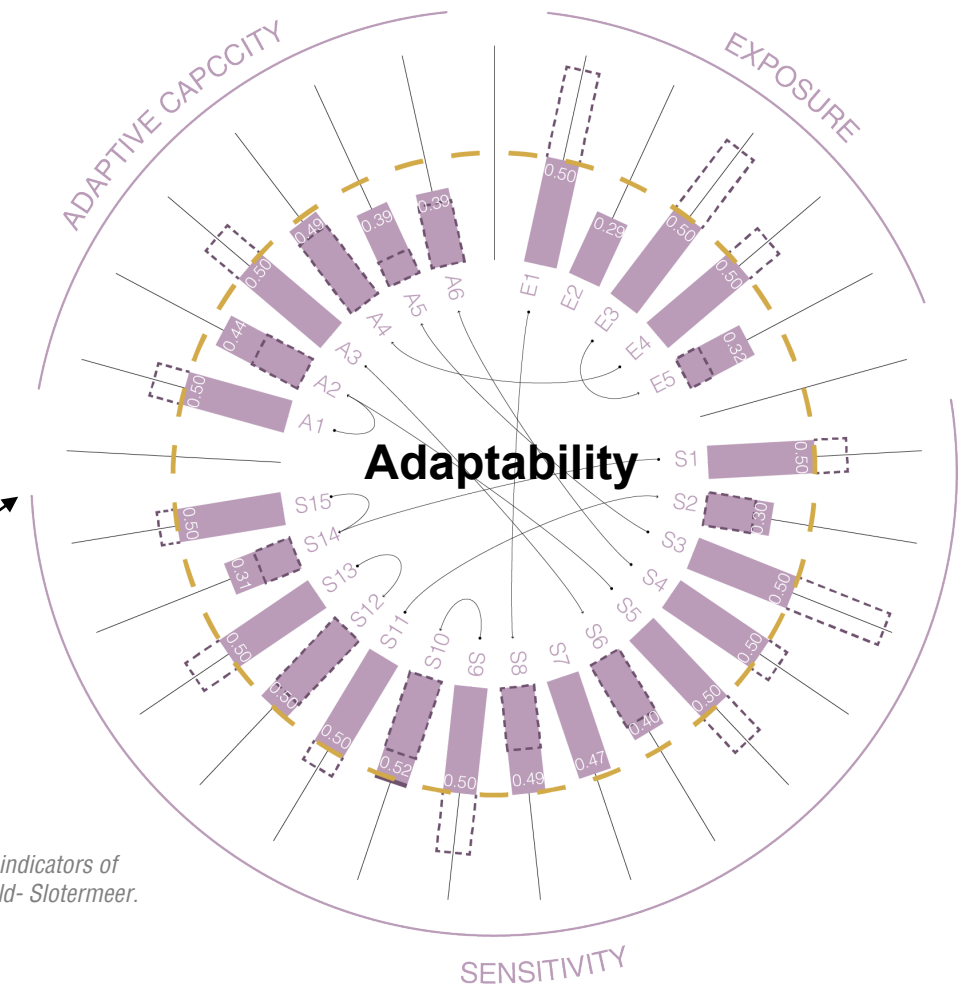
Fig. 6.6.6 The evaluated indicators of transformability in Geuzenveld-Slotermeer. Made by author.

5.2 Micro design principles

- Adaptability

Short-term strategies

Respond quickly

Current residents

Pandemic vulnerability

E1   air pollution
E3   import/export
E4   daily passengers
S1   residential density
S3   age distribution (18-)
S4   immigrants
S5   household income
S9   small businesses
S11   hospital accessibility
S13   motorized transport
S15   open space
A1   education
A3   hospital beds

index over the threshold

index below the threshold

index changed after design

threshold of vulnerability

Fig. 6.4.1 Overview of micro-scale design principles for exposure, sensitivity and adaptive capacity for adaptive capacity. Made by author.

5.2 Micro design principles

• Transformability

Long-term strategies

Lasting benefits

Future generation

General vulnerability

E1   air pollution
E3   import/export
E4   daily passengers
S1   residential density
S3   age distribution (18-)
S4   immigrants
S5   household income
S9   small businesses
S11   hospital accessibility
S13   motorized transport
S15   open space
A1   education
A3   hospital beds

index over the threshold

index below the threshold

index changed after design

threshold of vulnerability

Fig. 6.4.2 Overview of micro-scale design principles for exposure, sensitivity and adaptive capacity for transformability. Made by author.

5.3 Detailed application
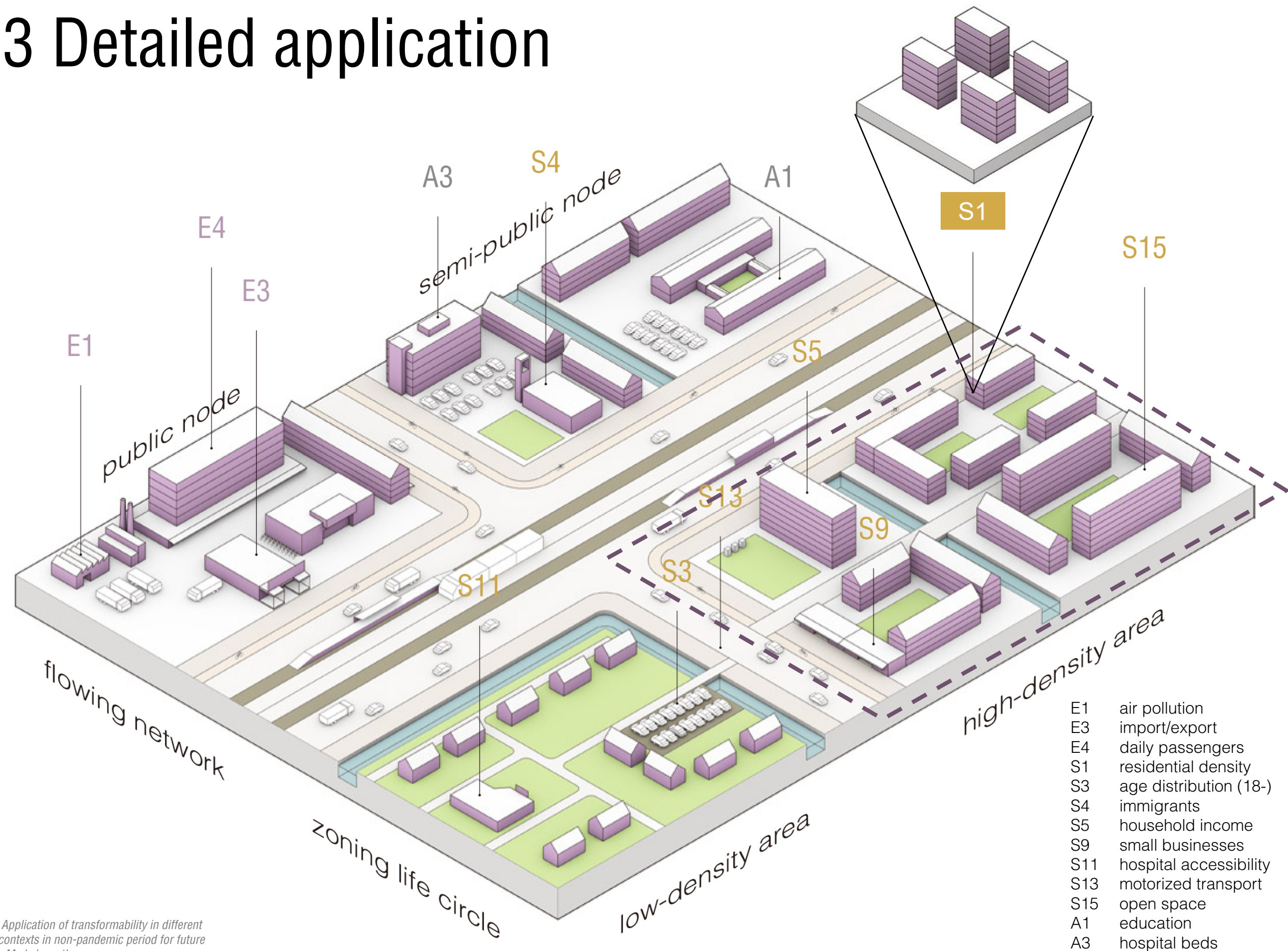
Fig. 6.4.5 Application of transformability in different planning contexts in non-pandemic period for future resilience. Made by author.

E1	air pollution
E3	import/export
E4	daily passengers
S1	residential density
S3	age distribution (18-)
S4	immigrants
S5	household income
S9	small businesses
S11	hospital accessibility
S13	motorized transport
S15	open space
A1	education
A3	hospital beds

5.3 Detailed application

high-density life circle
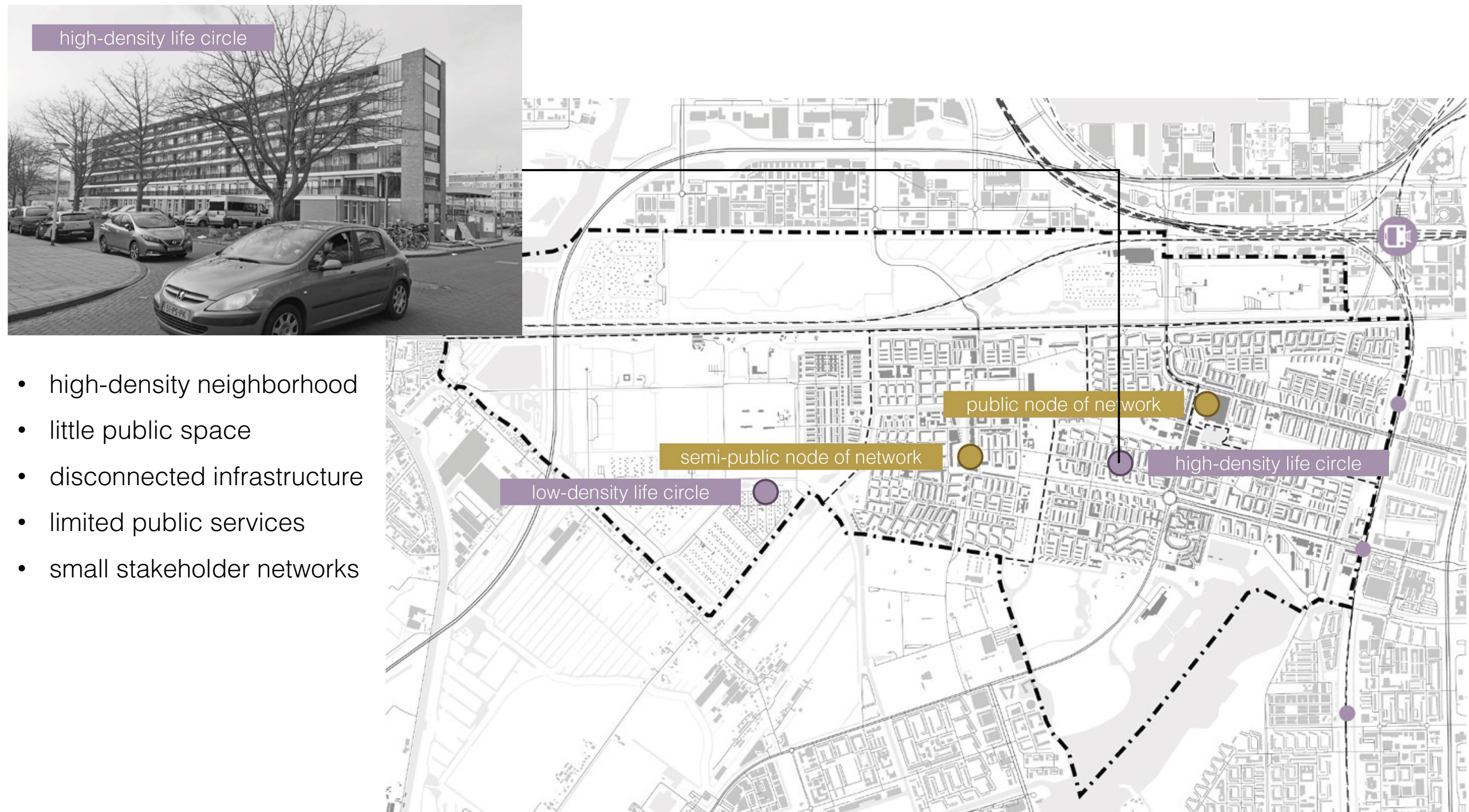
- high-density neighborhood

- little public space

- disconnected infrastructure

- limited public services

- small stakeholder networks

public node of network

semi-public node of network

high-density life circle

low-density life circle

Fig. 6.5.6 Location of focused areas in Geuzenveld-Slotermeer. Made by author.

5.3 Detailed application

- Current situation

Fig. 6.5.29 Isometric map of current situation for high-density life circle without pandemic. Made by author.
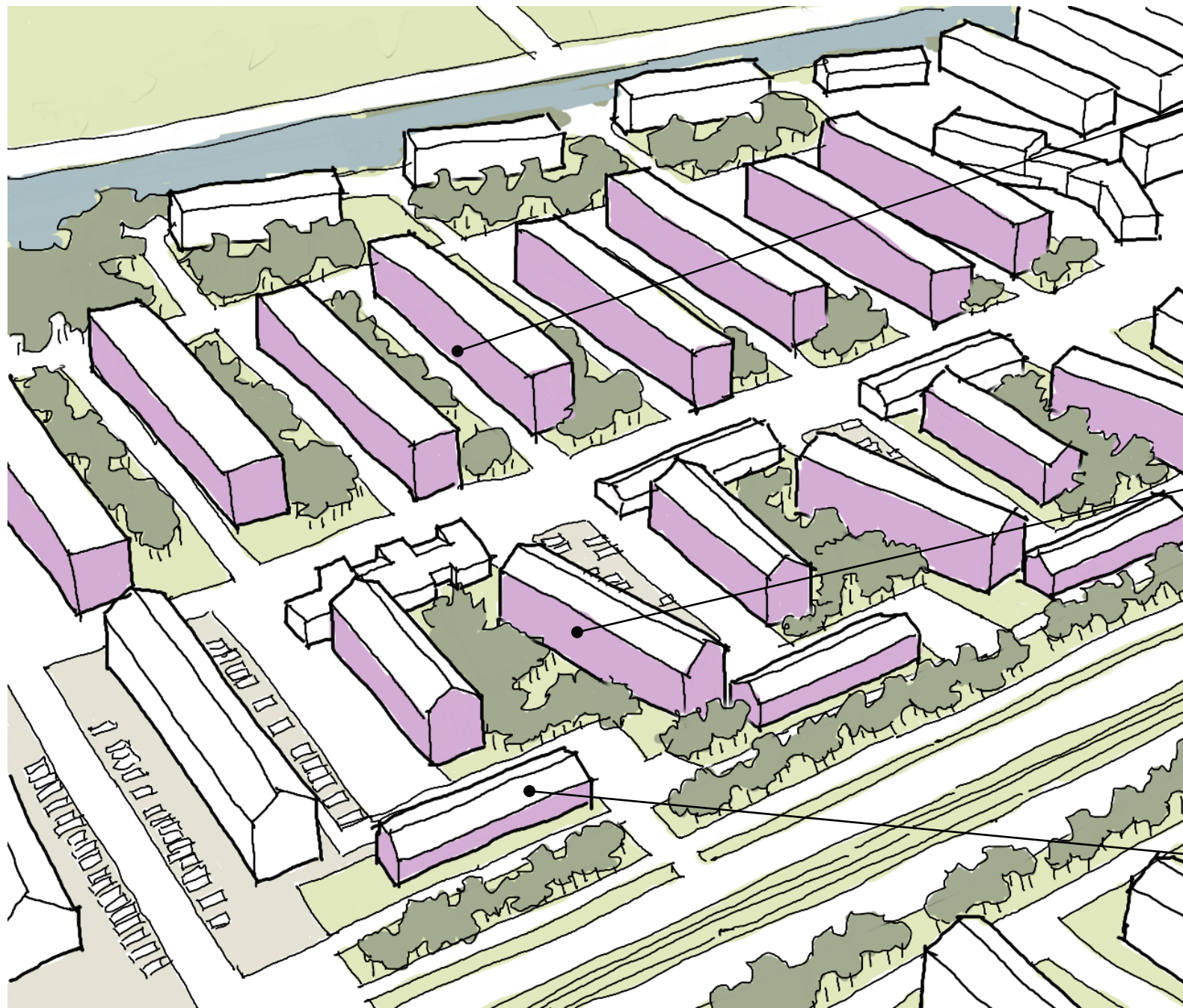
S15
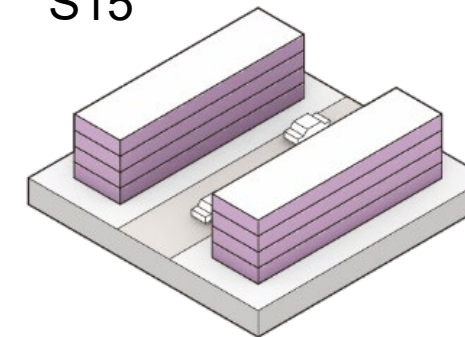
Lack of open space

Low living quality

Open space

S1
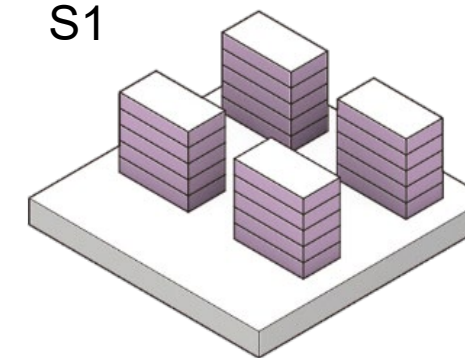
Low building density

High living density

Residential density

S9
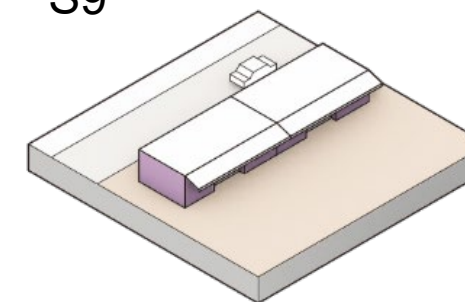
Along the main road

Closed during the pandemic

Small businesses

5.3 Detailed application

- Current situation

Fig. 6.5.28 The evaluated indicators of current situation for high-density life circle without pandemic. Made by author.

Fig. 6.5.30 Impression of current situation for high-density life circle without pandemic. Made by author.

