



FLOODS: THE NEW ABNORMAL



NATIONS AROUND THE GLOBE PICKING UP PIECES AFTER DEVASTATING FLOODS



THESSALY, GREECE 2023





VULNERABLE GROUPS



VULNERABLE GROUPS

P5 PRESENTATION

MSc. Management in the Built Environment
TU Delft, BK - AUBS

DATE

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BUILDING FLOOD RESILIENCE

A CASE STUDY ON CLIMATE-DRIVEN FLUVIAL
FLOODING IN VULNERABLE NEIGHBOURHOODS

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BROAD RECOMMENDATIONS



Climate change & natural hazards

urban flooding

PROBLEM STATEMENT





Climate change & natural hazards

urban flooding

PROBLEM STATEMENT



Current strategies

**technical focus
infrastructure focus**





Climate change & natural hazards

urban flooding

PROBLEM STATEMENT



Current strategies

**technical focus
infrastructure focus**

However lacking...

socioeconomic focus
geographical challenges &
socio-economic challenges



RESEARCH AIM

Gaps between theory and practical implementation, for socioeconomically vulnerable communities:

- Governmental flood resilience strategies in socioeconomically vulnerable neighbourhoods in Dordt
- Actionable insights to refine flood resilience frameworks in Dordrecht and similar contexts



What flood governance strategies do governmental actors develop and implement to enhance resilience against climate-change-induced fluvial flooding in vulnerable neighbourhoods in the Netherlands?

RESEARCH QUESTIONS

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Which governmental actors are involved in flood resilience strategies, and what specific strategies have been implemented to address flood resilience?

How have vulnerabilities to flooding been recognized and articulated by governmental actors, particularly in socioeconomically vulnerable communities, such as Krispijn and De Staart?

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[community perception]

Considering the current strategies and the perceptions of both governmental and non-governmental stakeholders, how can flood governance be improved or refined to better support flood resilience in vulnerable neighbourhoods?

[what's next? recommendations]

METHOD

THEORETICAL RESEARCH



LITERATURE REVIEW

POLICY & VISION DOCUMENTS

EMPIRICAL RESEARCH



QUALITATIVE: **CASE STUDY**

MULTI-ACTOR **INTERVIEWS**

QUESTIONNAIRES

VALIDATION BY **EXPERTS**

EMPIRICAL RESEARCH

PRIMARY DATA

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institutional perception

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EMPIRICAL RESEARCH

SECONDARY DATA: GOVERNMENTAL DOCUMENTS

Documents: Policy and vision reports (e.g., national, municipal)

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EMPIRICAL RESEARCH

SECONDARY DATA: GOVERNMENTAL DOCUMENTS

Documents: Policy and vision reports (e.g., national, municipal)

PRIMARY DATA: IN-DEPTH INTERVIEWS

Institutional actors: government officials (e.g., Waterschap, Safety region, Gemeente)

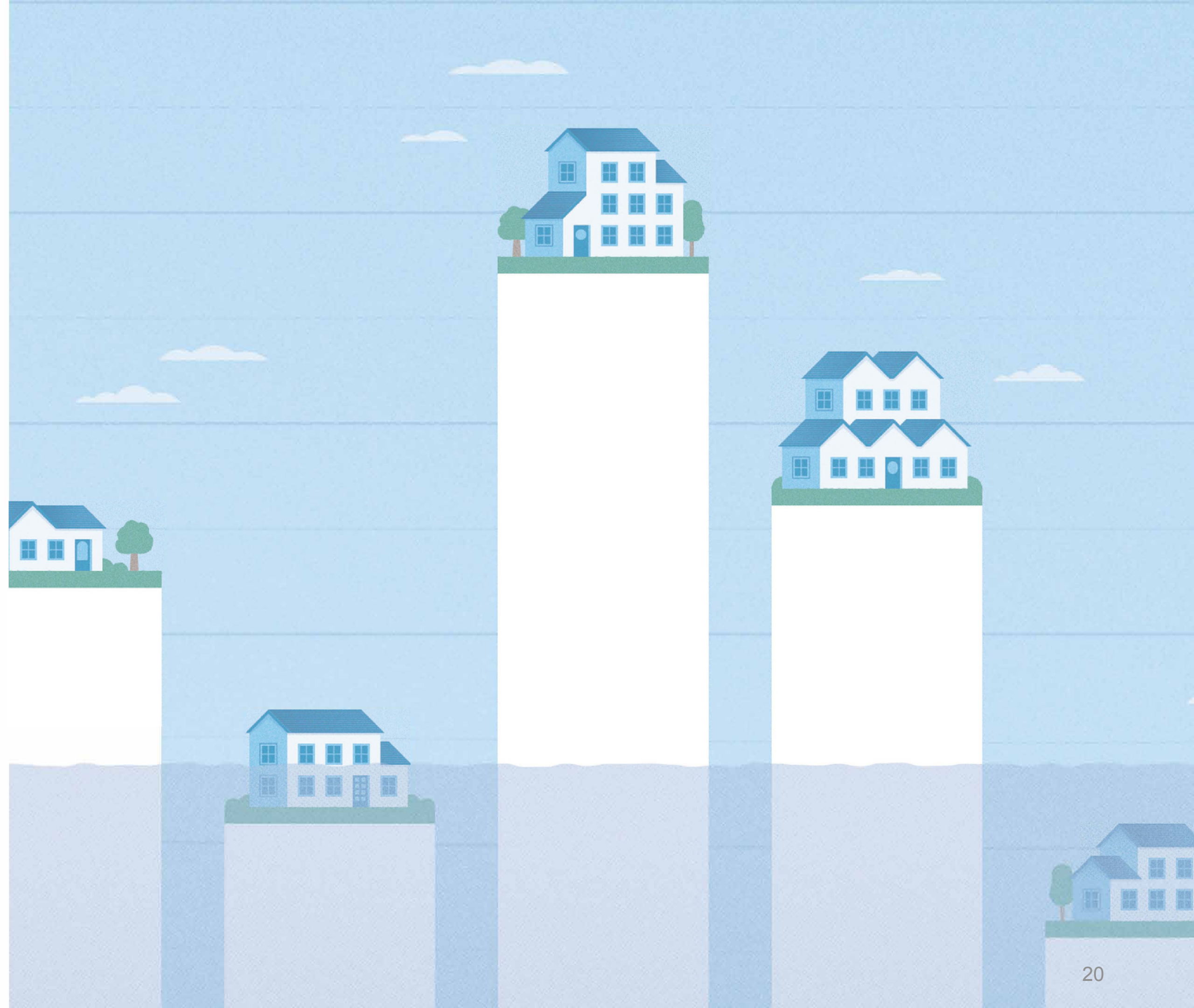
Experts: urban planners, architects, academics (e.g., IABR)

Community actors: community leaders (e.g., Vogelnest, De Staartje)

PRIMARY DATA: QUESTIONNAIRES

Community members: inhabitants (e.g., Krispijn, De Staart residents)

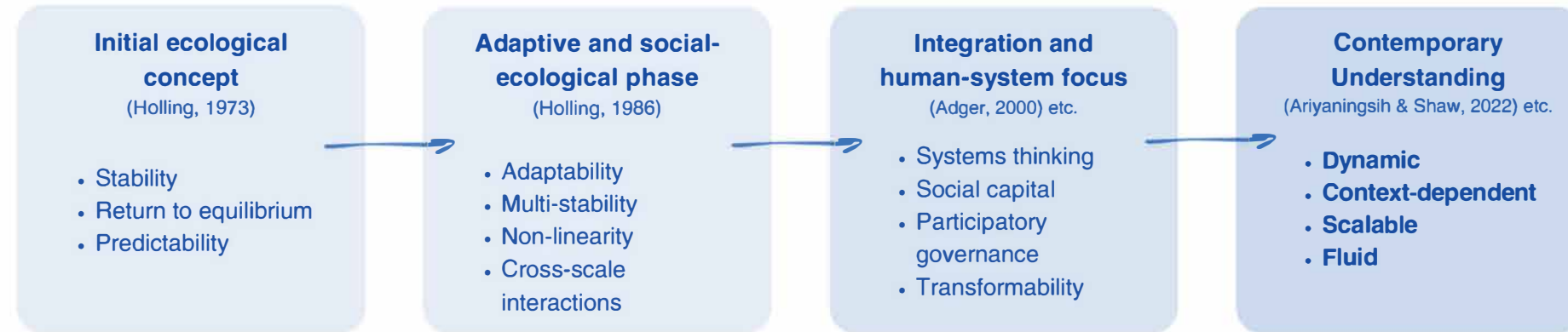
THEORETICAL BACKGROUND



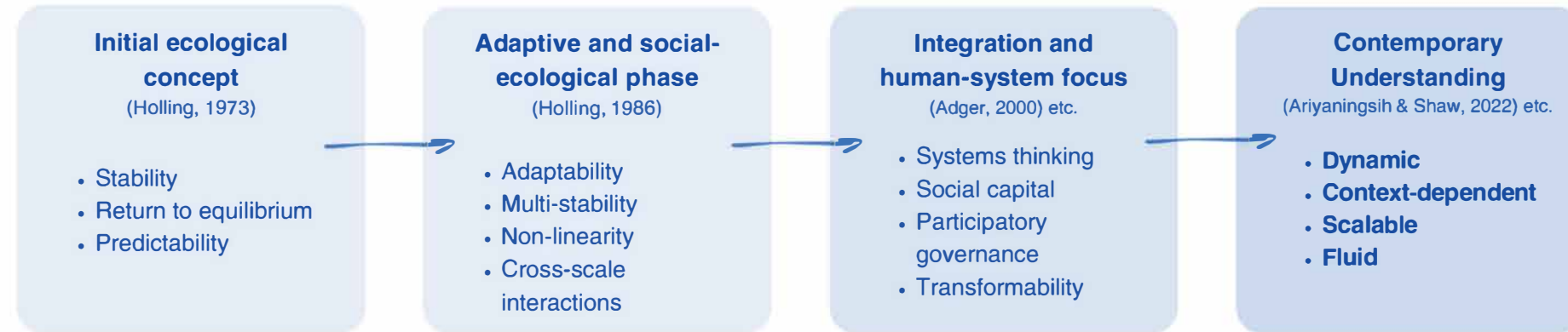
RESILIENCE

AND

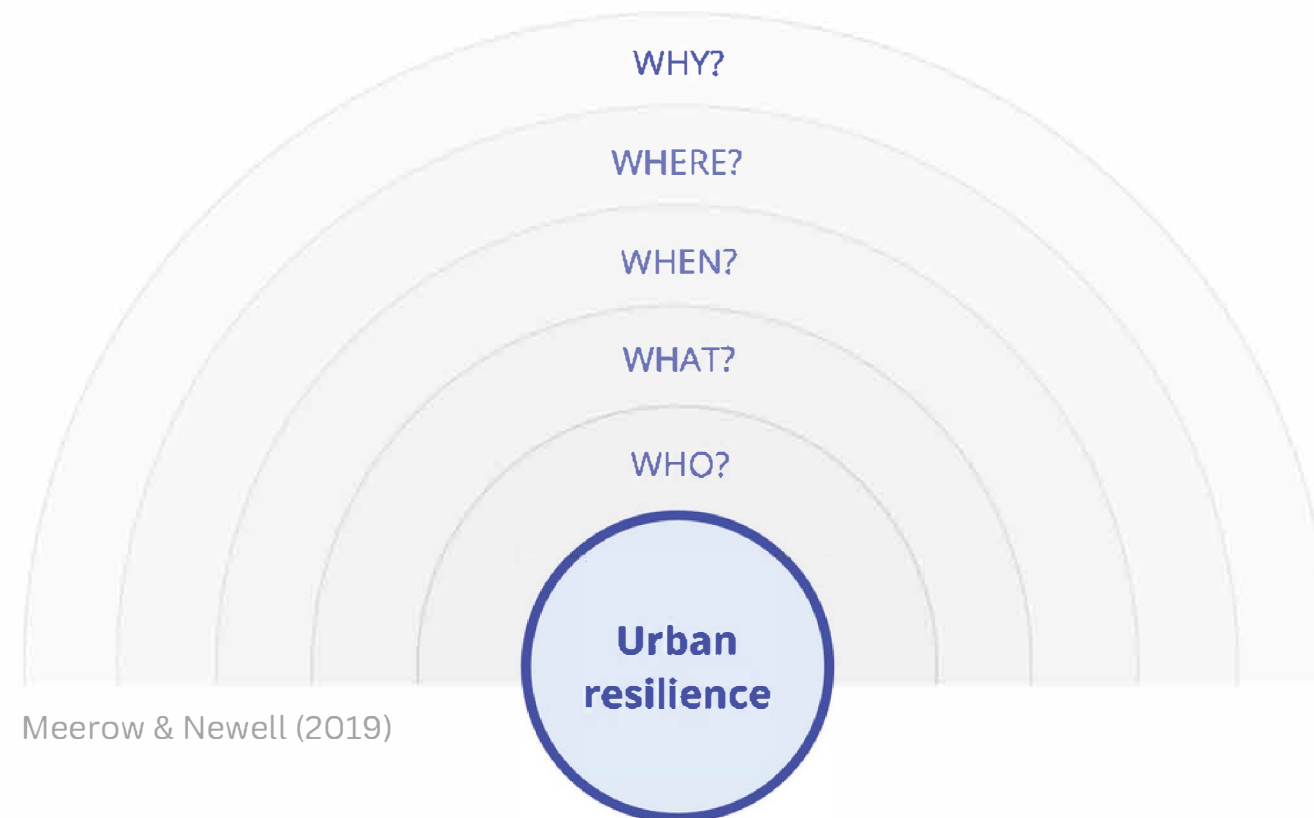
VULNERABILITY

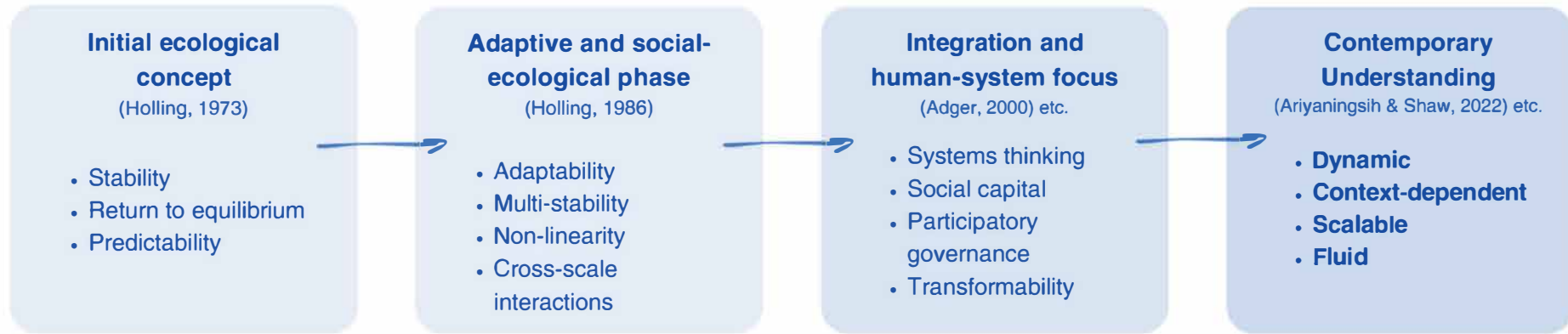


RESILIENCE

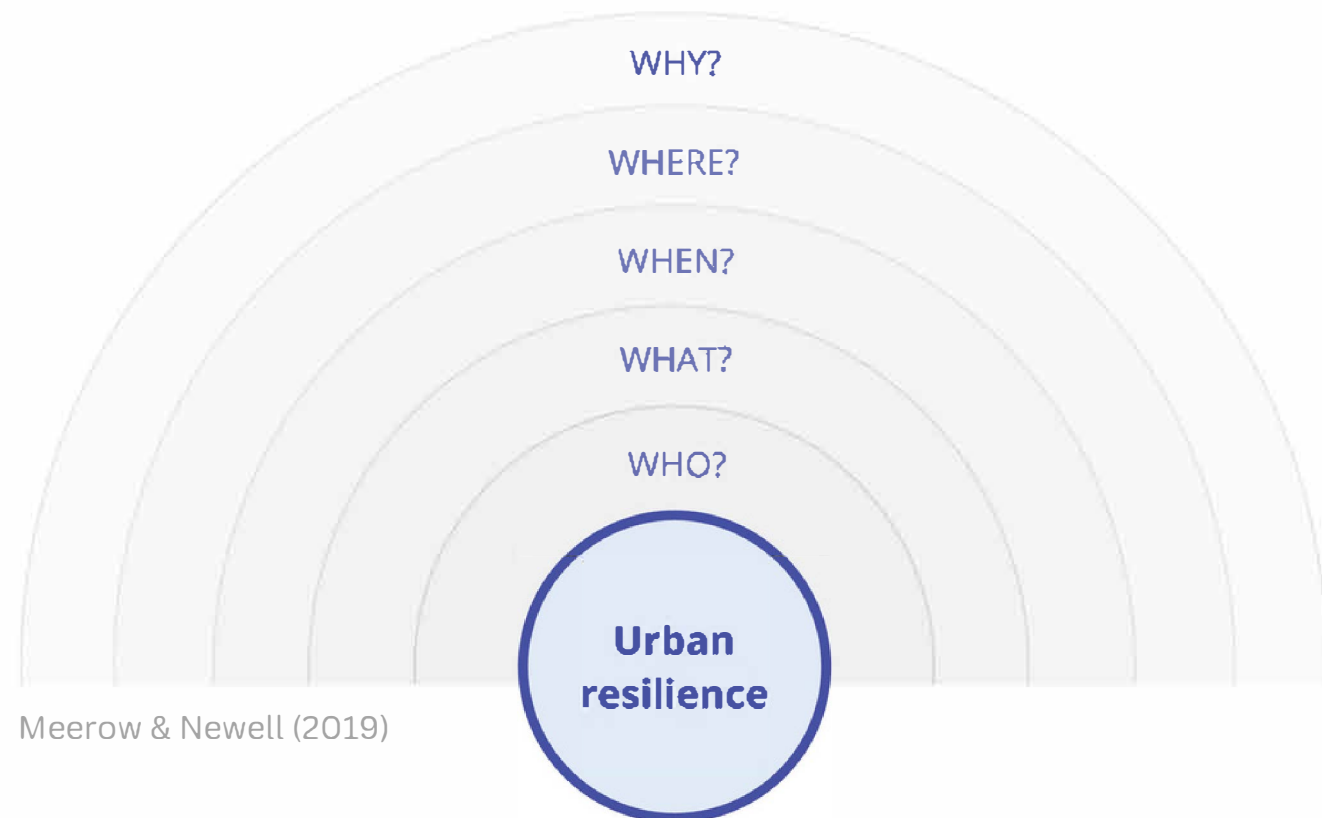


RESILIENCE

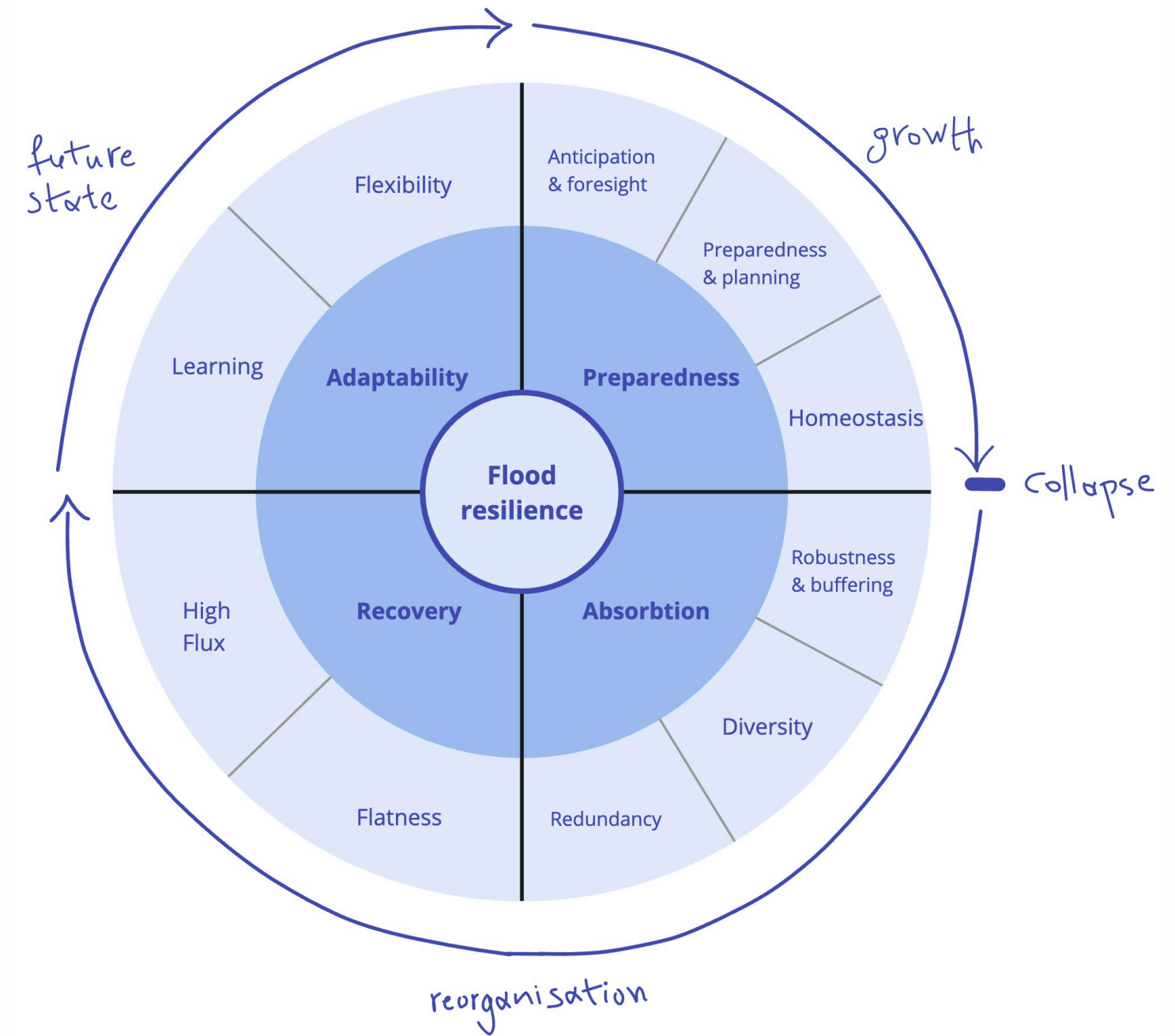




RESILIENCE



Meerow & Newell (2019)



adapted from Wardekker et al. (2020)

PHASES OF INTERVENTION / PRINCIPLES OF RESILIENCE /