5.3 Detailed application

• Adaptability

S15
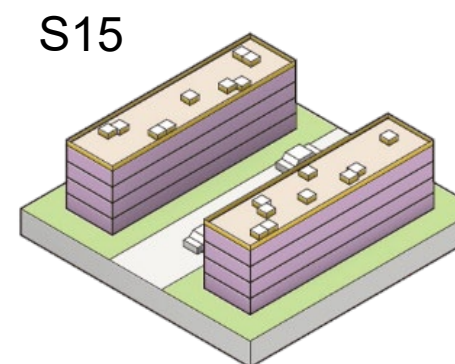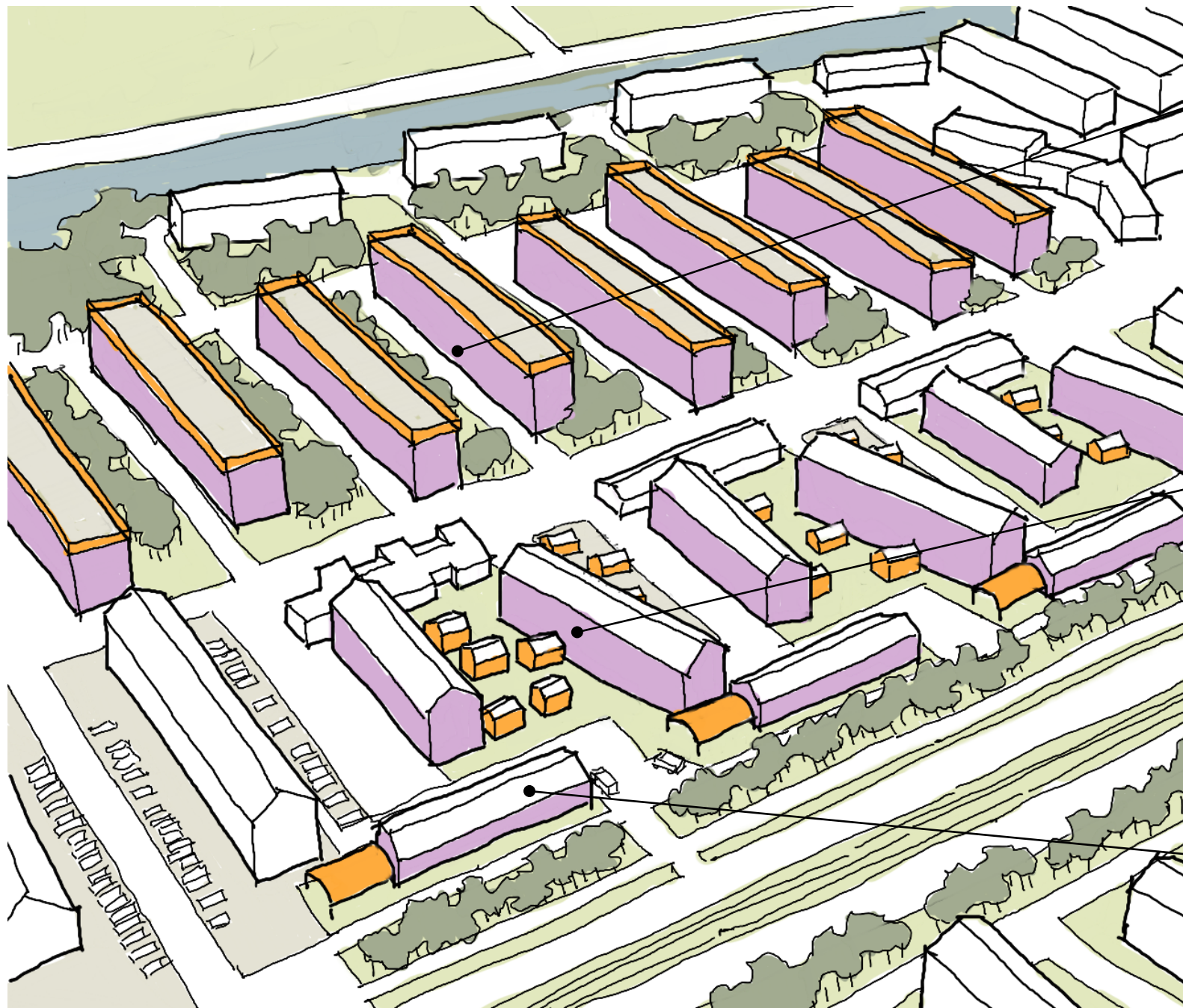
Open space

Using roofs as open space for activities

S1

Residential density
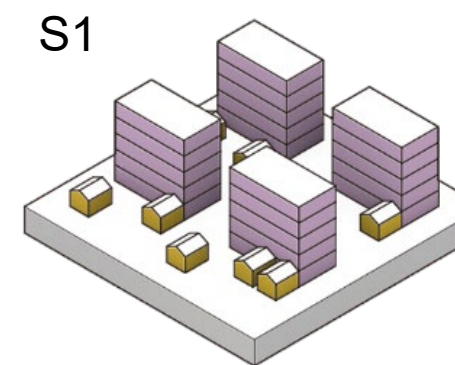
Modular construction for temporary housing

S9
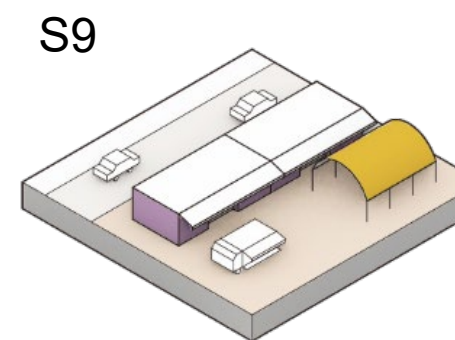
Small businesses

Developing online commerce with storage

Fig. 6.5.35 Isometric map of transformability for high-density life circle in 2050. Made by author.

5.3 Detailed application

- Adaptability

Fig. 6.5.31 The evaluated indicators of adaptability for high-density life circle during the pandemic. Made by author.

Fig. 6.5.33 Impression of adaptability for high-density life circle during the pandemic. Made by author.

5.3 Detailed application

- Transformability
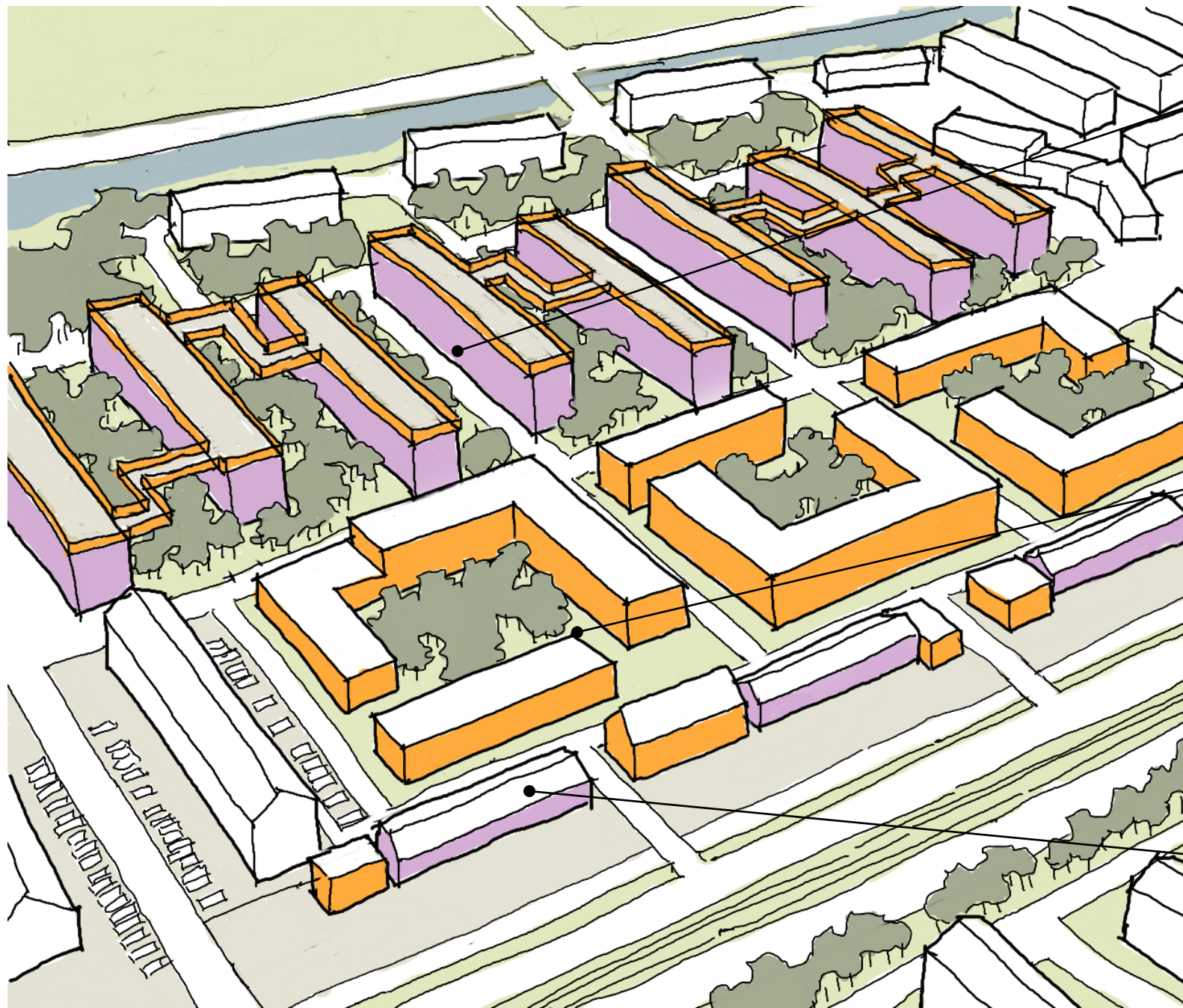
S15
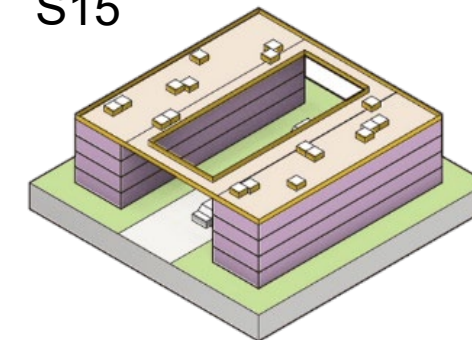
Connected open
space network

Open space

S1
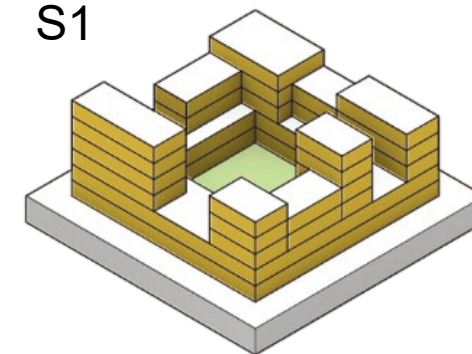
Mixed housing to
increase living diversity

Residential density

S9
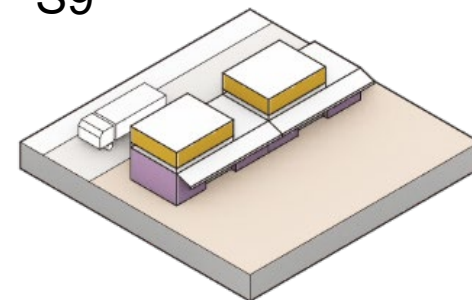
Walkable street
Mixed businesses

Small businesses

Fig. 6.5.32 Isometric map of resistance for high-density life circle during the pandemic. Made by author.

5.3 Detailed application

- Transformability

Fig. 6.5.34 The evaluated indicators of transformability for high-density life circle in 2050. Made by author.

Holiday

Workday

Fig. 6.5.36 Impression of transformability for high-density life circle in 2050. Made by author.

5.3 Detailed application

- Implement roadmap
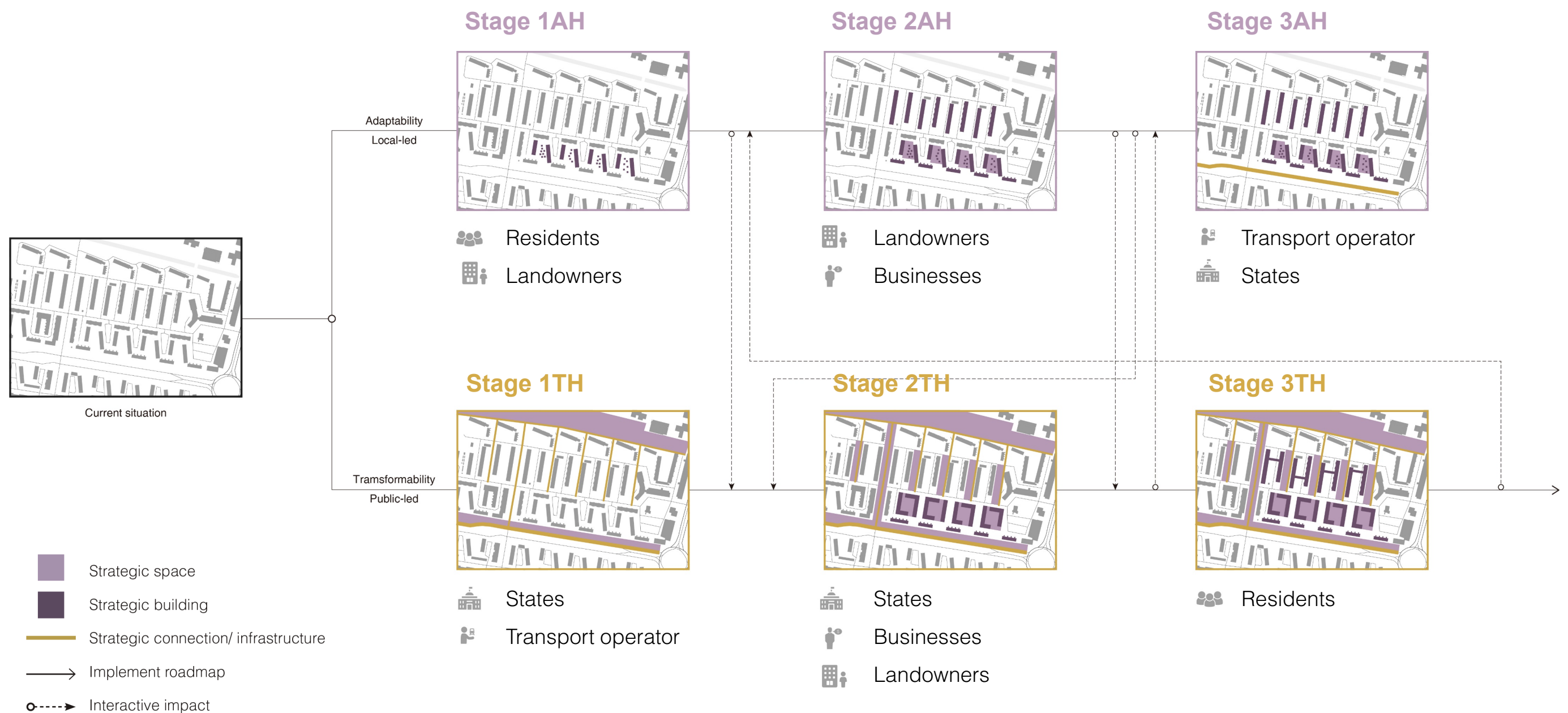
Fig. 6.5.39 Implement roadmap with different stakeholders in high-density life circle. Made by author.

5.4 Local community

- Spatial dimension: current

S13

Motorized transport

S1

Residential density

E4

Daily passengers

Low-density neighborhood

Semi-public node

High-density neighborhood

Public node
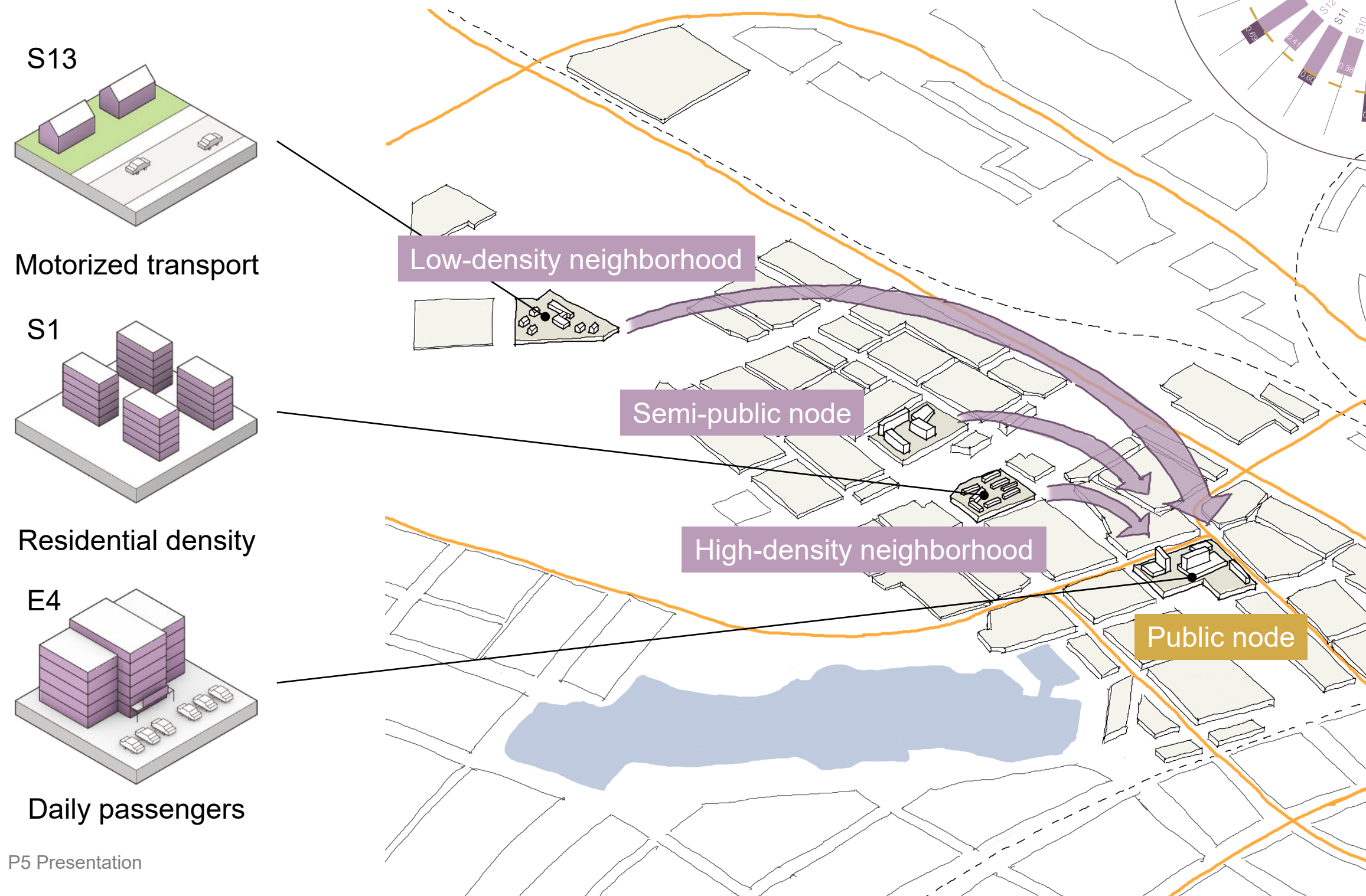
Fig. 6.6.1 The life circles and urban flow in Geuzenveld-Slotermeer at present. Made by author.