AREA'S SENSITIVITY & EXPOSURE
DUE TO ITS LOCATION & PROXIMITY
TO RIVERS

flood
vulnerability

VULNERABILITY

AREA'S SENSITIVITY & EXPOSURE
DUE TO ITS LOCATION & PROXIMITY
TO RIVERS

flood
vulnerability

VULNERABILITY

socioeconomic
vulnerability

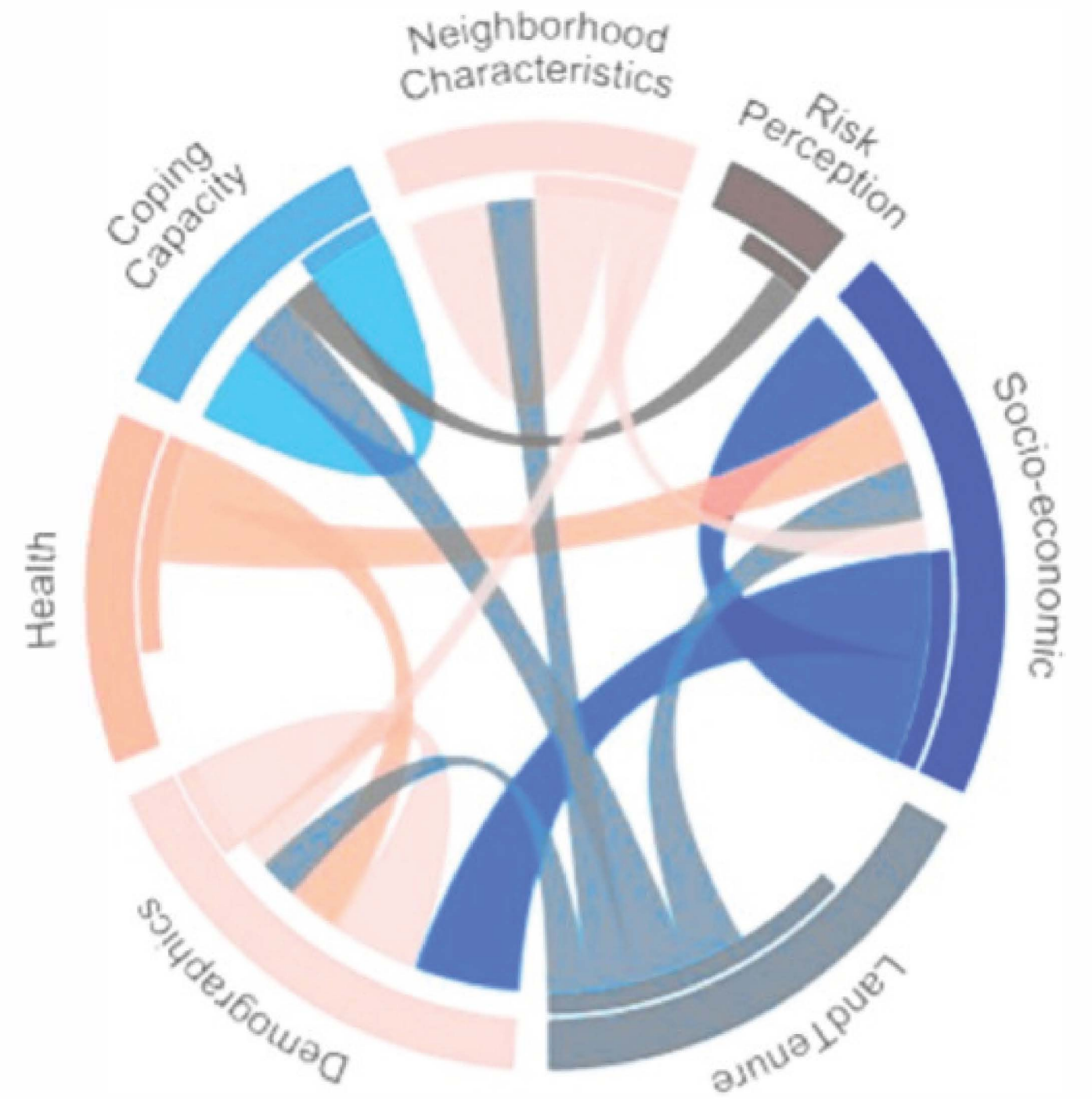
NEIGHBOURHOOD'S CHARACTER;
CONSISTING OF
VULNERABLE GROUPS

inequalities, limited access to
resources raising climate justice issues

HOW IS A VULNERABLE NEIGHBOURHOOD DEFINED?

VULNERABLE NEIGHBOURHOOD

CHARACTERISTICS / INDICATORS



Rufat et al. (2015)

FLOOD GOVERNANCE

GOVERNANCE STRATEGIES ENHANCING RESILIENCE

CONTEXT-SENSITIVE
DIVERSIFICATION

LINKAGE AND ALIGNMENT
OF STRATEGIES

INVOLVEMENT OF
PRIVATE ACTORS
(CITIZENS)

ADEQUATE FORMAL AND
INFORMAL RULES

BROADEN THE
RESOURCE BASE

INCLUSIVE, SOCIETAL DEBATE
ON THE BASIC STARTING
POINTS

FLOOD GOVERNANCE

**TO ENHANCE RESILIENCE
& MITIGATE VULNERABILITY**

THEORETICAL FRAMEWORK

RESILIENCE AND VULNERABILITY

TWO SIDES OF THE SAME COIN

Understanding, addressing vulnerability
integral part of promoting resilience

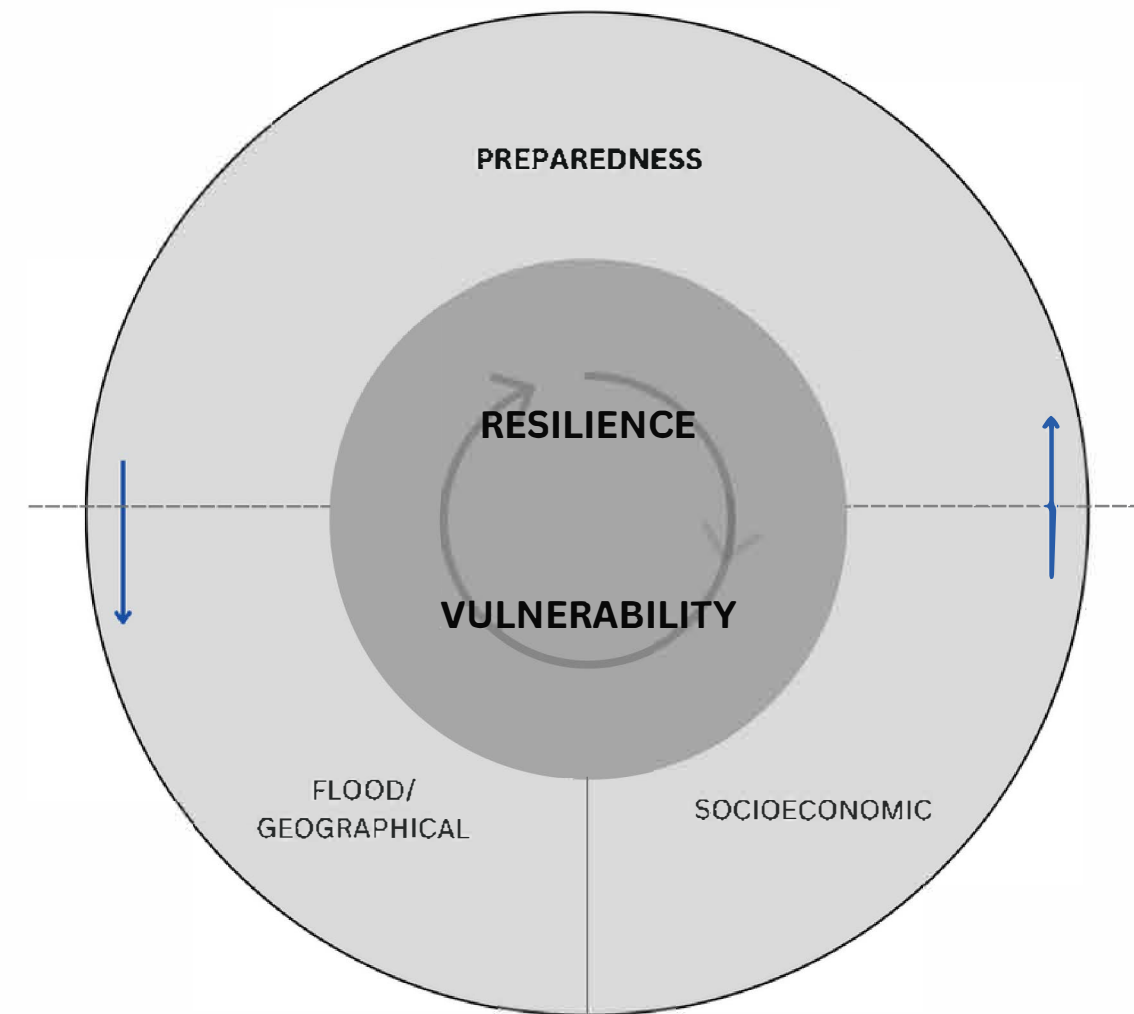


RESILIENCE AND VULNERABILITY

TWO SIDES OF THE SAME COIN

Understanding, addressing vulnerability
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focus: **Preparation phase**



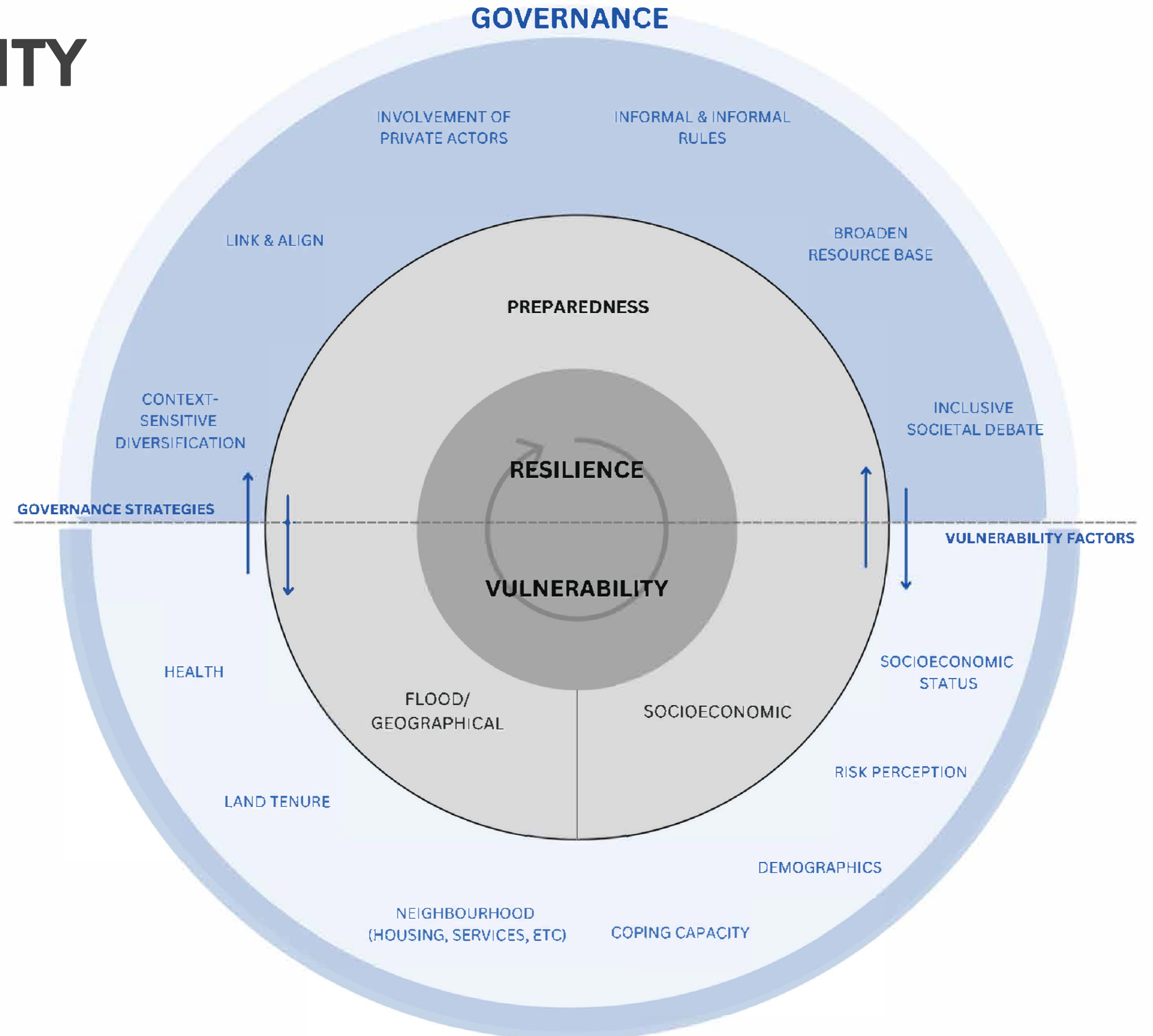
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TWO SIDES OF THE SAME COIN

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Beyond macro-level governance