Fig. 6.6.2 The evaluated indicators in Geuzenveld-Slotermeer at present. Made by author.

5.4 Local community

- ## Spatial dimension: adaptability

S13

Cycling and walking

S1

Temporary housing

E4

Community working

Low-density neighborhood

Semi-public node

High-density neighborhood

Public node
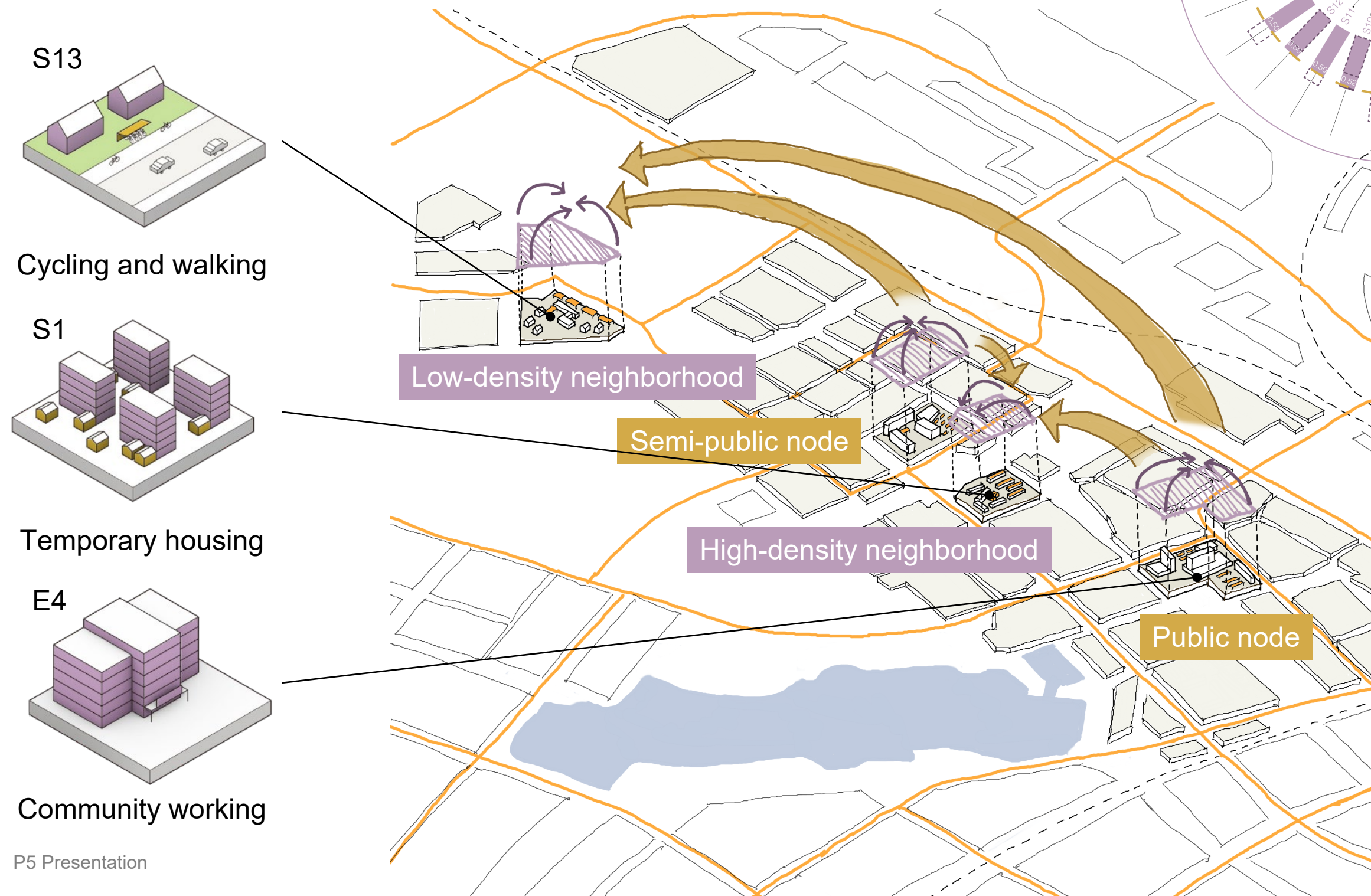
Fig. 6.6.3 The life circles and urban flow of adaptability in Geuzenveld-Slotermeer. Made by author.

Fig. 6.6.4 The evaluated indicators of adaptability in Geuzenveld-Slotermeer. Made by author.

5.4 Local community

- Spatial dimension: transformability
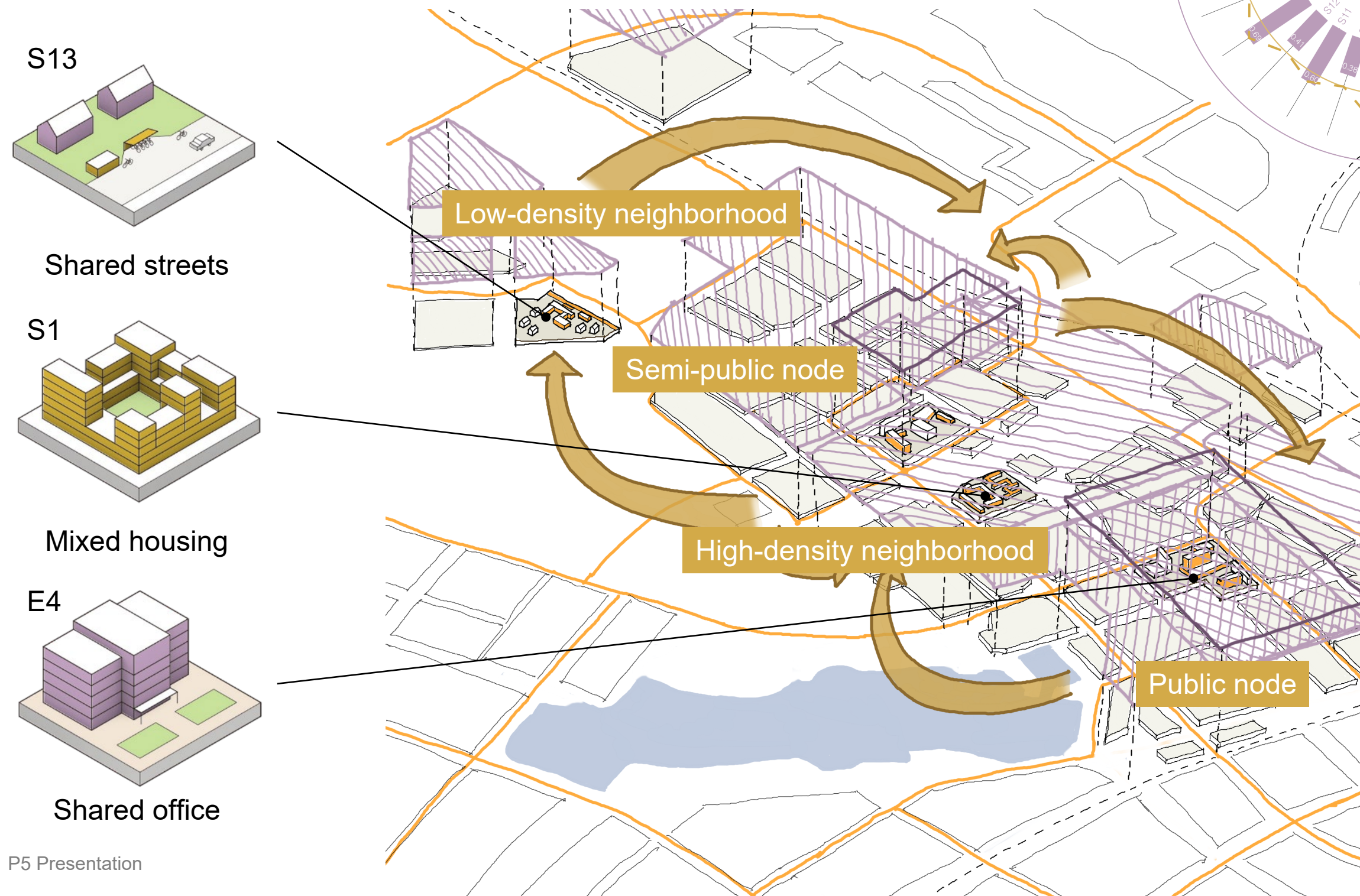
Fig. 6.6.5 The life circles and urban flow of transformability in Geuzenveld-Slotermeer. Made by author.

Fig. 6.6.6 The evaluated indicators of transformability in Geuzenveld-Slotermeer. Made by author.

5.4 Local community

- ## Time dimension
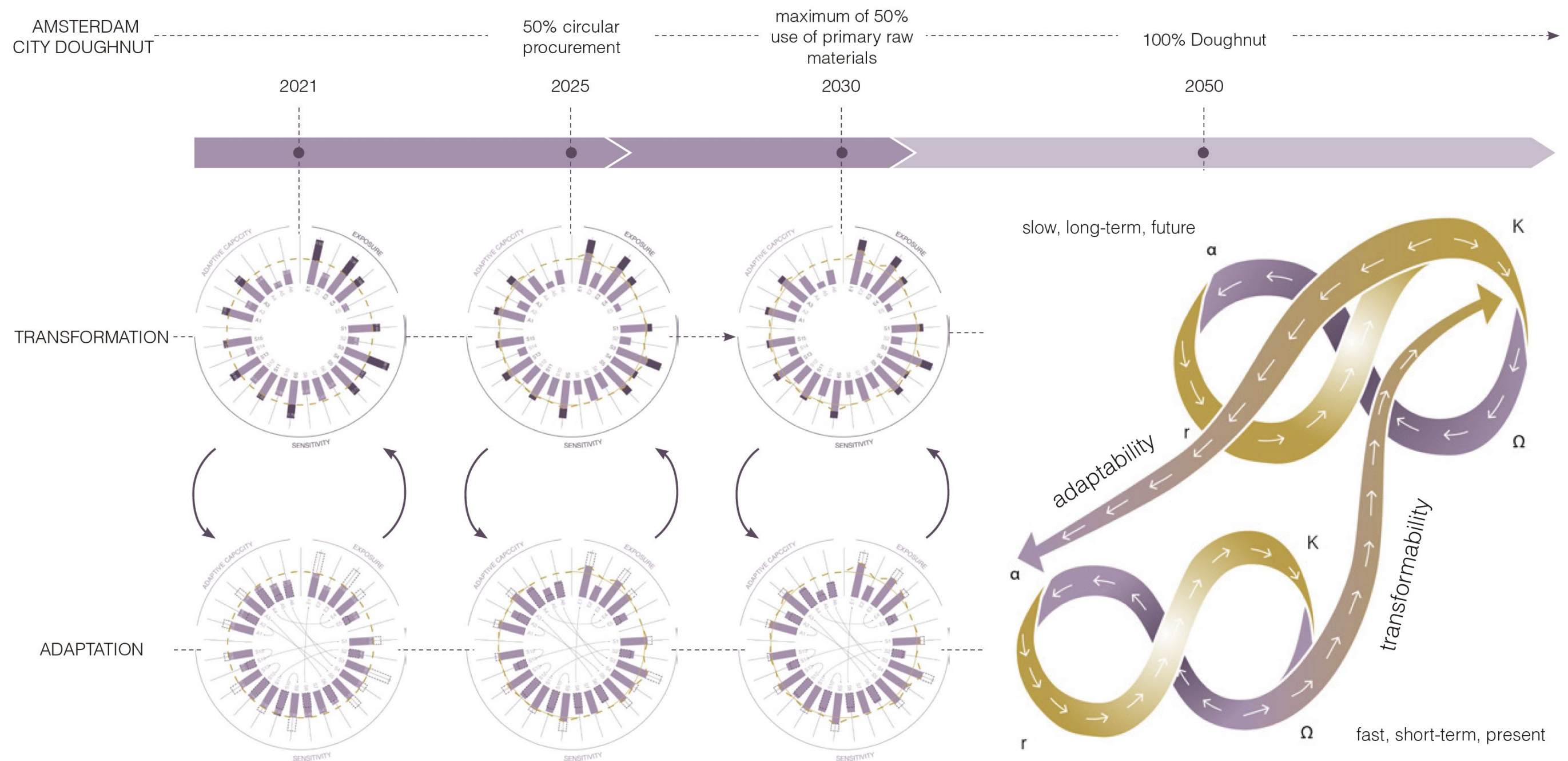
Fig. 6.6.7 Time dimension of development phases compared with Amsterdam Doughnut Economy. Made by author.

Fig. 5.4.2 Time dimension of dynamic planning. Made by author, adapted from Holling and Gunderson (2002, pp. 34–41).

5.5 Regional planning

- ## Regional impacts of adaptation
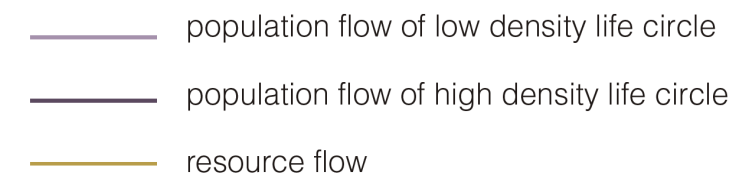
Fig. 6.7.2 Process of metropolitan region. Made by author.
Fig. 6.7.3 Regional impacts of adaptation in MRA. Made by author.
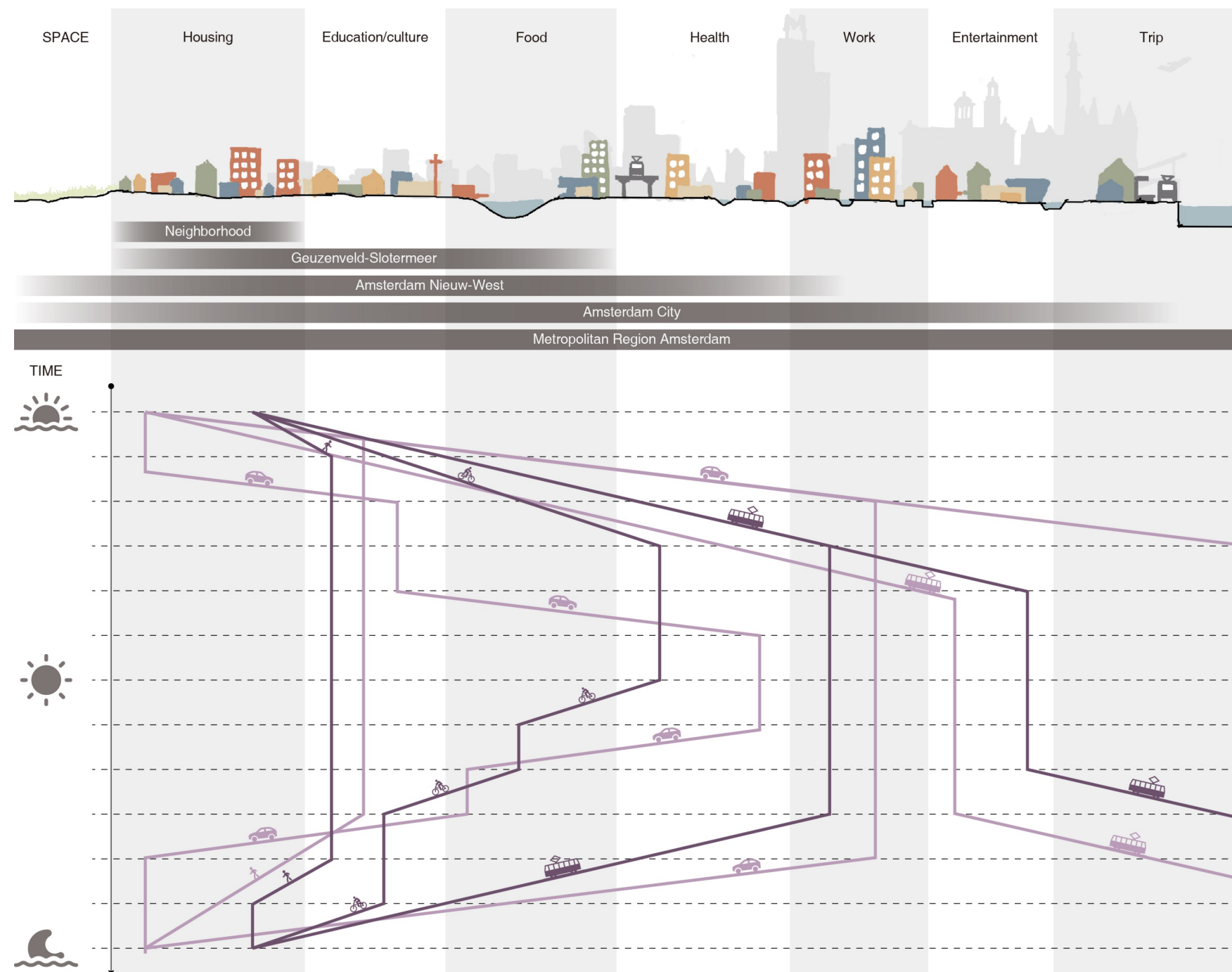
Current flow