RESILIENCE AND VULNERABILITY

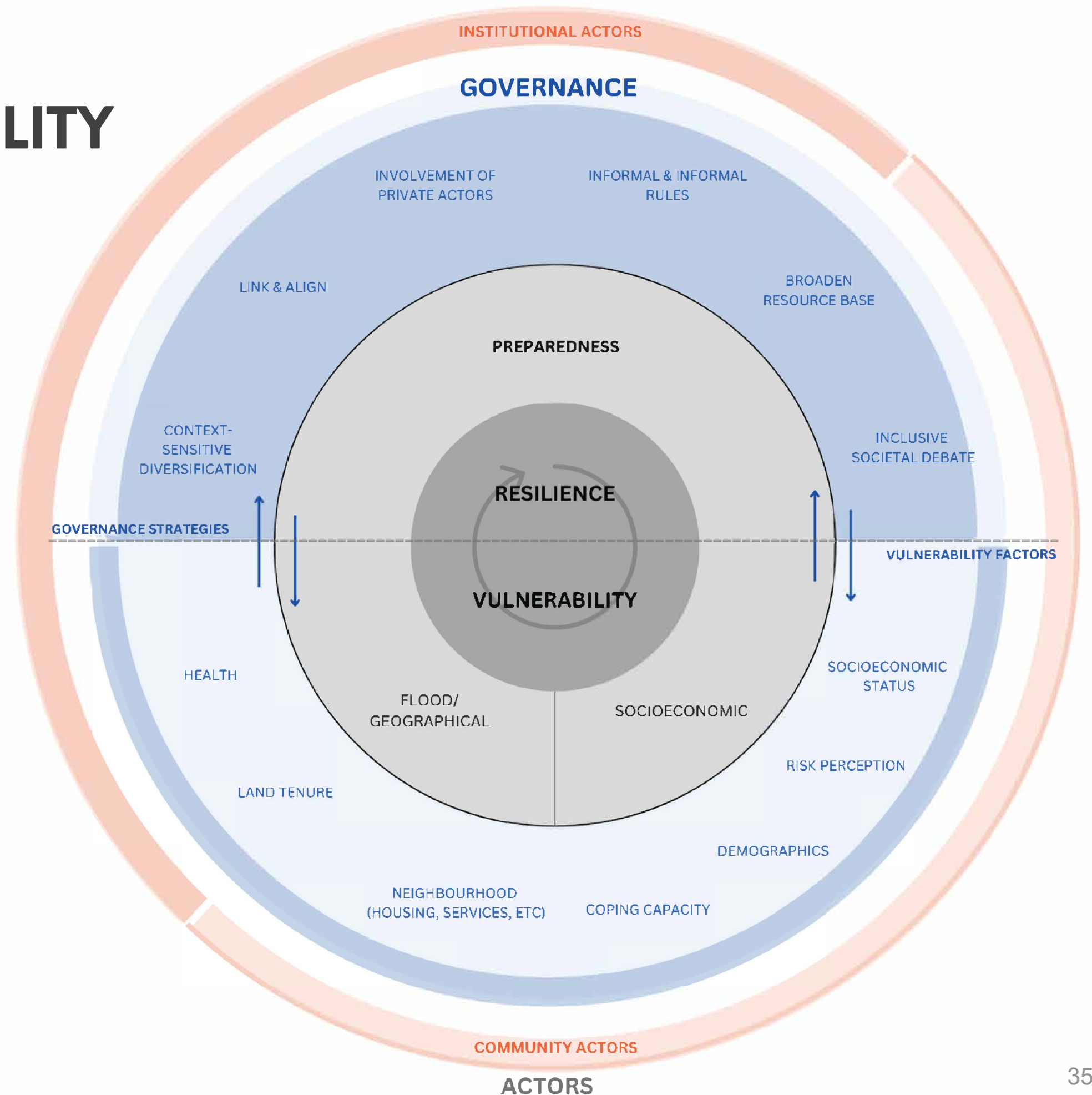
TWO SIDES OF THE SAME COIN

Understanding, addressing vulnerability
integral part of promoting resilience

focus: **Preparation phase**

Beyond macro-level governance

Multi-level stakeholder involvement



CASE STUDY & FOCUS URBAN AREAS



ISLAND OF DORDRECHT

A CITY SHAPED BY WATER

HISTORICAL CATASTROPHES

GEOGRAPHICAL FORM AS AN ISLAND

BUT ALSO MODERN CHALLENGES...
geographic and socioeconomic



DORDRECHT

FLOOD VULNERABILITY JOURNEY TOWARDS FLOOD RESILIENCE

RISING SEA & RIVER LEVELS DUE TO CLIMATE CHANGE

UNIQUE LOW-LYING TOPOGRAPHY

...CAUSING PROACTIVE CHANGE



DORDRECHT

SOCIOECONOMIC VULNERABILITY

population: **121.434** in 2023 (CBS, 2024)

COPING CAPACITY

SOCIOECONOMIC STATUS

DEMOGRAPHIC CHARACTERISTICS

HEALTH AND SAFETY

HOUSING TENURE

NEIGHBOURHOOD CHARACTERISTICS

RISK PERCEPTION

KRISPIJN



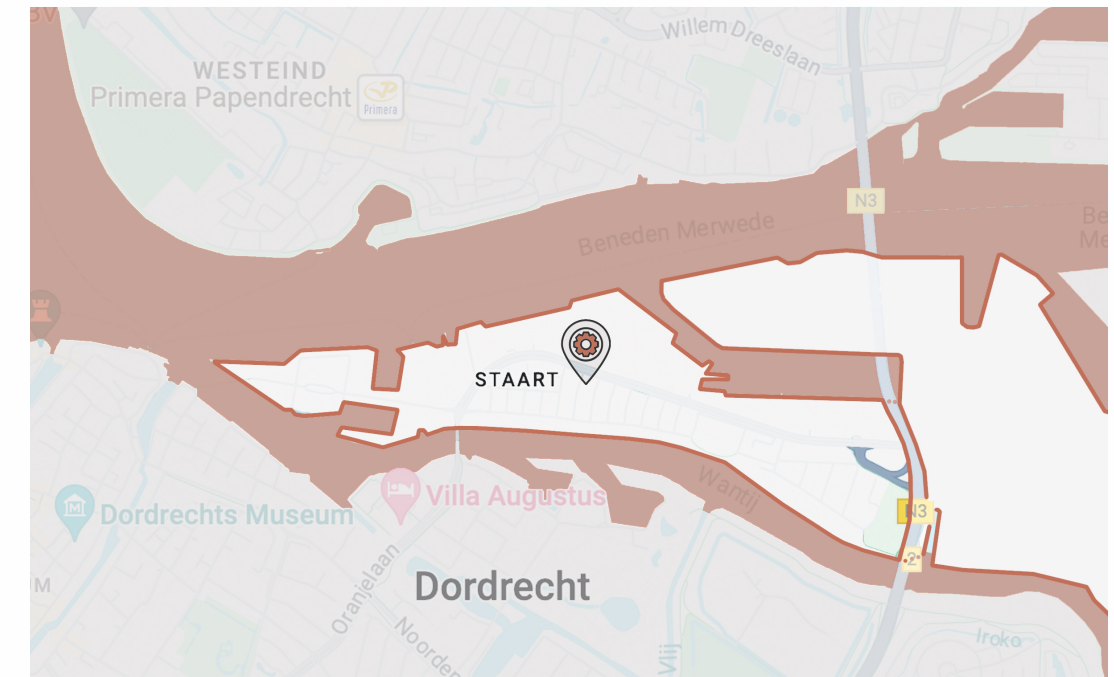
- LOW-LYING AREA WITHIN DIKES
- DIRECT FLOOD VULNERABILITY
- SOCIOECONOMIC VULNERABILITY
- POTENTIAL EVACUEES

KRISPIJN



- LOW-LYING AREA WITHIN DIKES
- DIRECT FLOOD VULNERABILITY
- SOCIOECONOMIC VULNERABILITY
- POTENTIAL EVACUEES

DE STAART



- HIGH-LYING AREA OUTSIDE DIKES
- INDIRECT FLOOD VULNERABILITY
- SOCIOECONOMIC VULNERABILITY
- POTENTIAL SHELTER AREA, HOSTING THE EVACUEES

SOCIOECONOMIC PROFILE

KRISPIJN

population: **15.875**

(CBS, 2024)

COPING CAPACITY

SOCIOECONOMIC STATUS

DEMOGRAPHIC CHARACTERISTICS

NEIGHBOURHOOD CHARACTERISTICS

DE STAART

5.290

COPING CAPACITY

SOCIOECONOMIC STATUS

DEMOGRAPHIC CHARACTERISTICS

NEIGHBOURHOOD CHARACTERISTICS

RISK PERCEPTION

DORDRECHT

SOCIOECONOMIC VULNERABILITY

RISK PERCEPTION

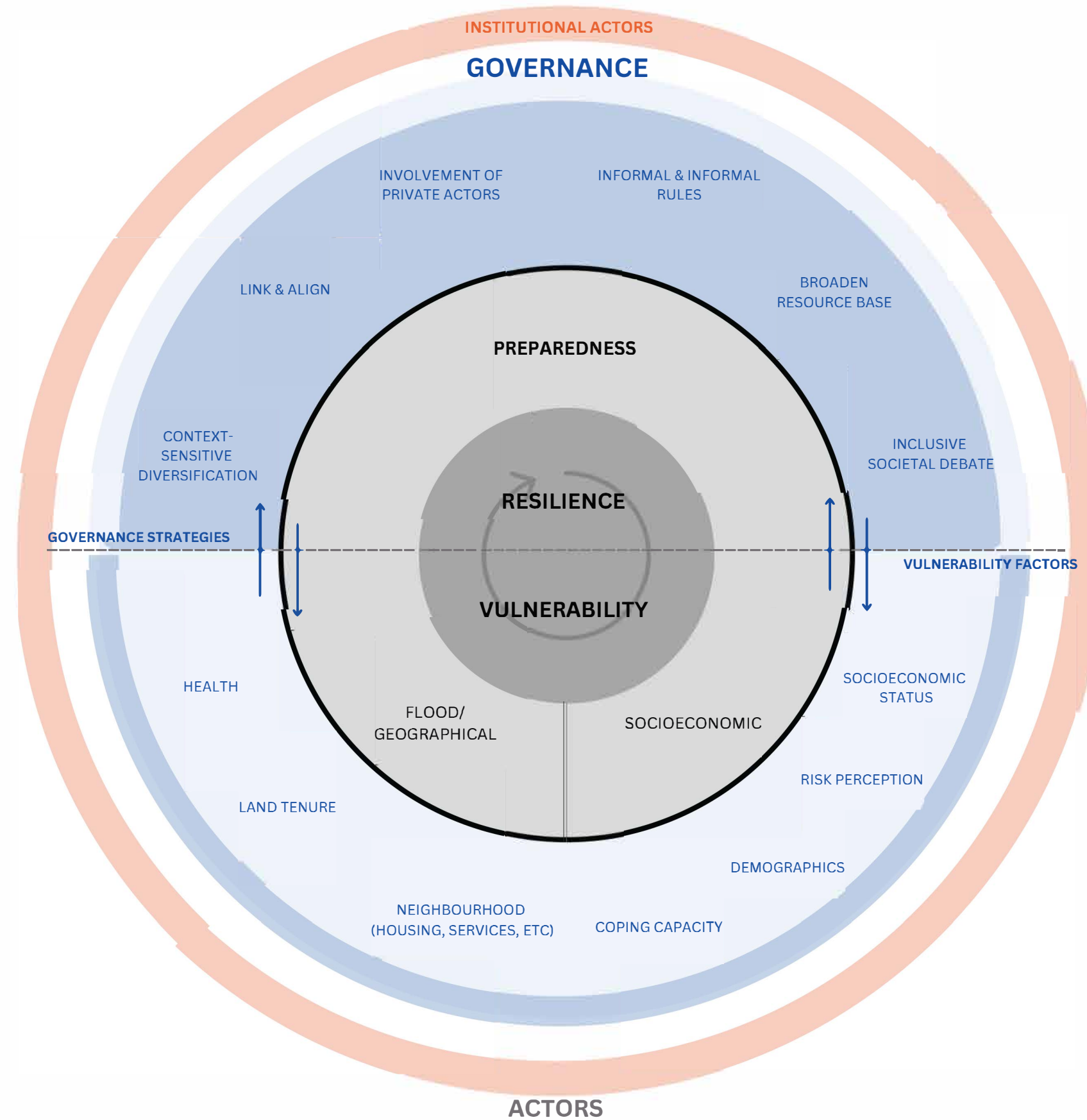
institutional approach
municipality of Dordrecht

community perception

Krispijn
De Staart

(CBS, 2024)