5.5 Regional planning
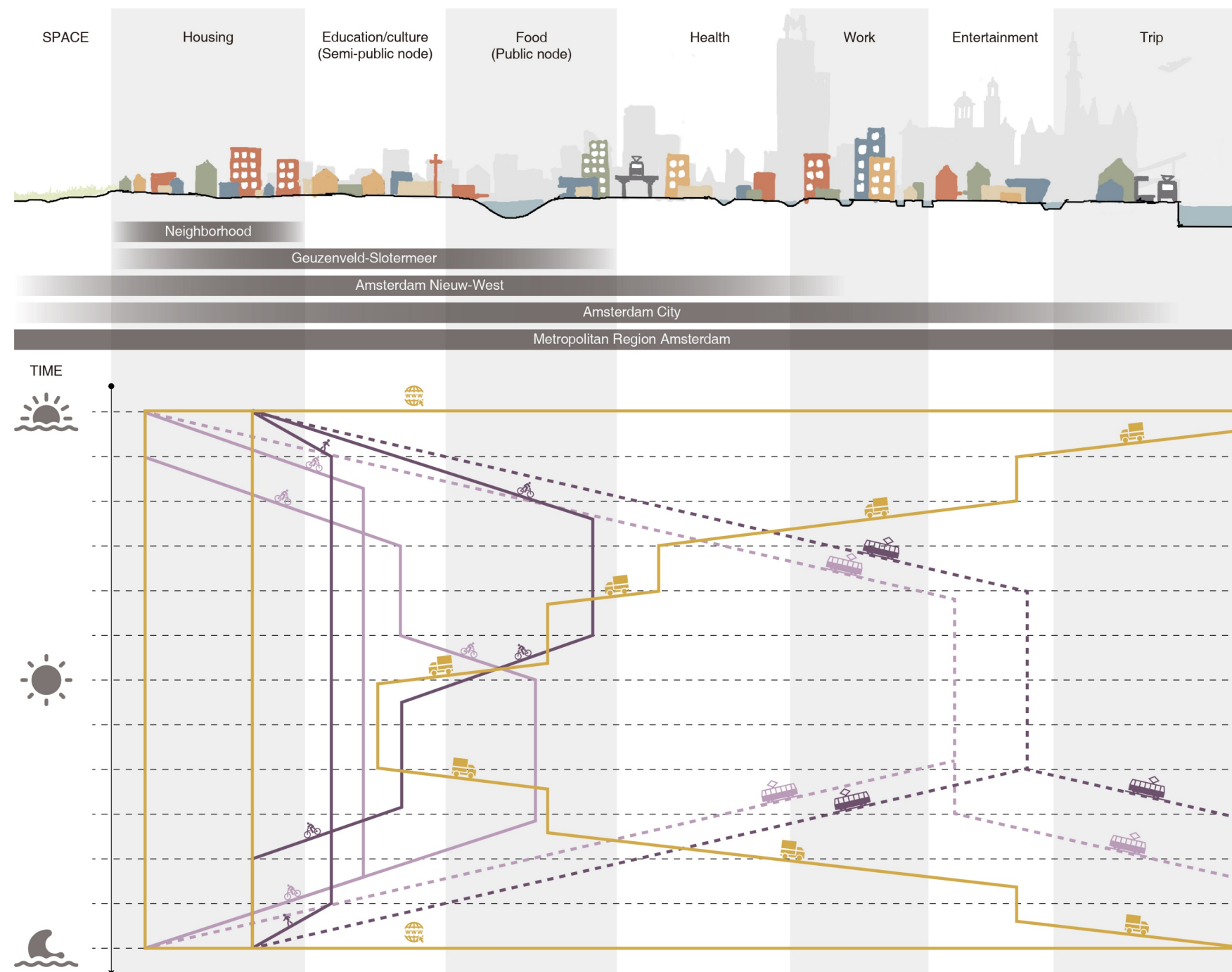
- Regional impacts of adaptation

Fig. 6.7.4 Process of small cities. Made by author.
Fig. 6.7.3 Regional impacts of adaptation in MRA. Made by author.

Adaptation
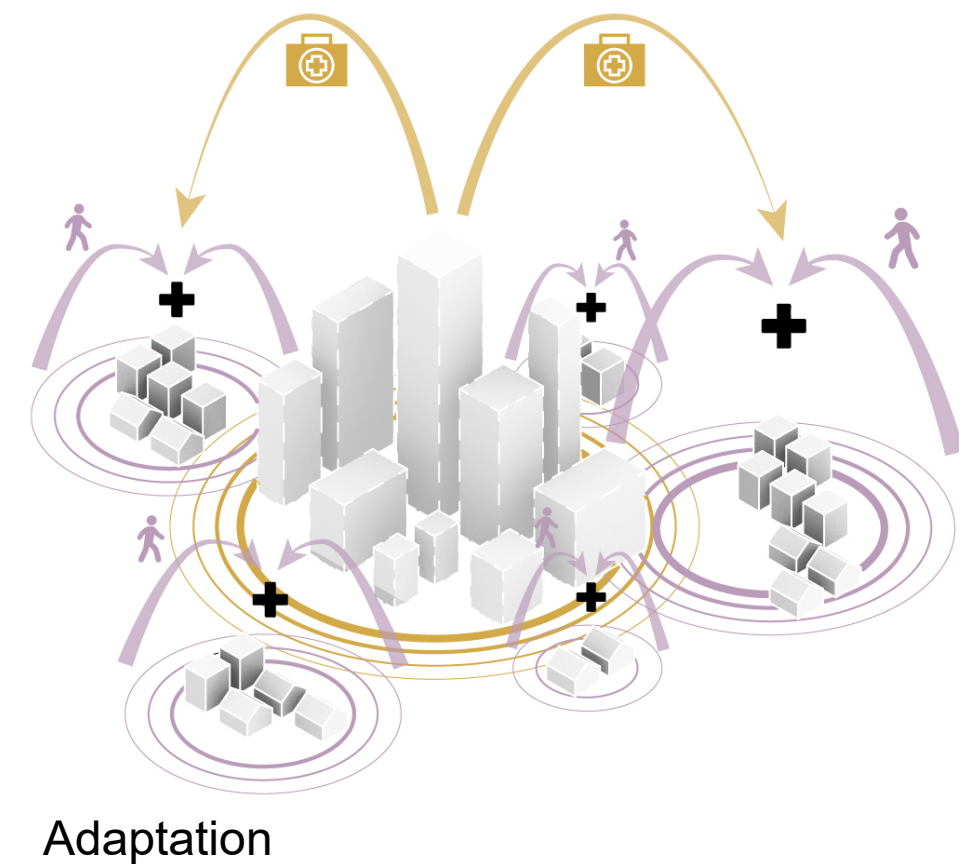
5.5 Regional planning

- ## Regional solutions for transformation

Fig. 6.7.5 Outcome of dynamic network in transformation. Made by author.

- ## Panarchy
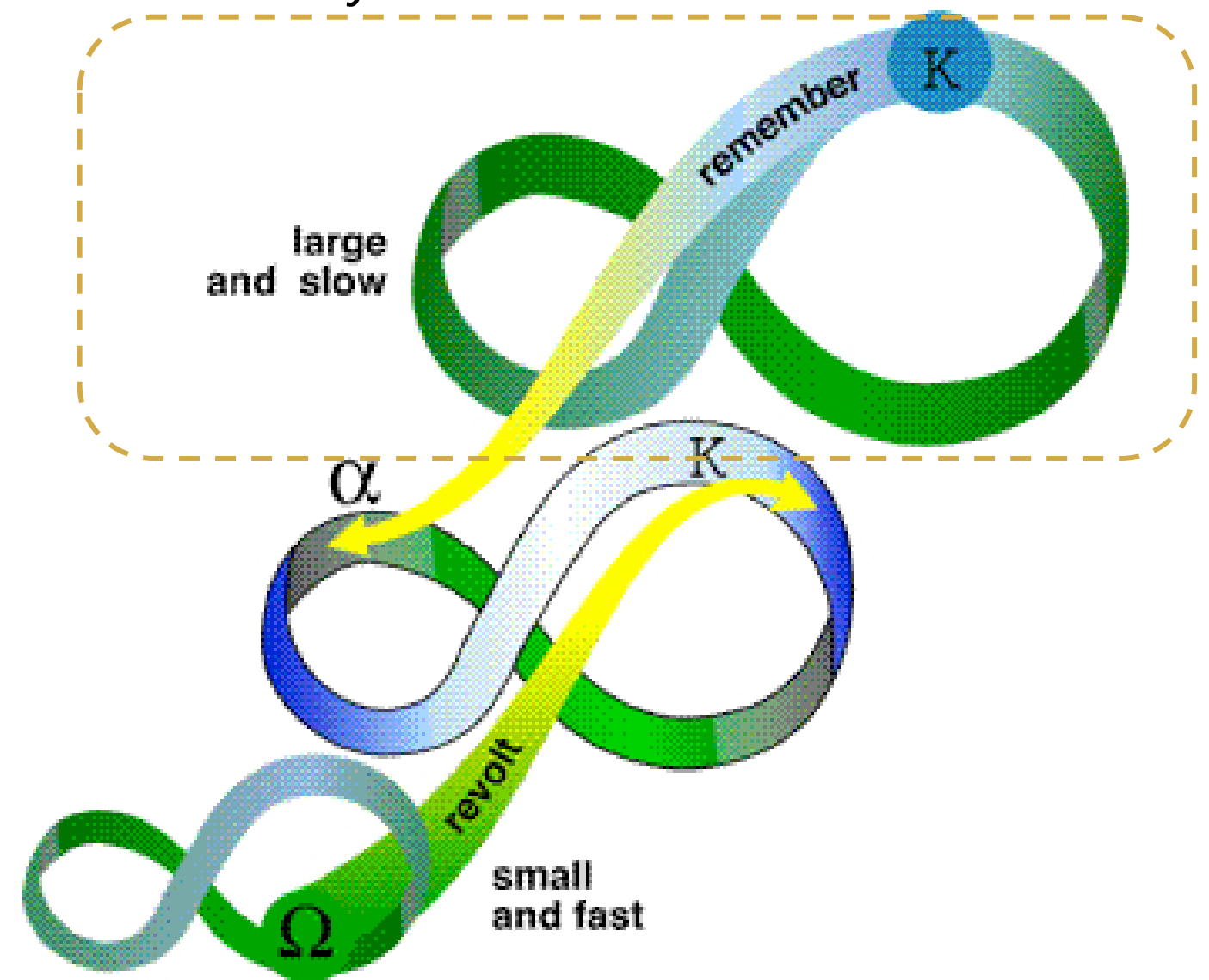
Fig. 5.2.2 Panarchy of adaptive cycle. Source: Gunderson & Holling, 2002.

5.5 Regional planning

- Regional solutions for transformation

Connection: efficient public transportation

Fig. 6.7.9 Impression of limited urban sprawl in MRA in 2050. Made by author.
Fig. 6.7.10 Impression of space for communication in MRA in 2050. Made by author.
Fig. 6.7.11 Impression of efficient public transportation in MRA in 2050. Made by author.

Origin: limited sprawl

Destination: space for communication

NORTH SEA

Port IJmuiden

Tourism Haarlem

HAARLEM

Circular industry

Office and manufacture

Geuzenveld-Slotermeer

Main port Schiphol

AMSTERDAM

Governance

Green port Aalsmeer

AMSTELVEEN

Culture and exhibition

Business

MARKERMEER

Entertainment Almere

ALMERE

Port Lelystad

HILVERSUM
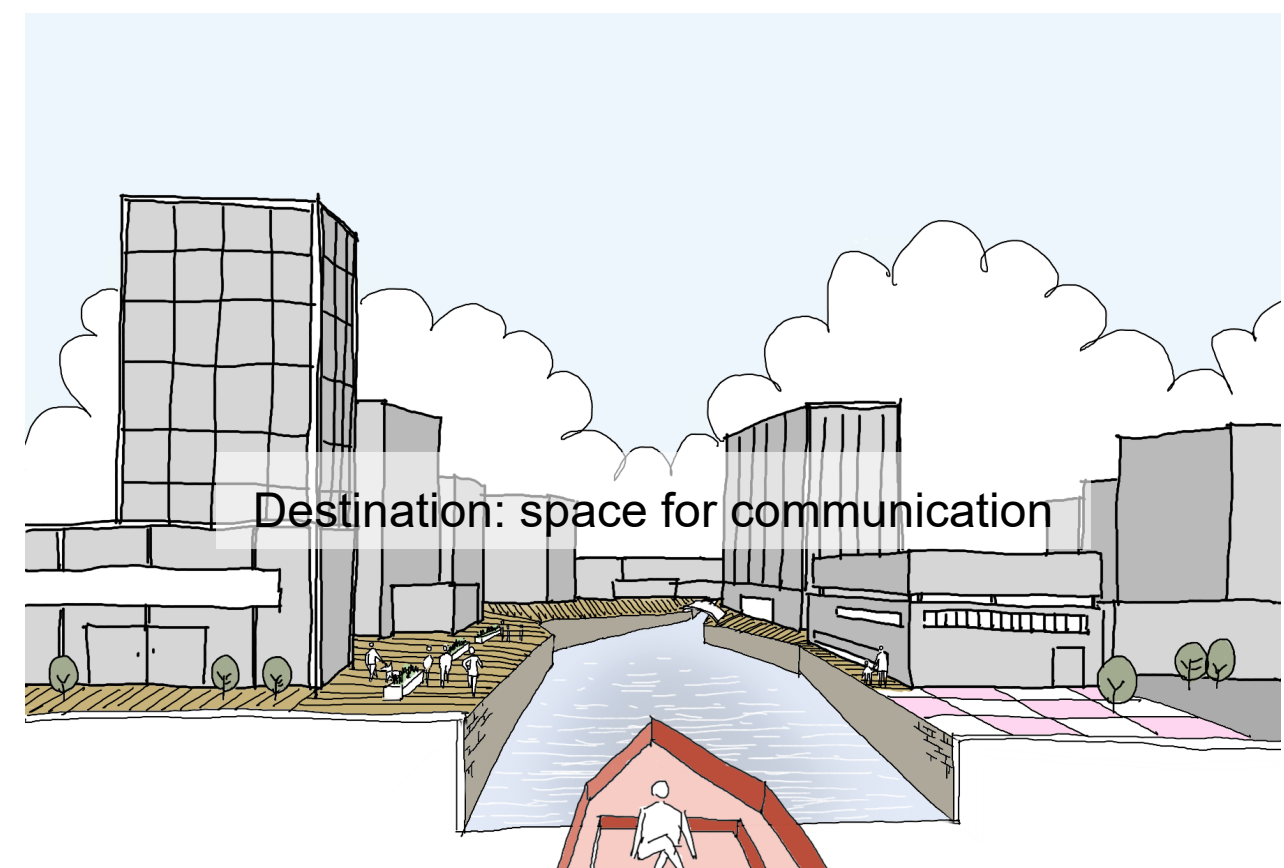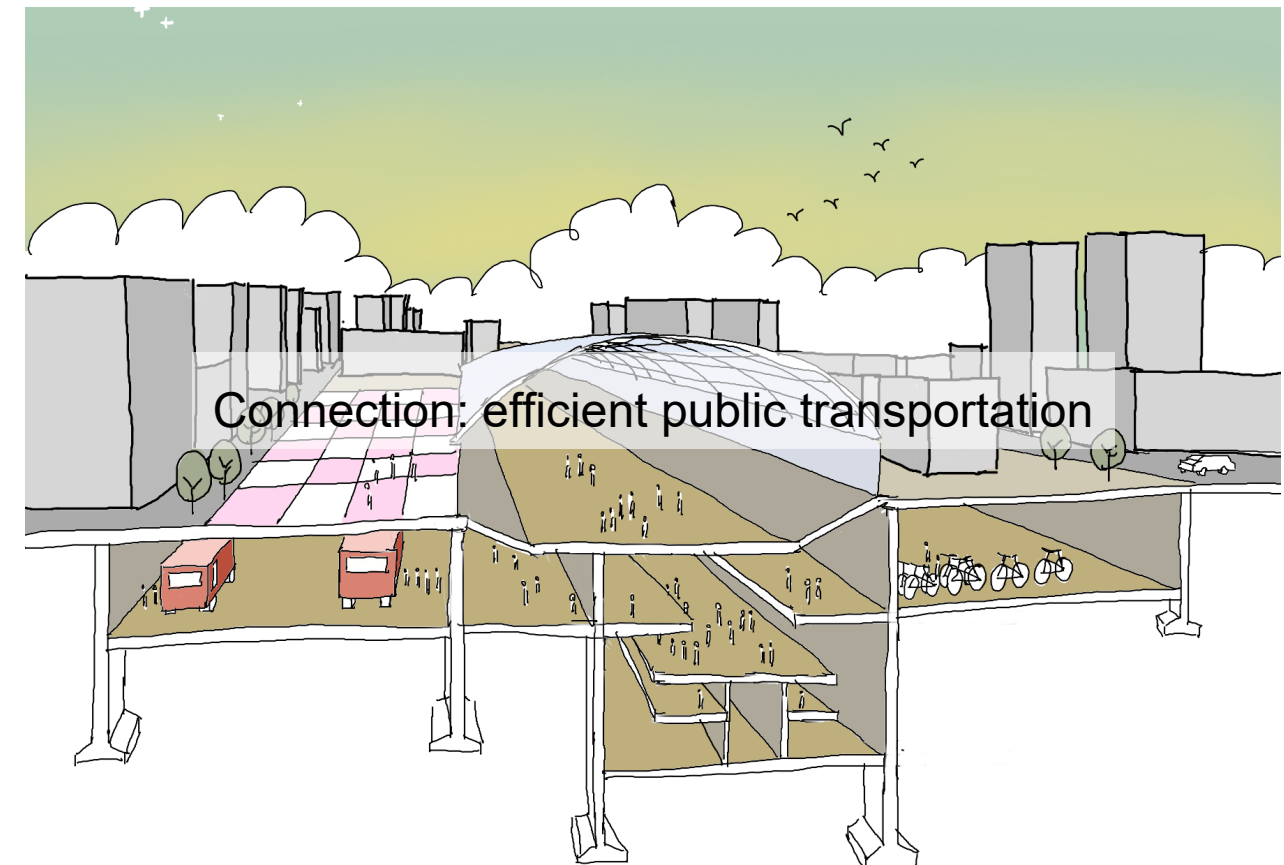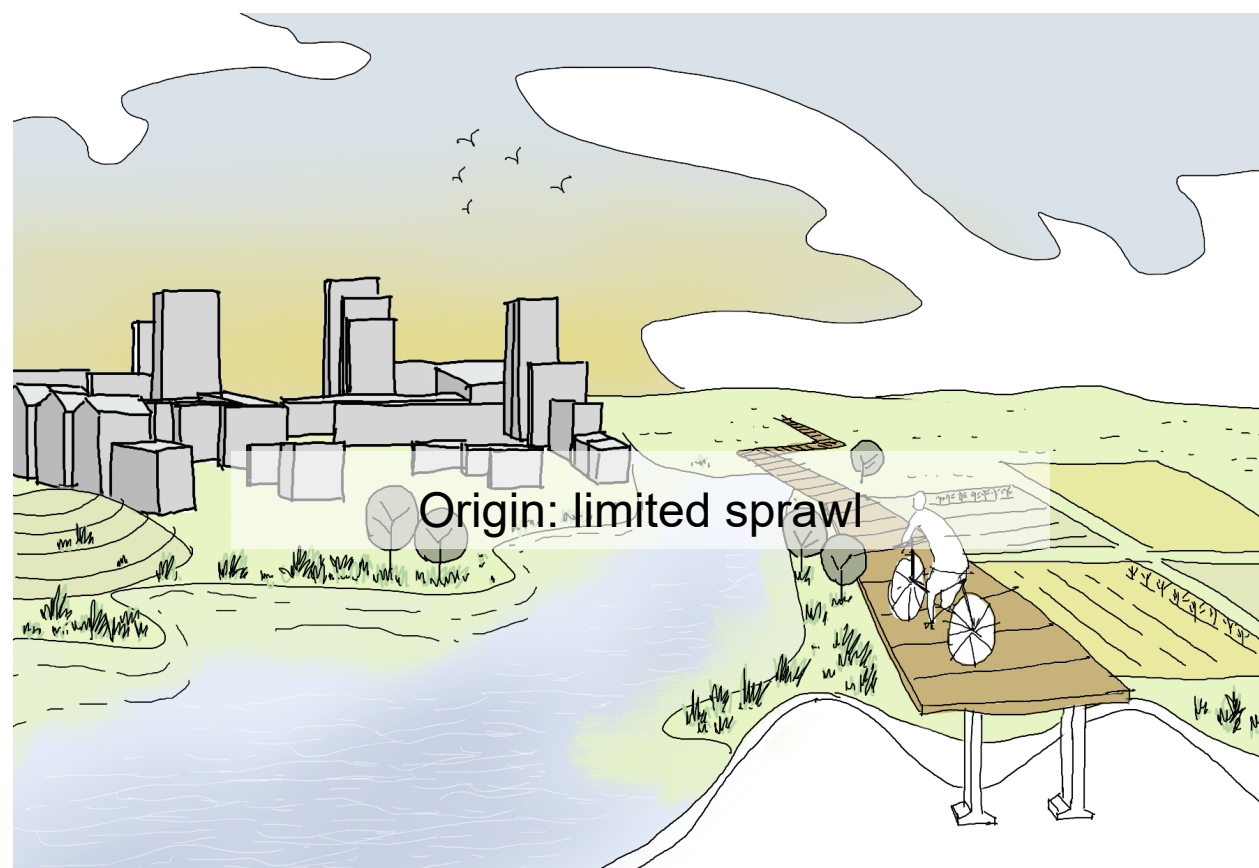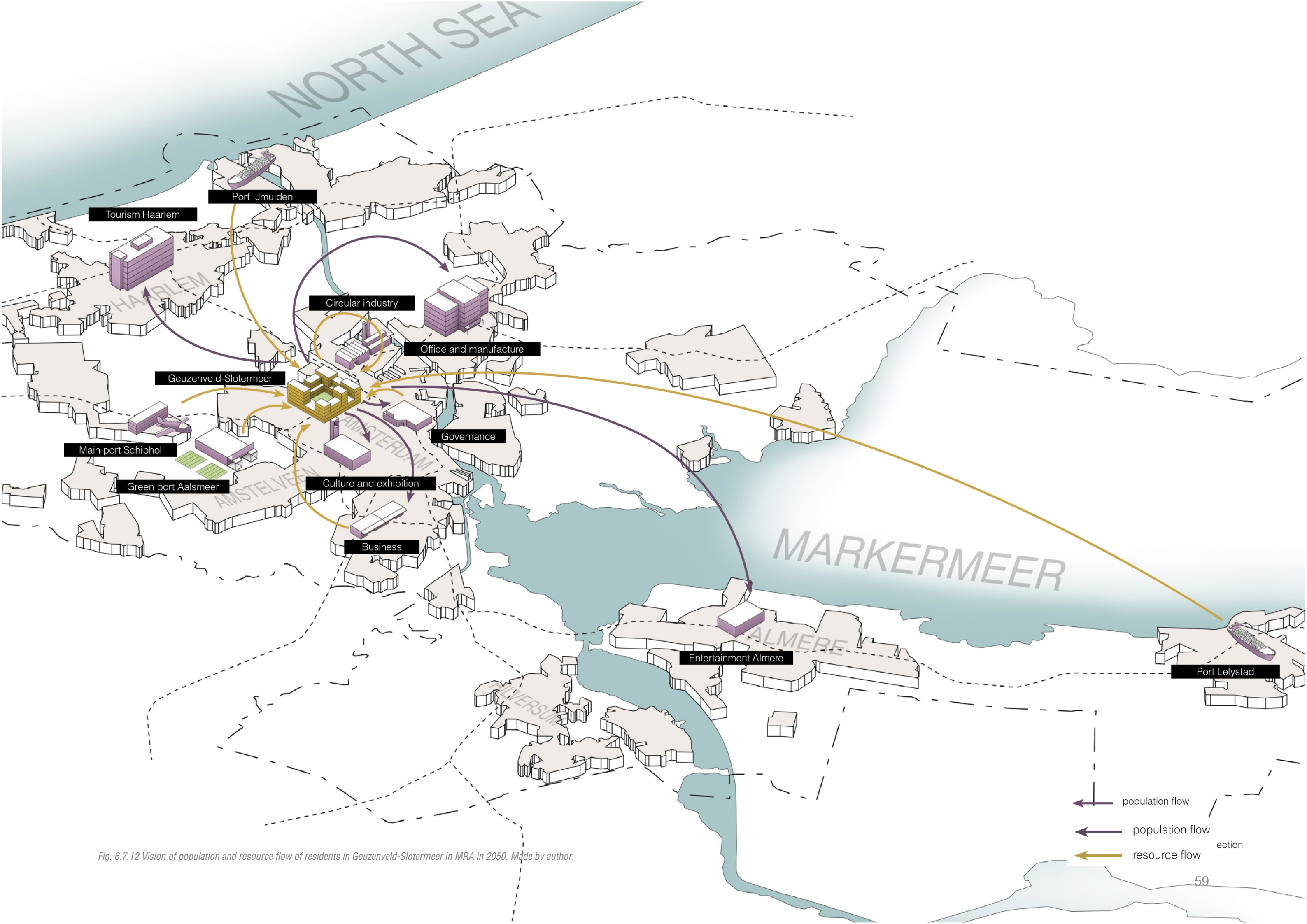
Fig. 6.7.12 Vision of population and resource flow of residents in Geuzenveld-Slotermeer in MRA in 2050. Made by author.

population flow

population flow

ection

resource flow

59

6 | EVALUATION AND CONCLUSION

6.1 Scenarios

Legend:
- housing areas
- mixed areas
- business center
- water space
- green space
- main public transport
- main urban streets
- railway station
- area for solar energy
- green-blue hotspot
- public node
- semi-public node
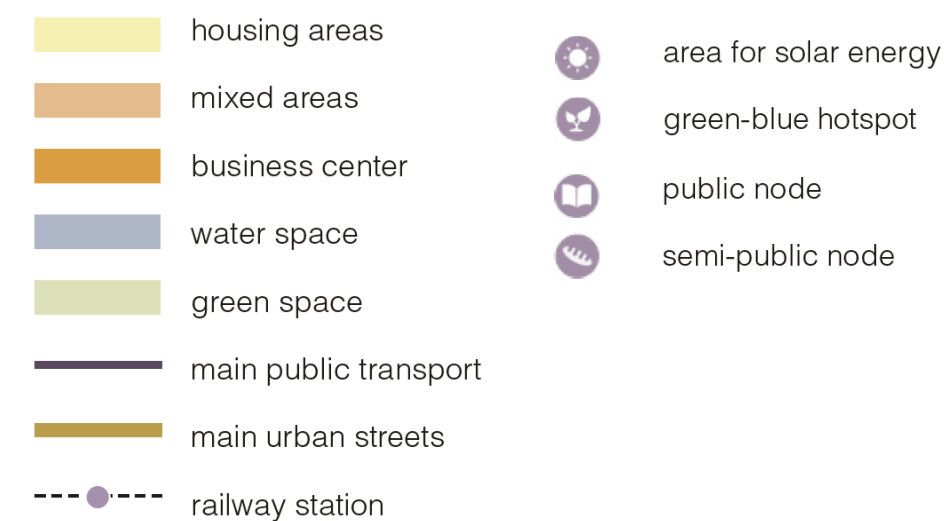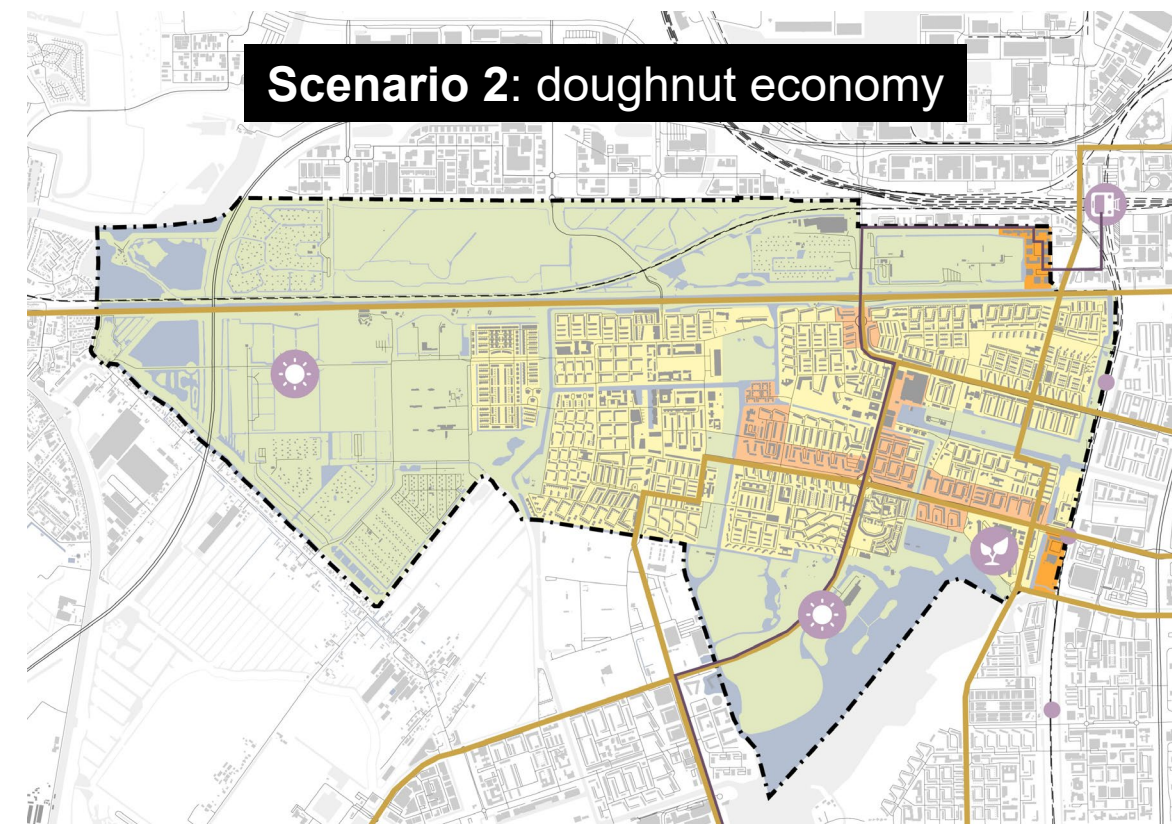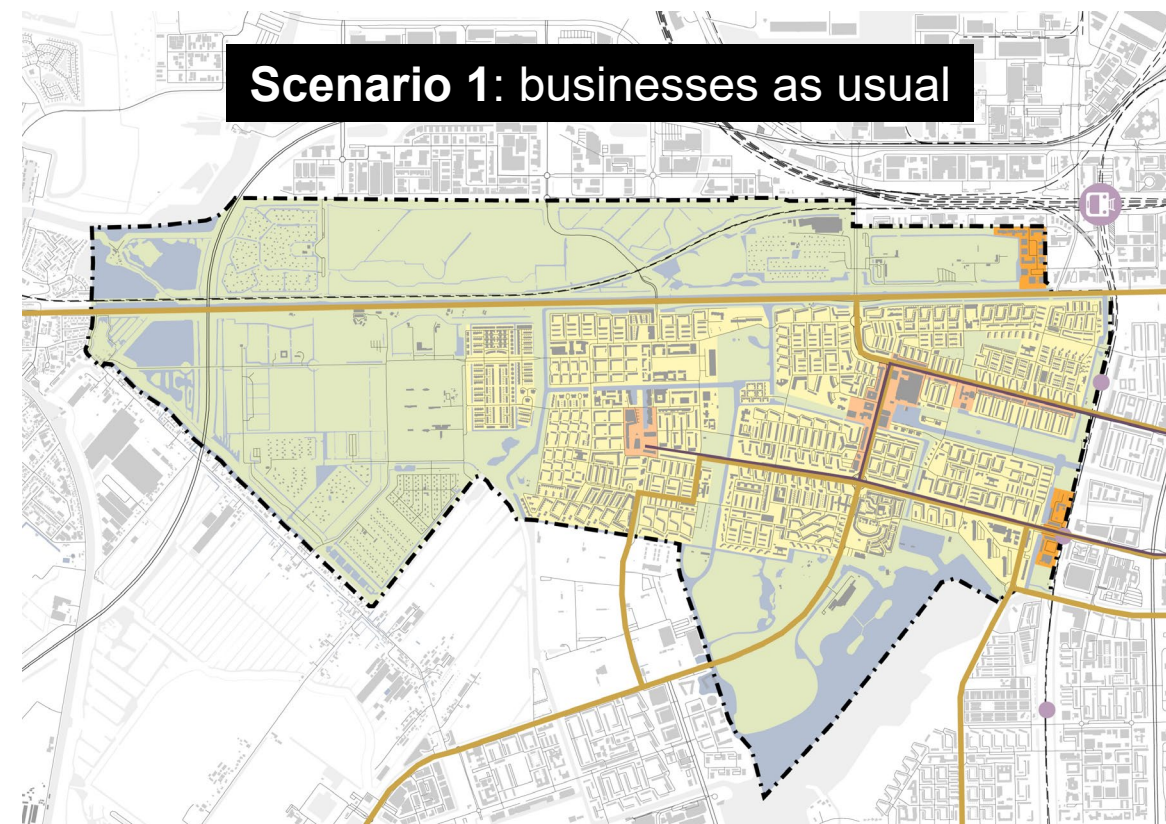
Fig. 1.1.2 Scenario 1: businesses as usual in Geuzenveld-Slotermeer in 2050. Made by author.

Fig. 1.1.3 Scenario 2: doughnut economy in Geuzenveld-Slotermeer in 2050. Made by author, based on source from https://amsterdam2050.nl/.

Fig. 1.1.4 Scenario 3: dynamic plannig in Geuzenveld-Slotermeer in 2050. Made by author.
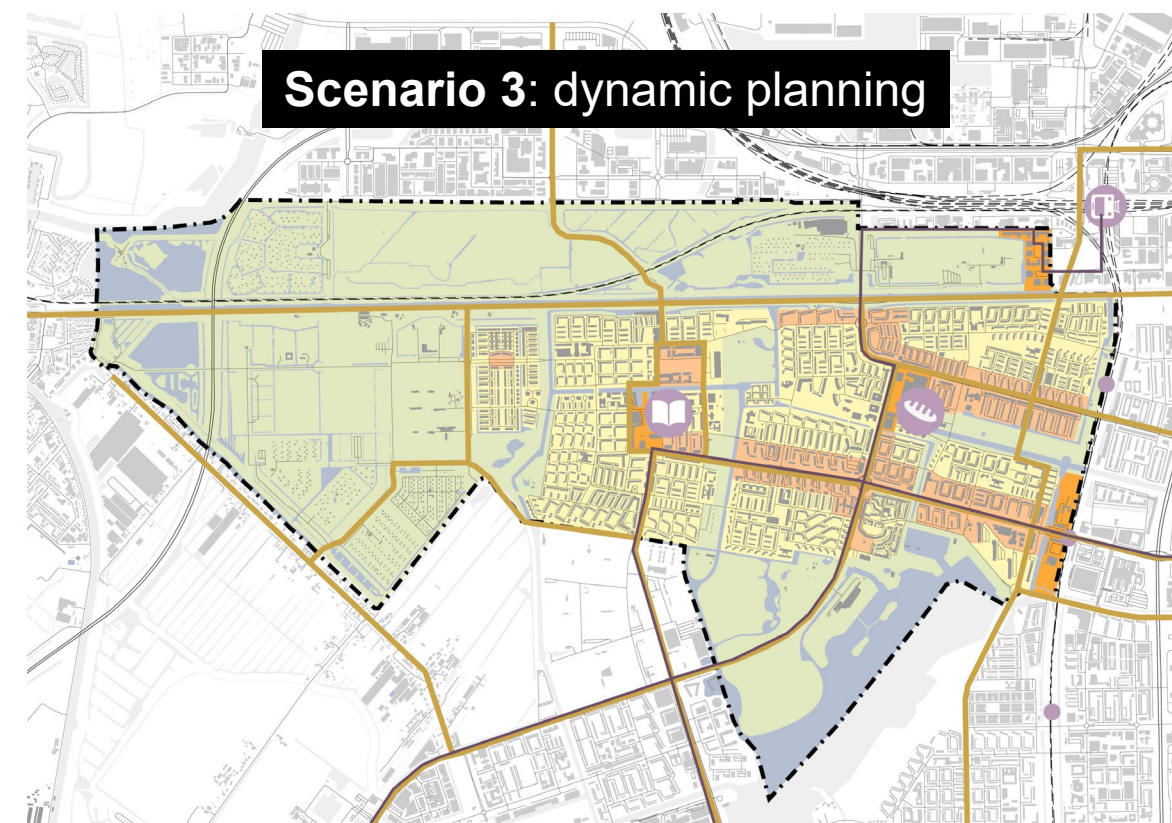
6.2 Pandemic vulnerability

- Short-term vulnerability

Typology

1. E(+), S(+), AC(−)
2. E(+), S(+), AC(+)
3. E(+), S(−), AC(−)
4. E(+), S(−), AC(+)
5. E(−), S(+), AC(−)
6. E(−), S(+), AC(+)
7. E(−), S(−), AC(−)
8. E(−), S(−), AC(+)

Fig. 7.5.1 Vulnerability of current situation in Geuzenveld-Slotermeer. Made by author.