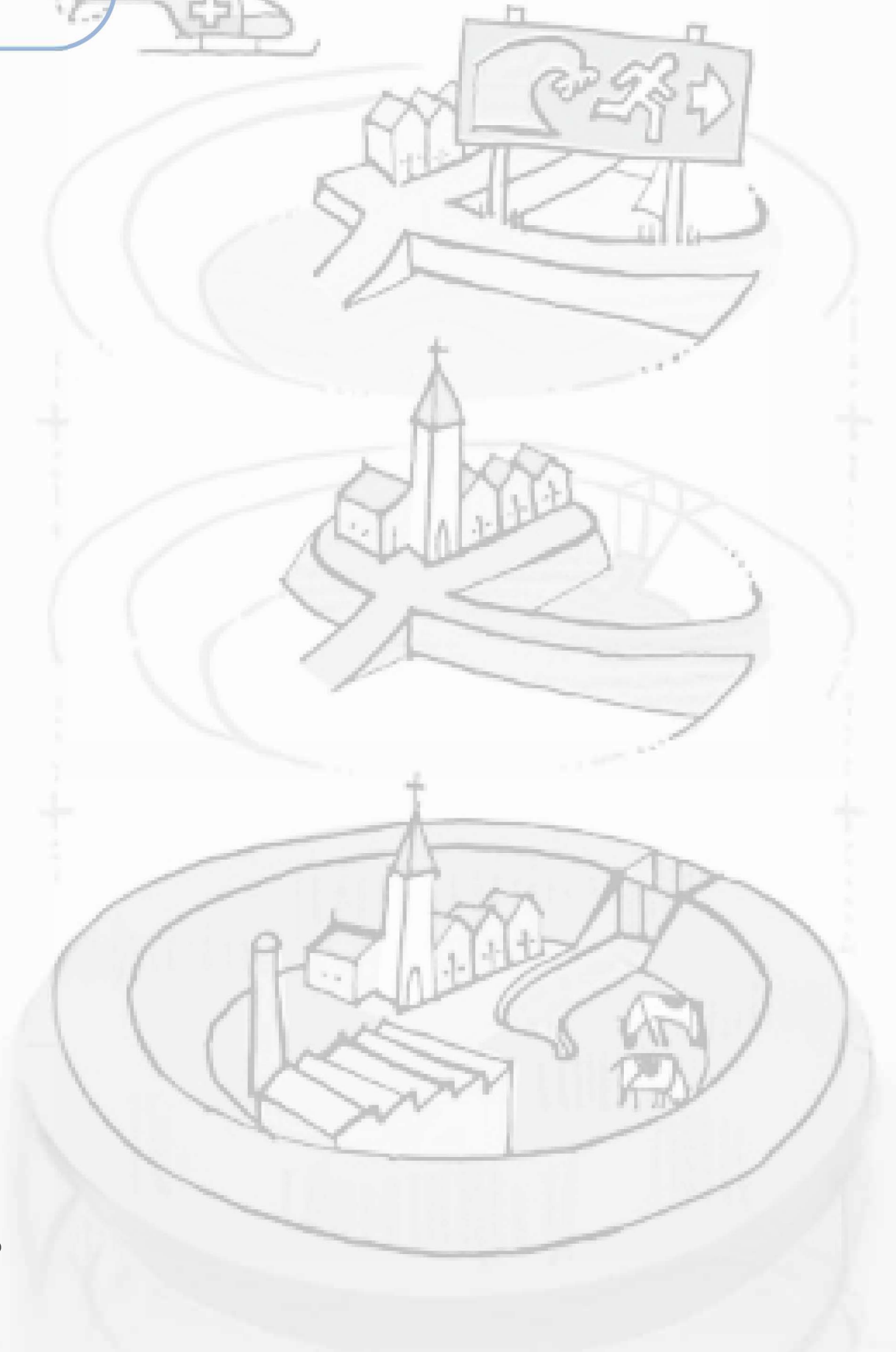
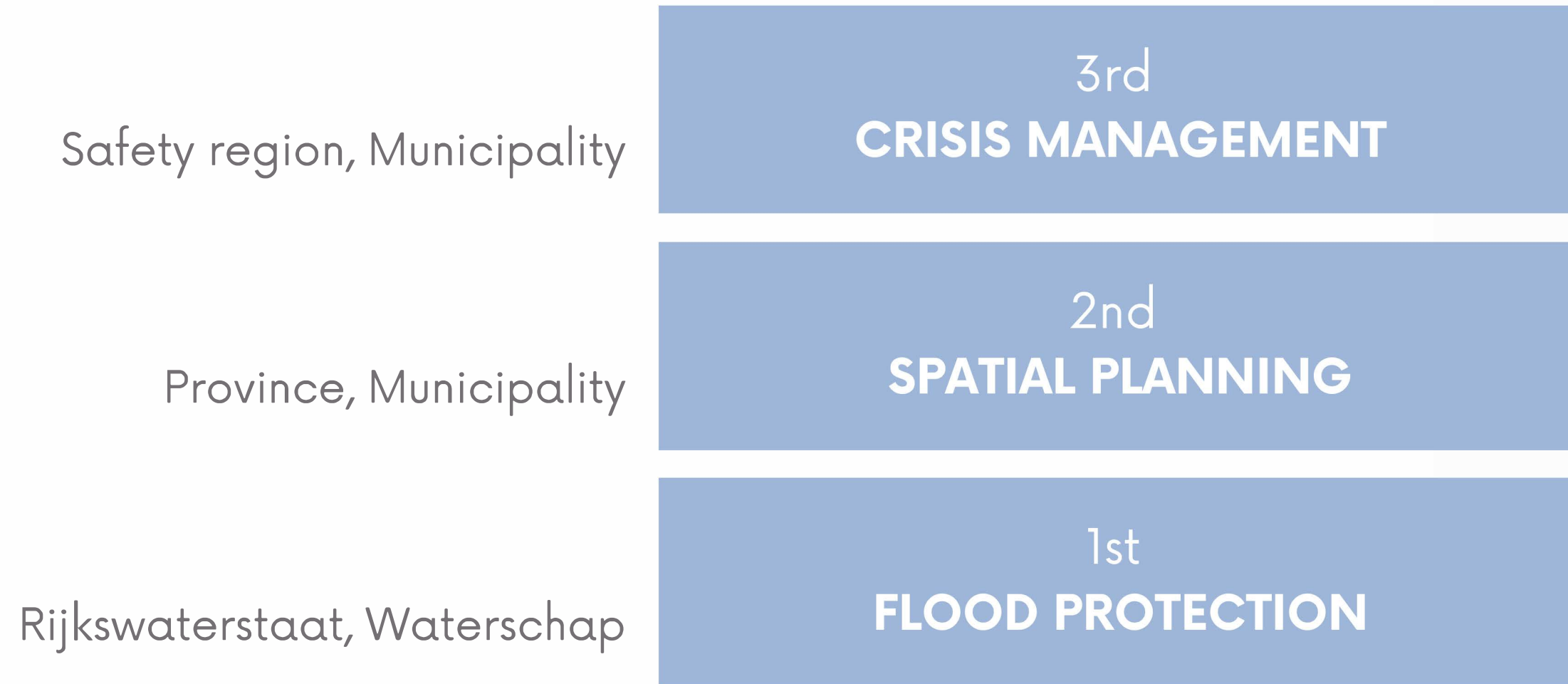
INSTITUTIONAL APPROACH



INSTITUTIONAL APPROACH



Multi-Layer Safety approach (MLS)



FROM NATIONAL STRATEGIC FRAMEWORK...