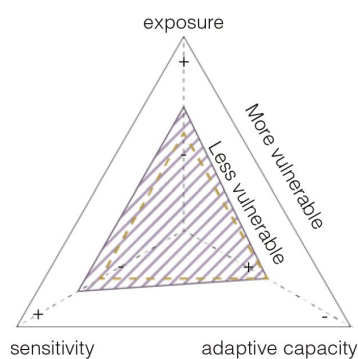Fig. 7.5.2 Vulnerability of business as usual in Geuzenveld-Slotermeer in a short term. Made by author.

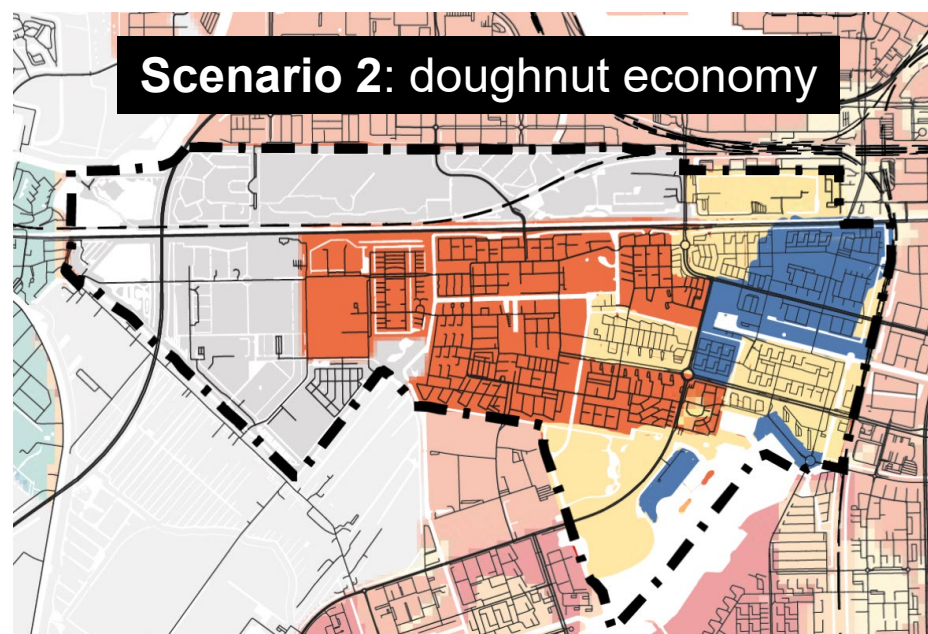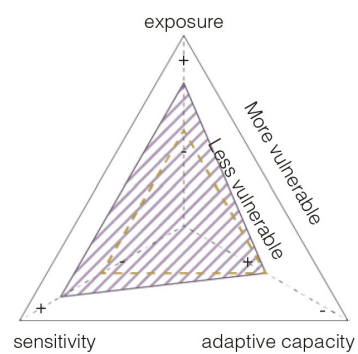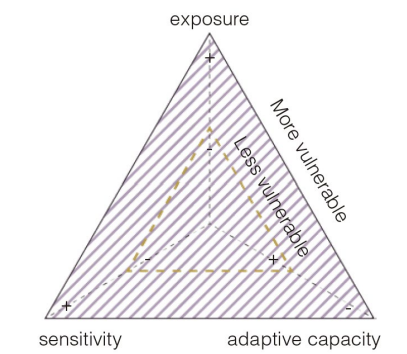Fig. 7.5.3 Vulnerability of Doughnut economic planning in Geuzenveld-Slotermeer in a short term. Made by author.
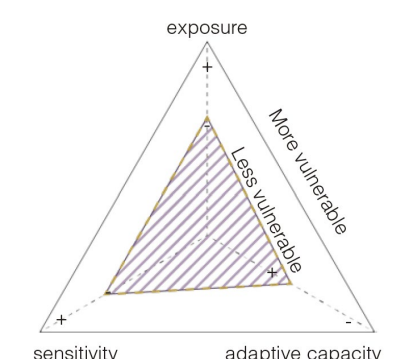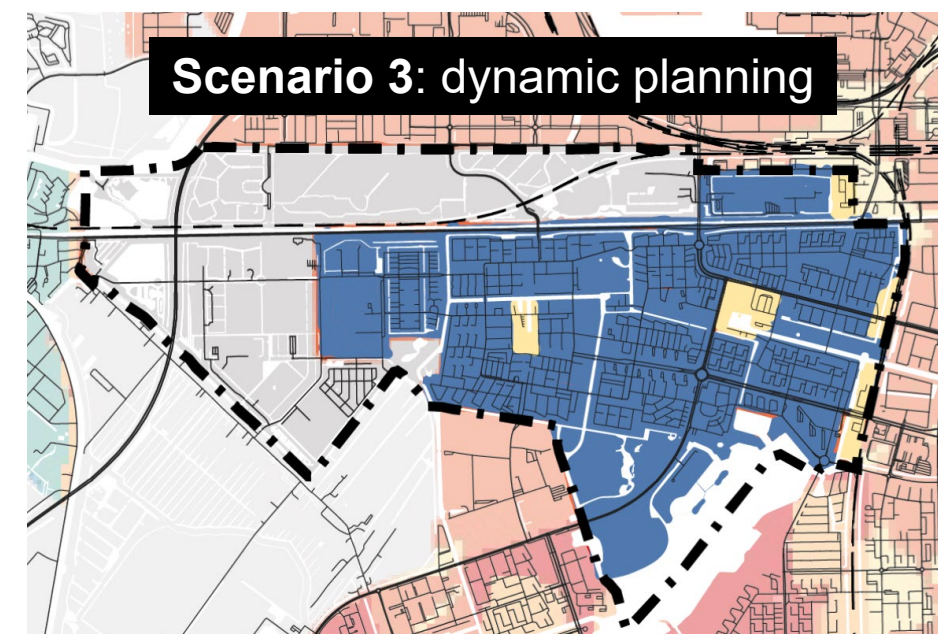
Fig. 7.5.4 Vulnerability of Dynamic planning in Geuzenveld-Slotermeer in a short term. Made by author.

6.2 Pandemic vulnerability

• Long-term vulnerability

Typology

■ 1. E(+), S(+), AC(-)   ■ 5. E(-), S(+), AC(-)

■ 2. E(+), S(+), AC(+)   ■ 6. E(-), S(+), AC(+)

■ 3. E(+), S(-), AC(-)   ■ 7. E(-), S(-), AC(-)

■ 4. E(+), S(-), AC(+)   ■ 8. E(-), S(-), AC(+)

Fig. 7.5.1 Vulnerability of current situation in Geuzenveld-Slotermeer. Made by author.
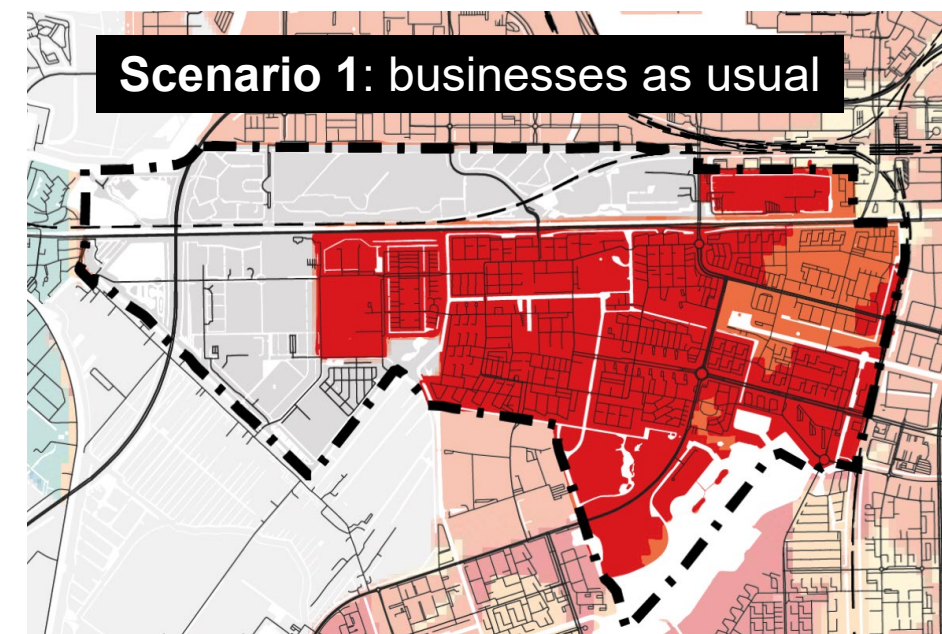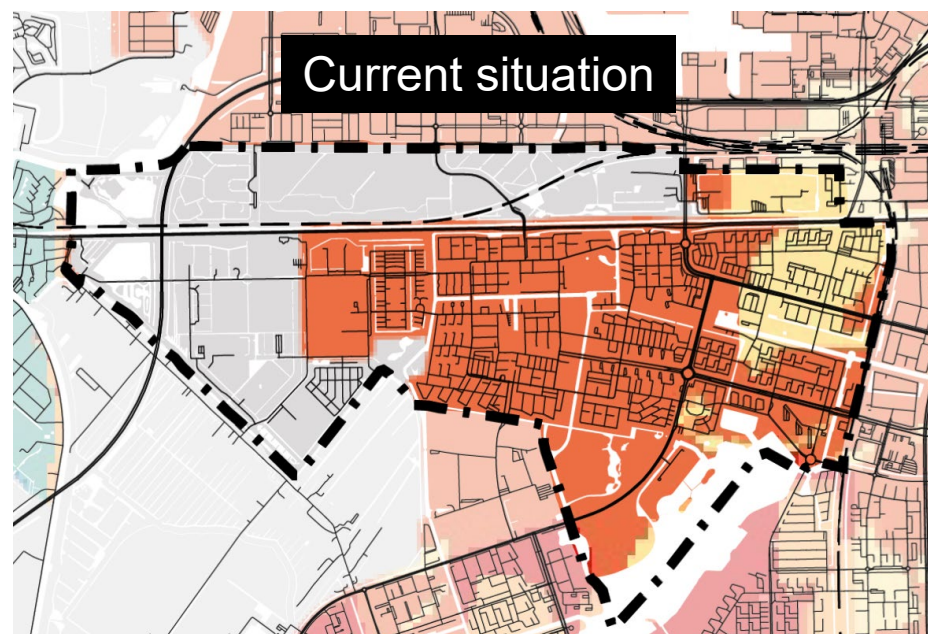

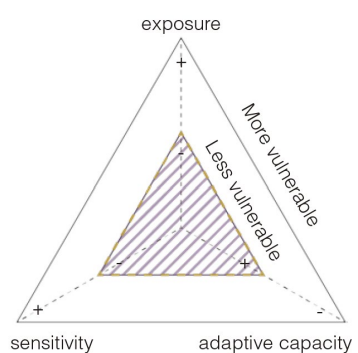*Fig. 7.5.5 Vulnerability of business as usual in Geuzenveld-Slotermeer in a long term. Made by author.*

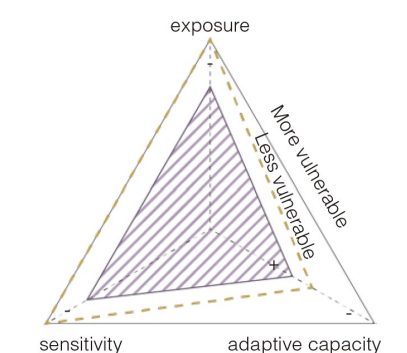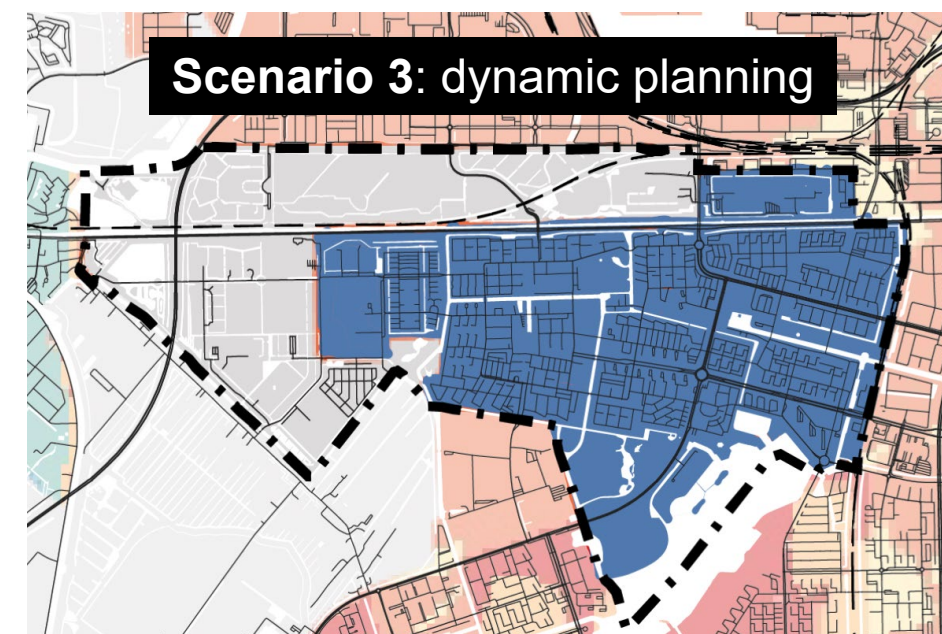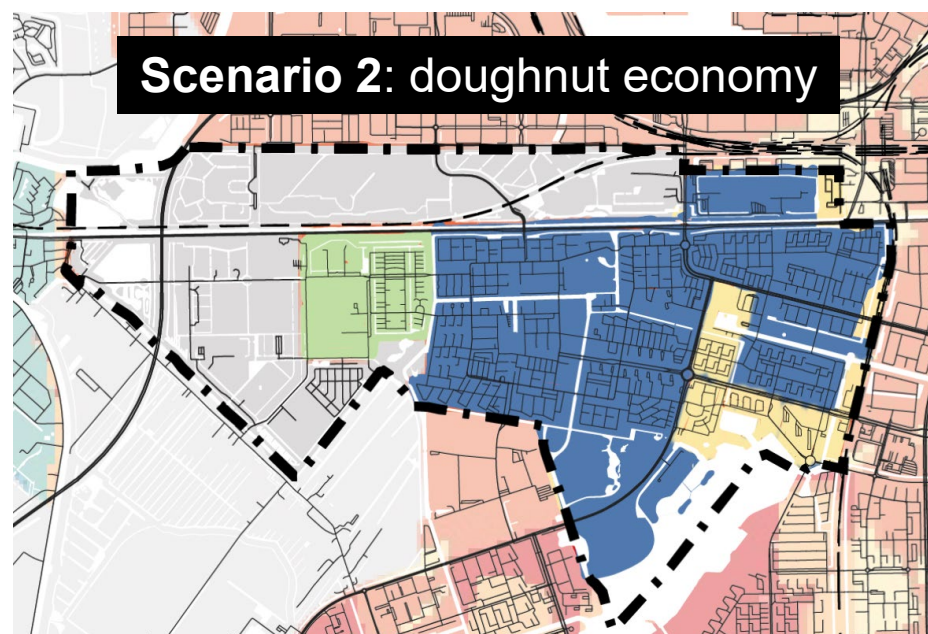*Fig. 7.5.6 Vulnerability of Doughnut economic planning in Geuzenveld-Slotermeer in a long term. Made by author.*

Fig. 7.5.7 Vulnerability of Dynamic planning in Geuzenveld-Slotermeer in a long term. Made by author.

6.3 Answering research questions

How can a **multi-scale** planning strategy in MRA **reduce the vulnerability** of the region to **global pandemics** to **improve the regional resilience** of various areas, groups, and institutions to COVID-19?
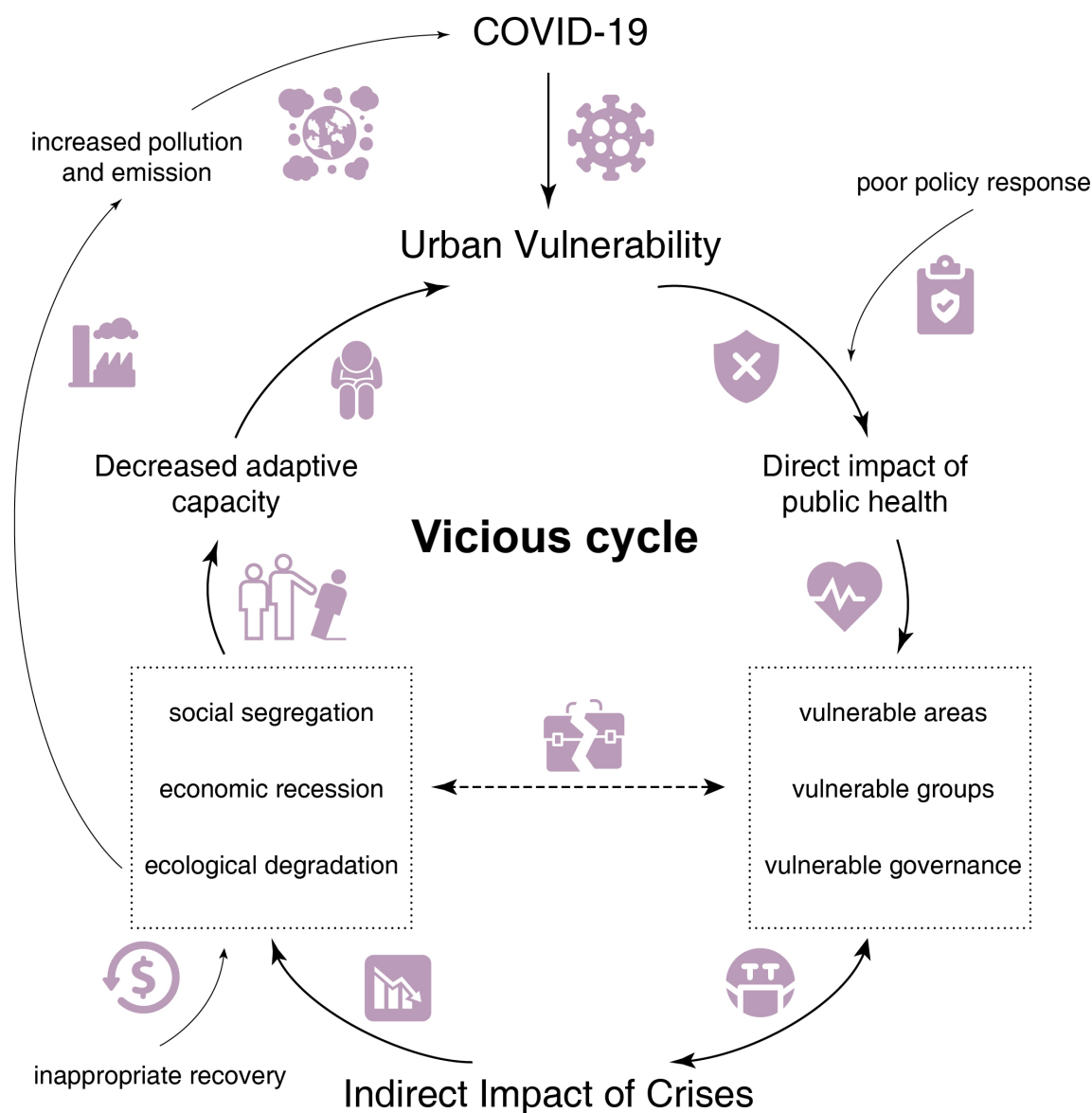
Fig. 8.1.1. Research problem: A vicious cycle of urban pandemic vulnerability. Made by author.
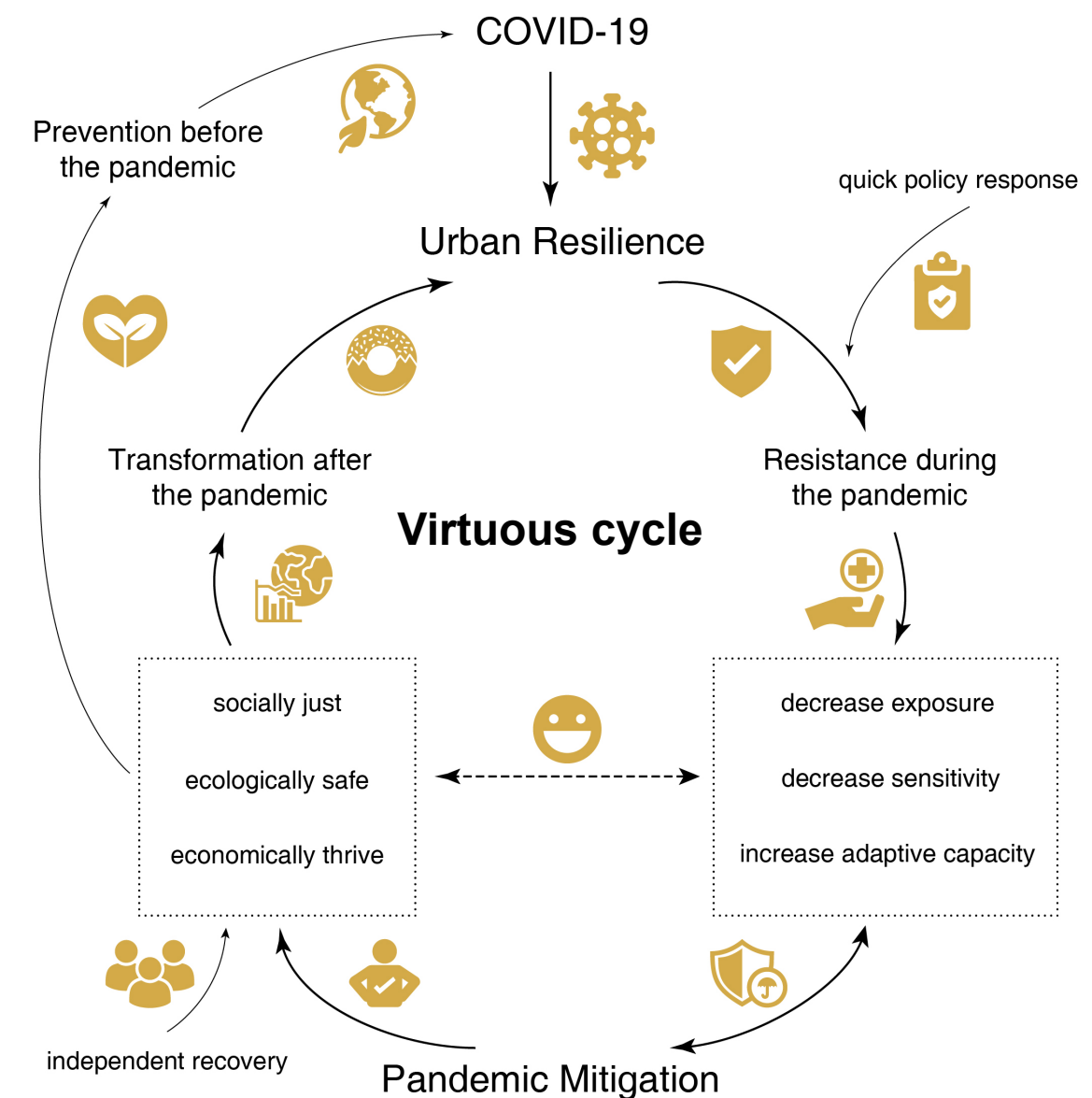
Fig. 8.1.2. Research outcome: A virtuous cycle of urban pandemic resilience. Made by author.

Stage 2TP: **Stage 2** of **T**ransformability in **P**ublic node
Stage 1AP: **Stage 1** of **A**daptability in **P**ublic node
Stage 3AS: **Stage 3** of **A**daptability in **S**emi-public node
Stage 1TH: **Stage 1** of **T**ransformability in **H**igh-density life circle

Stage 1TH

Stage 1AP

Stage 3AS

Stage 2TP

It's a community circular market! People are sharing their second-hand goods here.

BOROUGH MARKET

There are too many people today. I'll order it online later.

During the pandemic, I can still work in the shared office, rather than just meeting with colleagues on Zoom.

Fig. 6.6.8 Perspective vision of a community public node in Geuzenveld-Slotermeer during the development. Made by author.

65

Stage 3AH: **Stage 3** of **A**daptability in **H**igh-density life circle
Stage 3AS: **Stage 3** of **A**daptability in **S**emi-public node
Stage 2TS: **Stage 2** of **T**ransformability in **S**emi-Public node
Stage 1AS: **Stage 1** of **A**daptability in **S**emi-public node
Stage 2TH: **Stage 2** of **T**ransformability in **H**igh-density life circle

Stage 3AH

Stage 3AS

Stage 2TS

Stage 3AS

Stage 2TH

Stage 1AS

Let's go to the church for the exhibition!

I'd like to borrow some books from the school library after work.

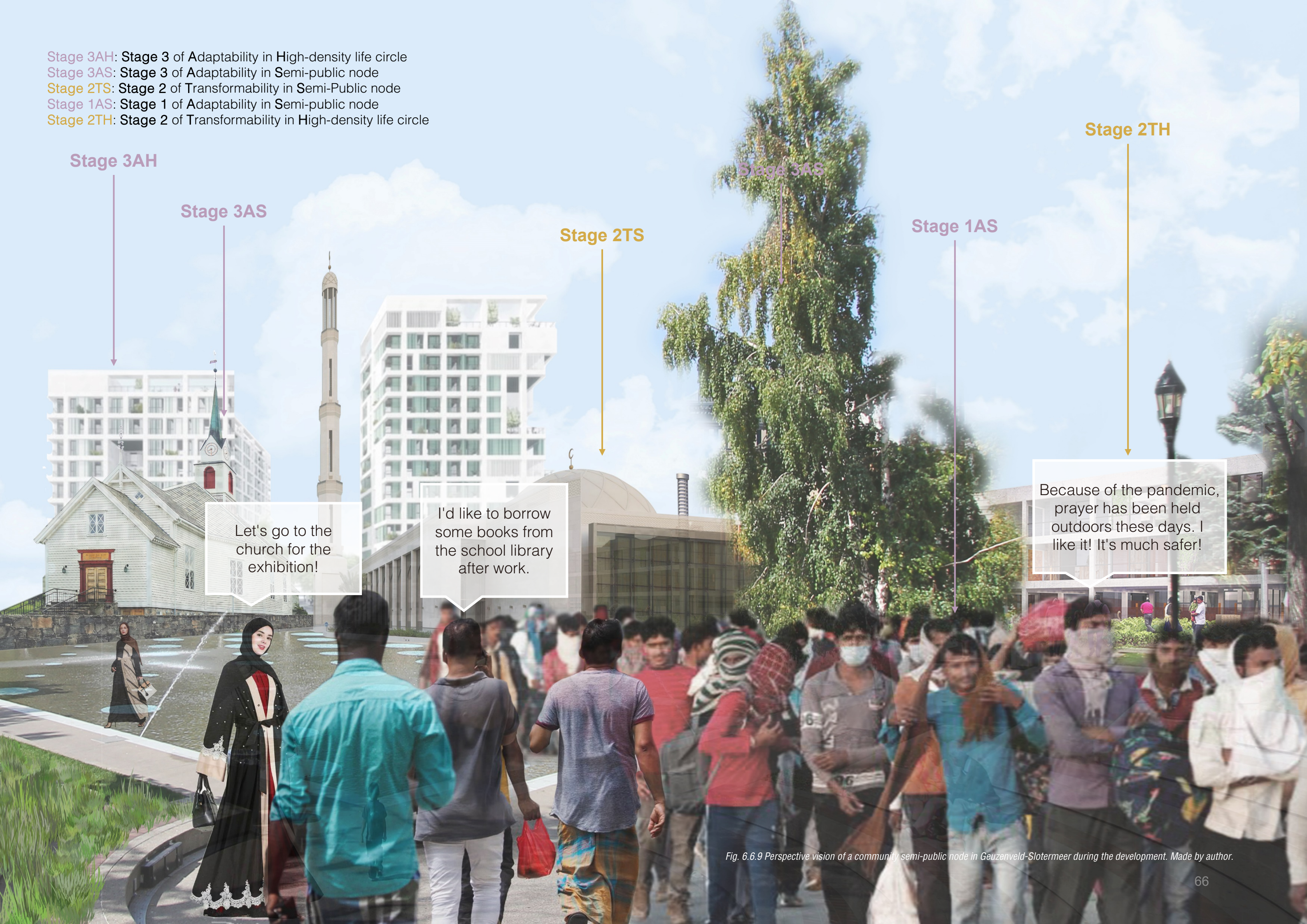Because of the pandemic, prayer has been held outdoors these days. I like it! It's much safer!

Fig. 6.6.9 Perspective vision of a community semi-public node in Geuzenveld-Slotermeer during the development. Made by author.

66

Stage 2AL: **Stage 2** of **A**daptability in **L**ow-density life circle
Stage 2AS: **Stage 2** of **A**daptability in **S**emi-public node
Stage 2TH: **Stage 2** of **T**ransformability in **H**igh-density life circle
Stage 3TL: **Stage 3** of **T**ransformability in **L**ow-density life circle
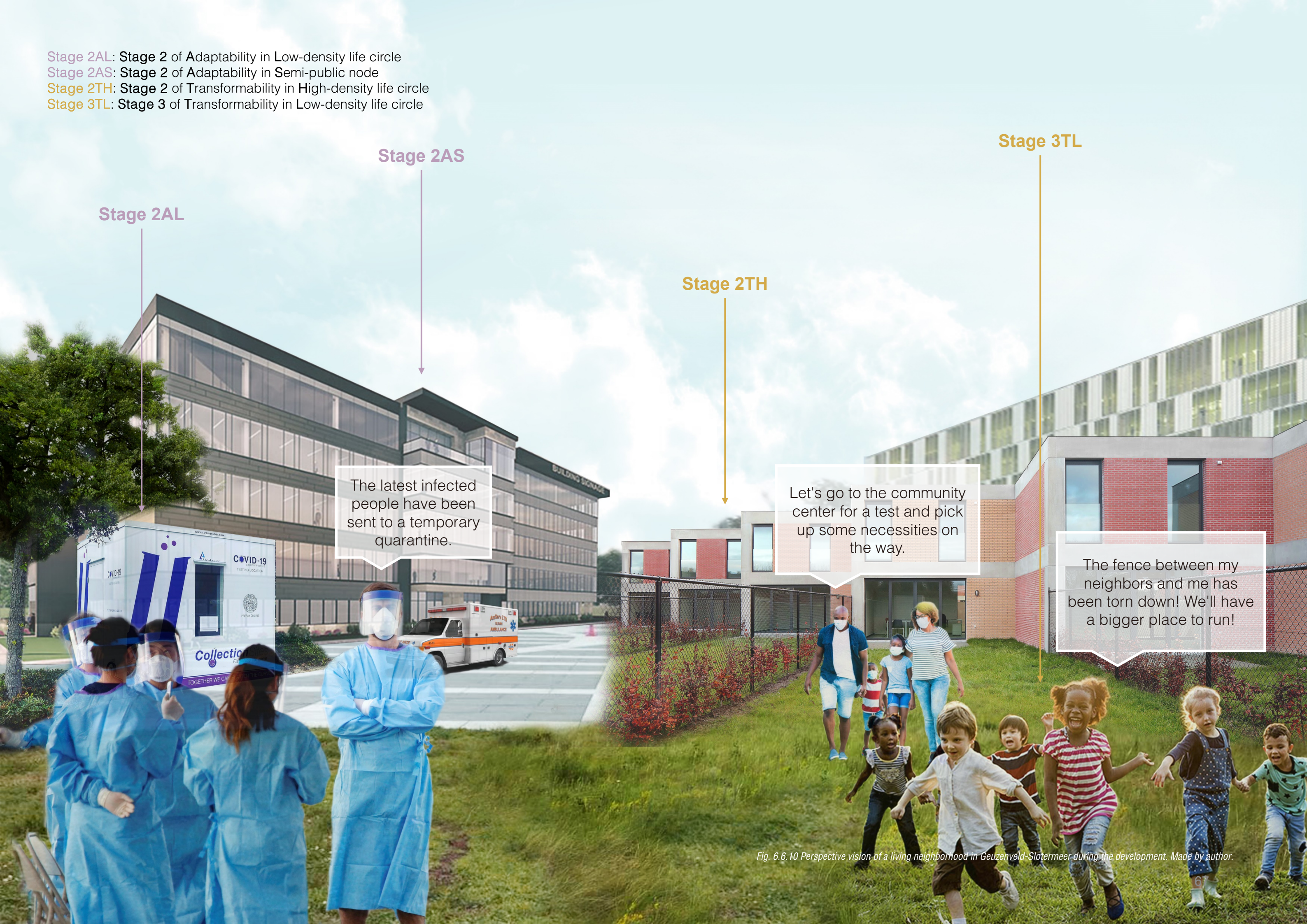
Stage 2AL

Stage 2AS

Stage 2TH

Stage 3TL

The latest infected people have been sent to a temporary quarantine.

Let's go to the community center for a test and pick up some necessities on the way.

The fence between my neighbors and me has been torn down! We'll have a bigger place to run!

Fig. 6.6.10 Perspective vision of a living neighborhood in Geuzenveld-Slotermeer during the development. Made by author.
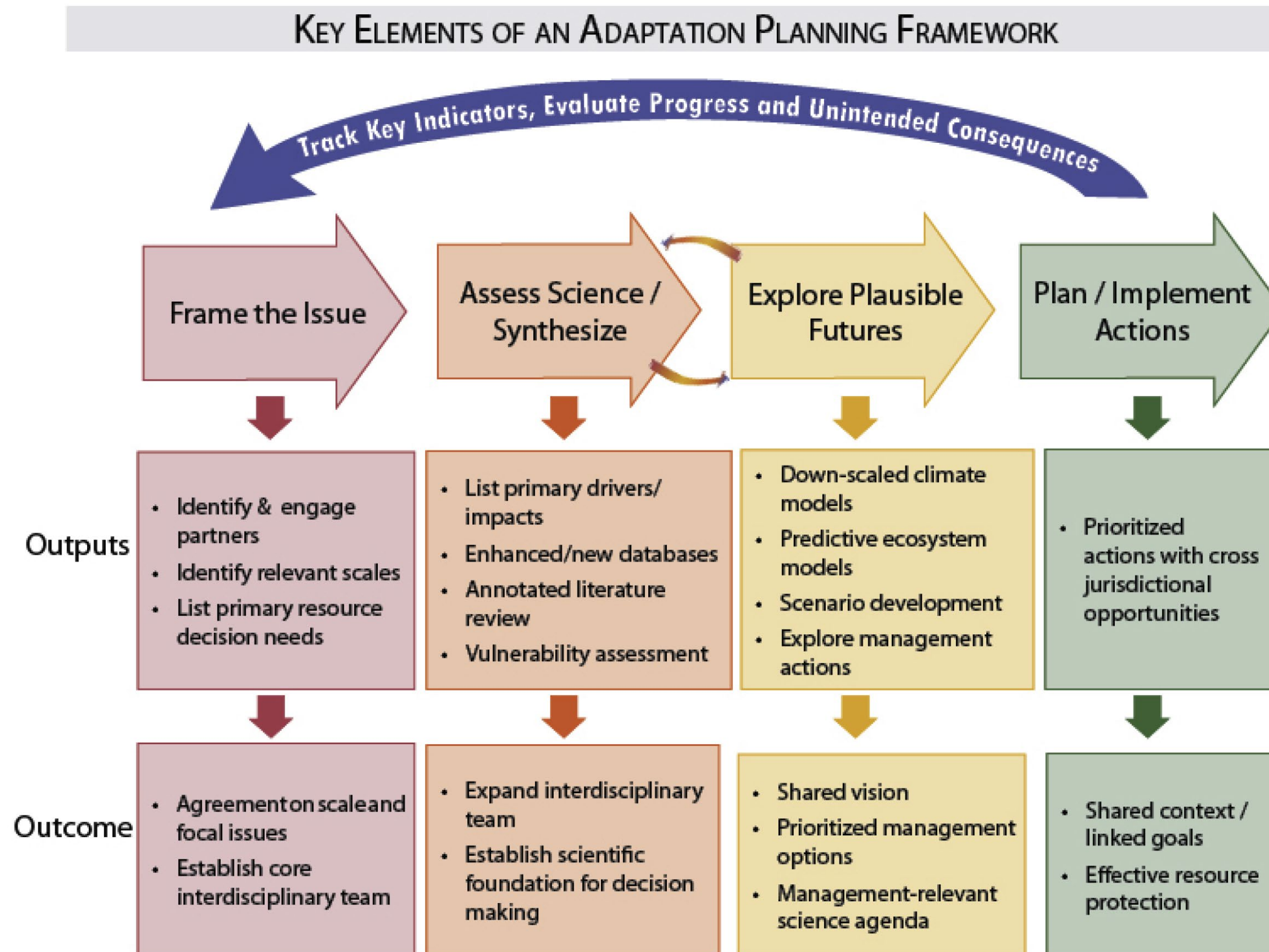
THANKS