INSTITUTIONAL APPROACH

...TO LOCAL STRATEGIES

CITY'S OVERARCHING VISION: '**SELF-RELIANT**' ISLAND

RISK **COMMUNICATION** & **AWARENESS** RAISING

EVACUATION PLANNING

INSTITUTIONAL APPROACH

...TO LOCAL STRATEGIES

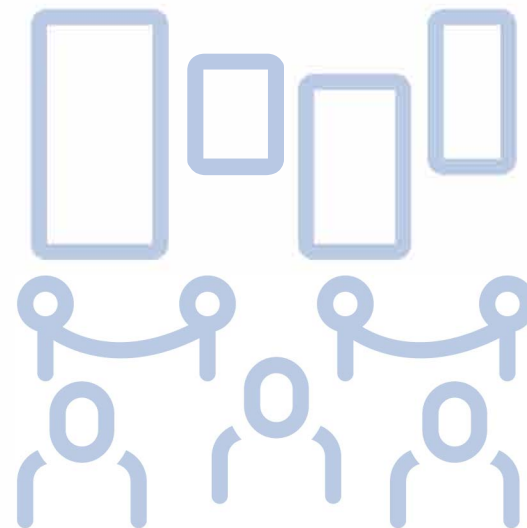
CITY'S OVERARCHING VISION: '**SELF-RELIANT**' ISLAND

RISK **COMMUNICATION** & **AWARENESS** RAISING

Interactive events



educational programs
(De Redders)



water festivals
(tij festival)

EVACUATION PLANNING

INSTITUTIONAL APPROACH

...TO LOCAL STRATEGIES

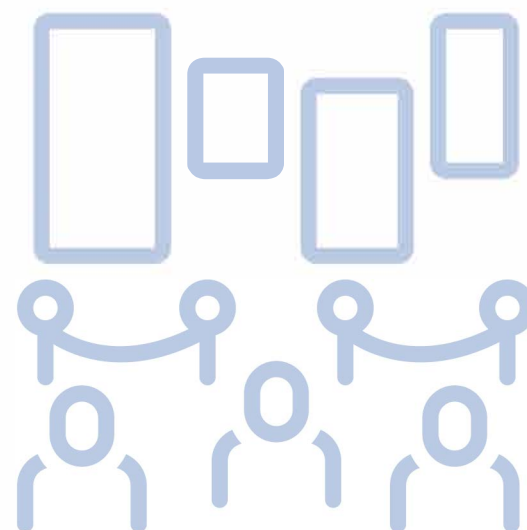
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RISK **COMMUNICATION** & **AWARENESS** RAISING

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educational programs
(De Redders)



water festivals
(tij festival)

EVACUATION PLANNING

Safe-haven areas



Maasterras, De Staart

INSTITUTIONAL APPROACH

**CONTEXT-SENSITIVE
DIVERSIFICATION**

Multi-level government cooperation
with focused city strategies

City strategies: broad-based city-
wide

**FORMAL AND
INFORMAL RULES
AND REGULATIONS**

Formal regulations; national
policies tailored locally

**LINKING AND
ALIGNING
STRATEGIES**

Collaborative 'horizontal'
governance framework

**INCLUSIVE SOCIETAL
DEBATE**

Top-down approach: Awareness
events organised by municipality,
supported by media

**INCLUSION AND
INVOLVEMENT OF
CITIZENS**

Involving by informing;
campaigns and events to boost
awareness (kids, youth)

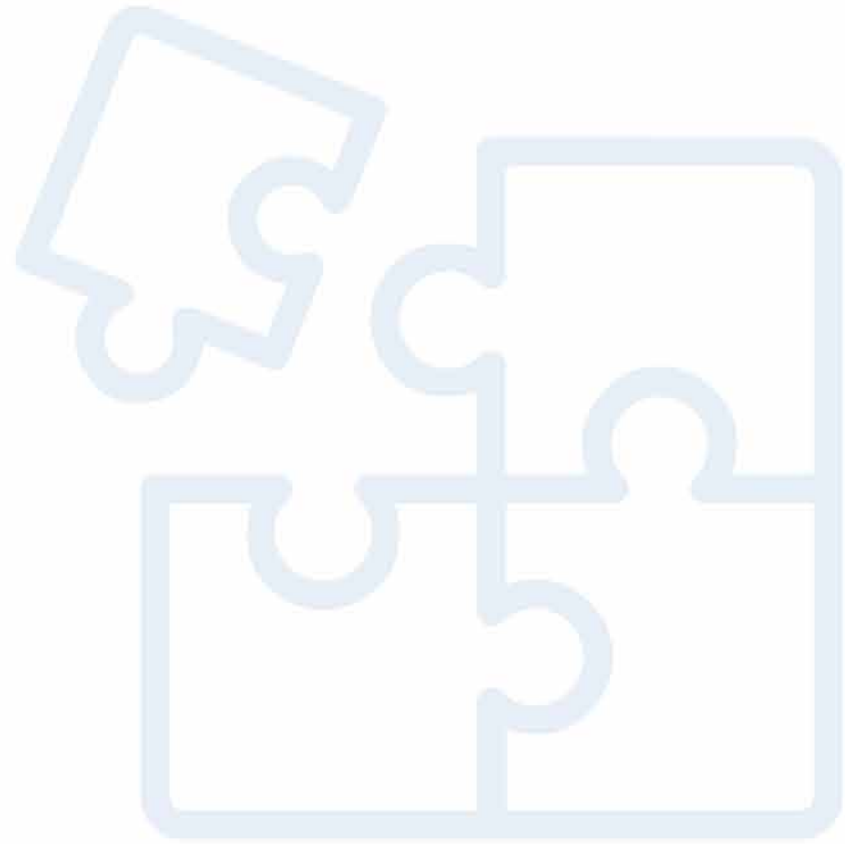
Concerns for vulnerable groups'
engagement

**BROADEN THE
RESOURCE BASE**

Participation in collaborative
/ EU projects

Concerns for inclusive
communication resources

INSTITUTIONAL APPROACH

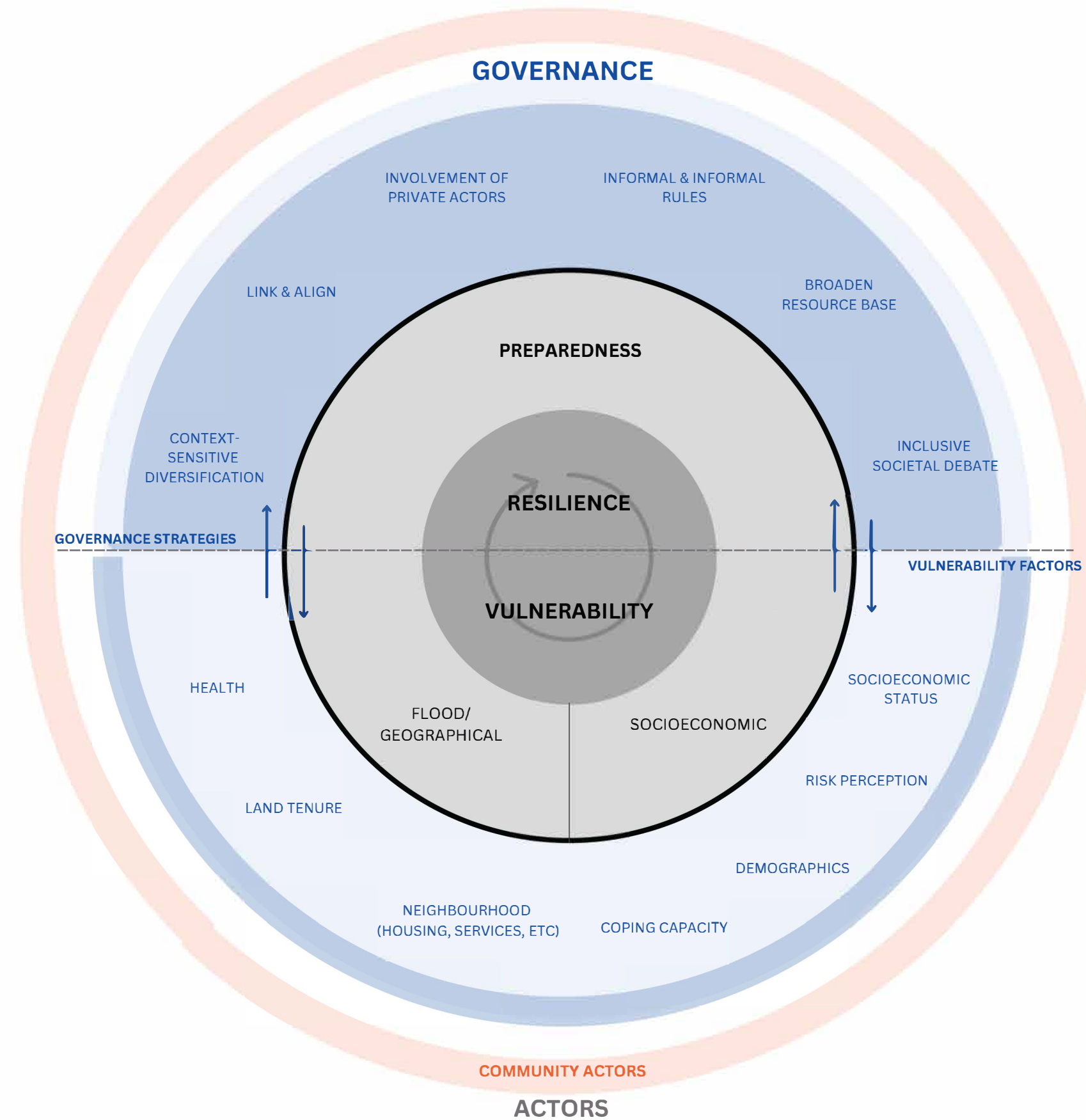


Wrap-up...

A broad-based, city-wide outreach
with a certain focus on children & youth engagement

Not tailor-made for the unique characteristics of various communities;
the unique socioeconomic needs of other vulnerable groups

COMMUNITY PERCEPTION



COMMUNITY PERCEPTION

A CONTEXT-SENSITIVE
DIVERSIFICATION

LINKAGE AND ALIGNMENT
OF STRATEGIES

INVOLVEMENT OF
PRIVATE ACTORS
(CITIZENS)

ADEQUATE FORMAL AND
INFORMAL RULES

BROADEN THE
RESOURCE BASE

INCLUSIVE, SOCIETAL DEBATE
ON THE BASIC STARTING
POINTS

COMMUNITY PERCEPTION

**CONTEXT-SENSITIVE
DIVERSIFICATION**

COMMUNITY PERCEPTION

KRISPIJN

CONTEXT-SENSITIVE
DIVERSIFICATION

Immediate socioeconomic concerns overshadow the acceptance and potential dangers of flooding.