Adaptive planning

KEY ELEMENTS OF AN ADAPTATION PLANNING FRAMEWORK

Track Key Indicators, Evaluate Progress and Unintended Consequences

	Frame the Issue	Assess Science / Synthesize	Explore Plausible Futures	Plan / Implement Actions
Outputs	• Identify & engage partners • Identify relevant scales • List primary resource decision needs	• List primary drivers/ impacts • Enhanced/new databases • Annotated literature review • Vulnerability assessment	• Down-scaled climate models • Predictive ecosystem models • Scenario development • Explore management actions	• Prioritized actions with cross jurisdictional opportunities
Outcome	• Agreement on scale and focal issues • Establish core interdisciplinary team	• Expand interdisciplinary team • Establish scientific foundation for decision making	• Shared vision • Prioritized management options • Management-relevant science agenda	• Shared context / linked goals • Effective resource protection

5.3 Detailed application

• Transformability
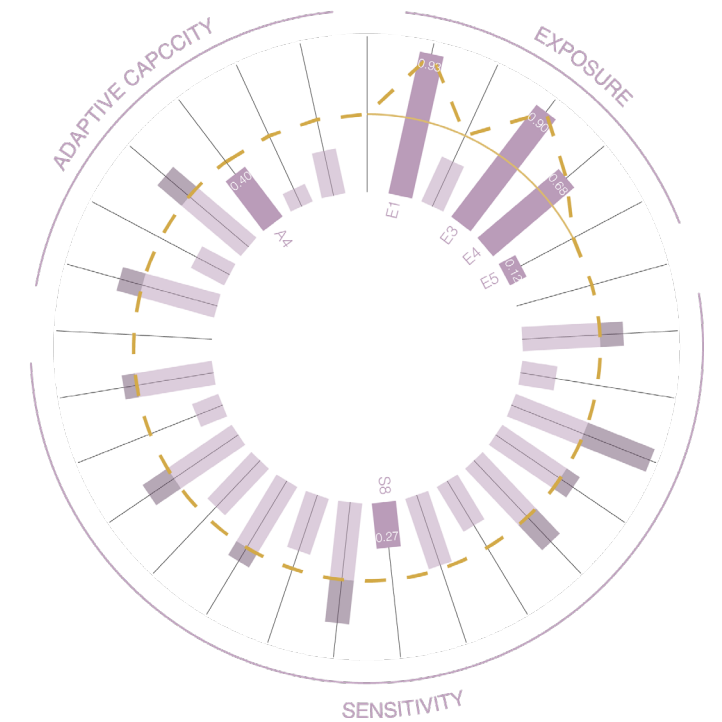

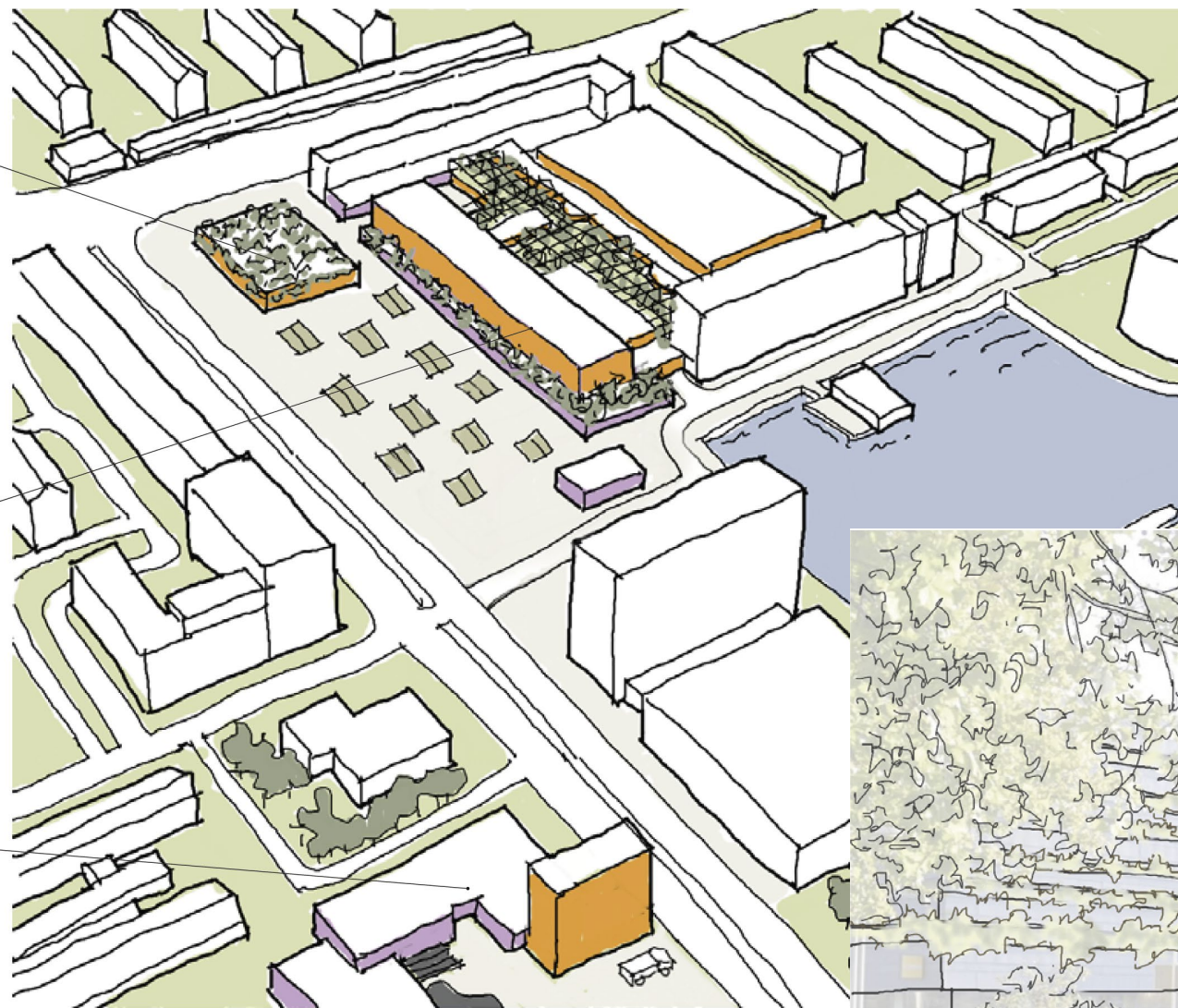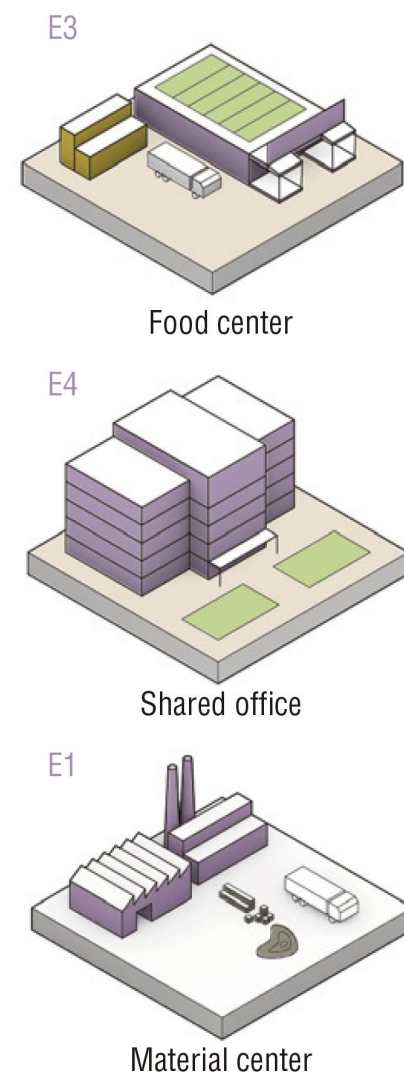Fig. 6.5.34 The evaluated indicators of transformability for high-density life circle in 2050. Made by author.

Fig. 6.5.36 Impression of transformability for high-density life circle in 2050. Made by author.

Holiday

Workday

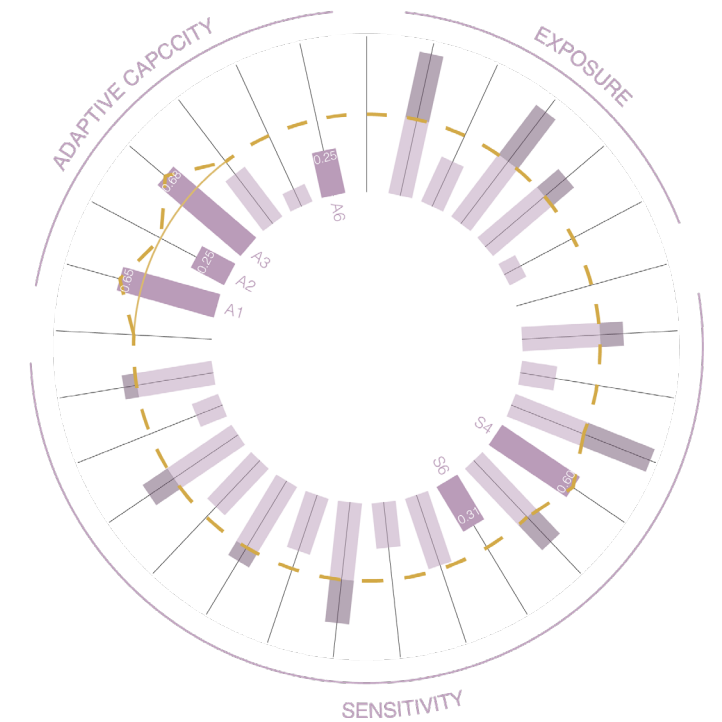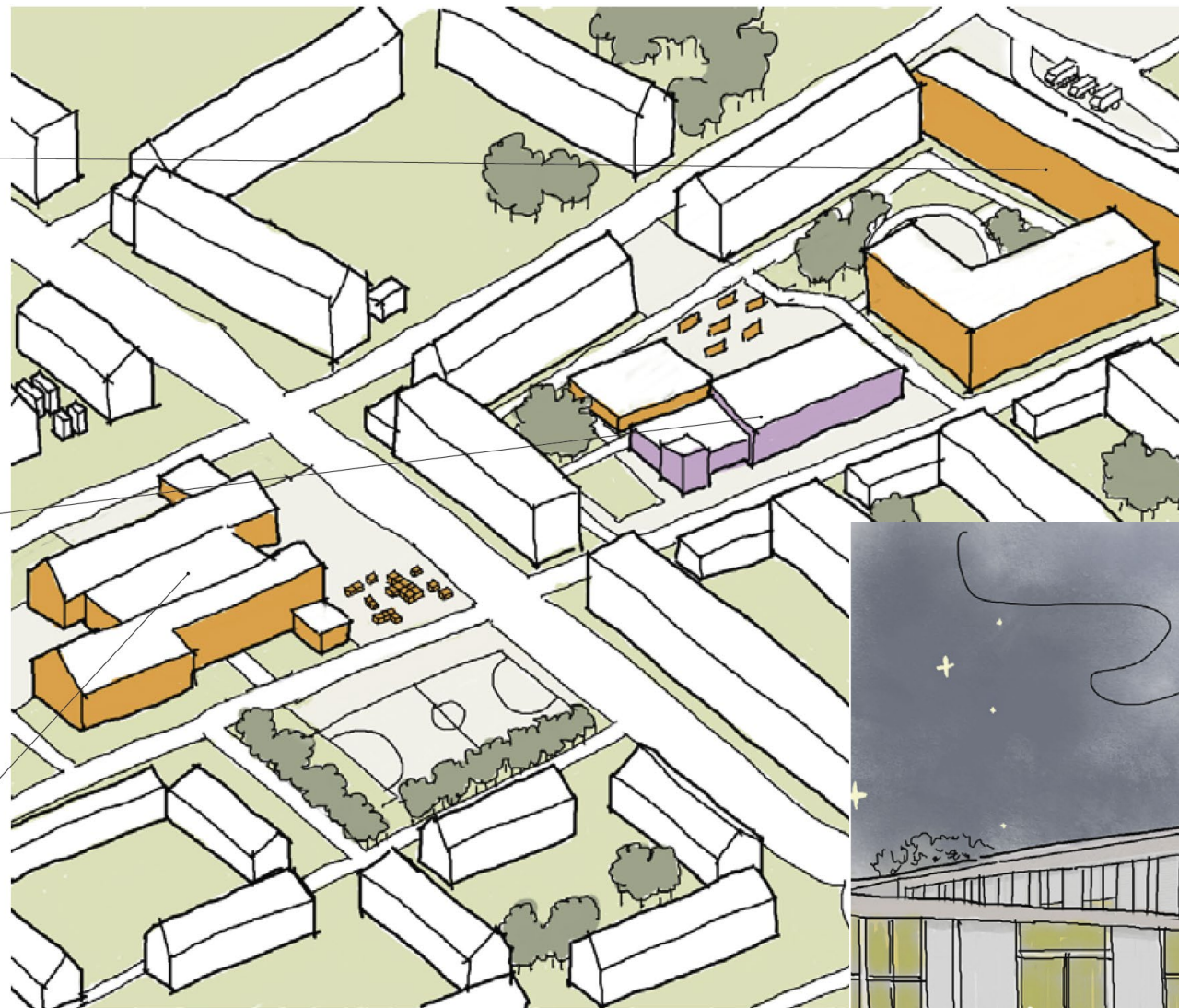# Public node of network

- Transformability

E3 — Food center

E4 — Shared office

E1 — Material center

Weekend

Weekday

Semi-public node of network

- Transformability

A3

Mixed hotel

S4

Cultural diversity

A1

Shared education

Daytime

Nighttime
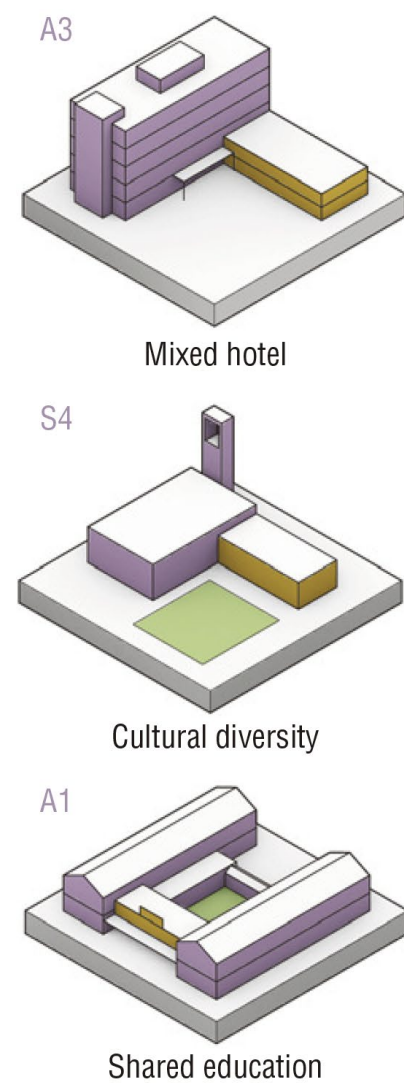
Low-density life circle

- Transformability

S13

Shared street

S3

Shared garden

S11

Mixed community center

ADAPTIVE CAPCCITY

EXPOSURE

SENSITIVITY

Peak hours

Off-peak hours

Evaluation indicators

EXPOSURE

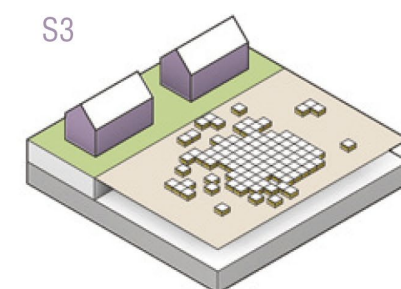| Indicator	Current index over threshold	Business as usual 2030	2050	Doughnut economy 2030	2050	Dynamic planning 2030	2050
air pollution	0.43	+ +	+ + +	-	- - -	- -	- - -
air humidity	-0.21	+	+ +	-	- -	-	-
import/export	0.40	+	+ + +	-	- -	- -	- - -
daily passengers	0.18	+ +	+ + +	-	-	- -	- -
international corporations	-0.38	+	+ +	+	+ +	+	+

ADAPTIVE CAPACITY (-)

Indicator	Current index over threshold	Business as usual 2030	2050	Doughnut economy 2030	2050	Dynamic planning 2030	2050
education	0.15	+	+ +	-	- -	- -	- -
government trust	-0.15	+ +	+ + +	-	-	+	-
hospital beds	0.13	+ +	+ + +	-	- -	- -	- -
health	-0.10	+	+ +	-	- -	+	- -
ability to use technology	-0.34	-	-	- -	- - -	+	- -
government efficency	-0.25	-	-	-	- -	+	-

SENSITIVITY

Indicator	Current index over threshold	Business as usual 2030	2050	Doughnut economy 2030	2050	Dynamic planning 2030	2050
residential density	0.15	+ +	+ + +	-	- -	- -	- - -
age (65+) diistribution	-0.25	+	+ + +	+	+ +	+	
age (18-) diistribution	0.46	-	-	-	- -	- - -	- - -
immigrants	0.10	+	+ +		-	-	- -
household income	0.12	+	+	-	- - -	- -	- - -
migrant workers	-0.19	+ +	+ + +	+	+	+	- -
tourism	-0.03	+	+ +	+	+ +		-
manufacture	-0.13	+	+ +	-	- -	+	-
small businesses	0.28	+ +	+ + +	-	- -	- -	- -
traffic density	-0.12	+ +	+ + +	-	- - -	+	-
hospital accessibility	0.10	+	+	-	- -	-	- -
amenity accessibility	-0.09	-	+	- -	- - -	+	- -
motorized transport	0.19	+	+ +	-	- - -	- -	- - -
green space	-0.32	+	+ + +	-	- -	+ +	-
open space	0.09	+ +	+ + +	-	- -	- -	- - -