"There is no awareness of this issue. To be honest, we don't really think about it."
(interviewee X, 2024)

COMMUNITY PERCEPTION

CONTEXT-SENSITIVE
DIVERSIFICATION

KRISPIJN

Immediate socioeconomic concerns overshadow the acceptance and potential dangers of flooding.

"There is no awareness of this issue. To be honest, we don't really think about it."
(interviewee X, 2024)

DE STAART

Belief that area's elevation provides a sense of security. Feeling unaffected by the flood threat.

"This is the safest place to live in Dordrecht in case of a flood."
(interviewee VIII, 2024)

"Doesn't seem like something that would affect us here."
(interviewee IX, 2024)

COMMUNITY PERCEPTION

**INCLUSION AND
INVOLVEMENT OF
CITIZENS**

COMMUNITY PERCEPTION

KRISPIJN

INCLUSION AND INVOLVEMENT OF CITIZENS

Low participation in engagement events.
Low awareness of the flood risk

"I don't see the risk of flooding as a present risk; it's not something that I feel close to me in the near future."
(interviewee IX, 2024)

Disconnect between governmental actions and their (community) needs.
Communication efforts not effectively reaching all community members.

"There's definitely language problems with the migrants and expats around here in participating." (interviewee X, 2024)

COMMUNITY PERCEPTION

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DE STAART

Low personal involvement: Inadequately informed about their roles and responsibilities

"I didn't realise until now that it would also mean that as residents we should take families at home."
(interviewee XII, 2024)

A need for more inclusive and detailed communication strategy for floods.

"City government should drive, give more information to us."
(questionnaire participant, 2024)

"The city never does something for us why would we shelter all those people?"
(interviewee IX, 2024)

INCLUSION AND INVOLVEMENT OF CITIZENS

COMMUNITY PERCEPTION

**INCLUSIVE SOCIETAL
DEBATE**

COMMUNITY PERCEPTION

KRISPIJN

INCLUSIVE SOCIETAL
DEBATE

Low participation & community representation in engagement events/ moments of interaction.

Lack of belief in their ability to contribute or sense of responsibility to engage with the government on flood resilience issues.

"Many of the community members have socioeconomic problems and do not feel clearly represented all the time"
(interviewee II, 2024)

"I don't really know much about all this technical stuff. Feels like it's not my place to get involved."
(questionnaire participant, 2024)

COMMUNITY PERCEPTION

KRISPIJN

Lack of awareness to participate in meaningful community events, moments of interaction.

Lack of belief in their ability to contribute or sense of responsibility to engage with the government on flood resilience issues.

"Many of the community members have socioeconomic problems and do not feel clearly represented all the time"
(interviewee II, 2024)

"I don't really know much about all this technical stuff. Feels like it's not my place to get involved."
(questionnaire participant, 2024)

DE STAART

Higher belief in their ability to contribute or willingness to engage with the government.

Need for more inclusive engagement processes to participate in discussions.

"The city should organise brainstorming moments with us [residents]."
(questionnaire participant, 2024)

INCLUSIVE SOCIETAL DEBATE



Overall...

**Dordrecht's approach: strategic response
but remaining areas for improvement**

particularly in community awareness, engagement, and inclusivity

**Divergence between institutional strategy and
community realities, with practical
applications often falling short**

due to dependence on other actors w/ different priorities, insufficient investment, or general political will

A CONTEXT-SENSITIVE
DIVERSIFICATION

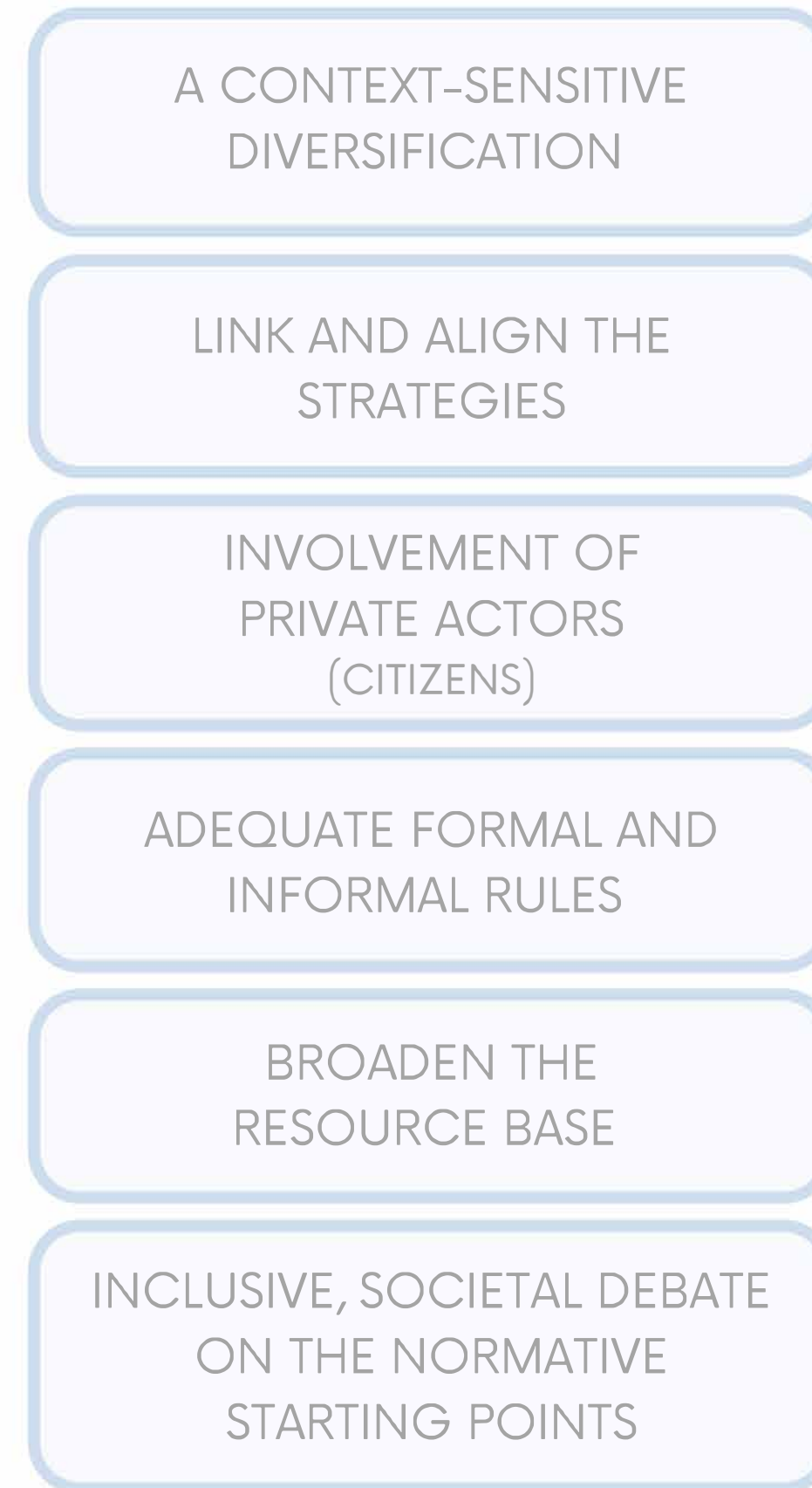
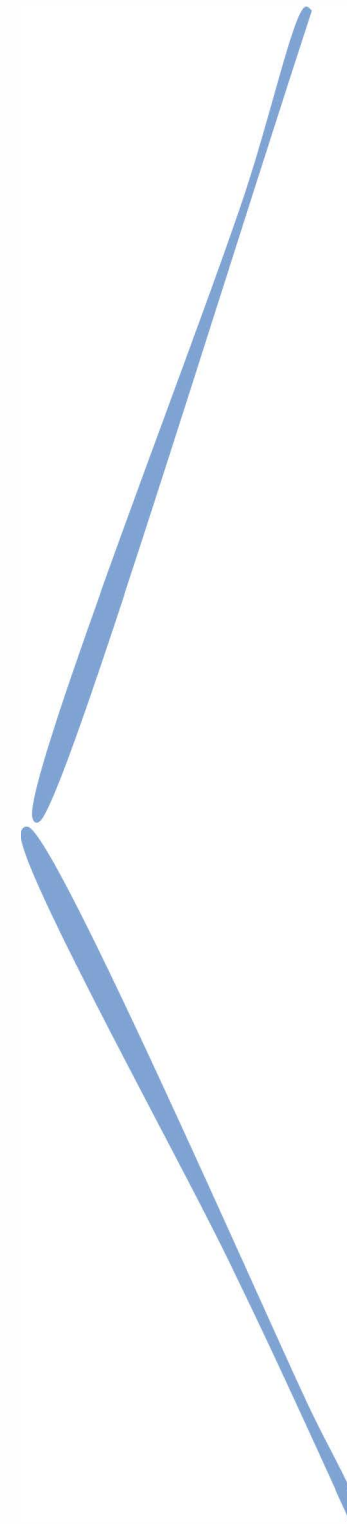
LINK AND ALIGN THE
STRATEGIES

INVOLVEMENT OF
PRIVATE ACTORS
(CITIZENS)

ADEQUATE FORMAL AND
INFORMAL RULES

BROADEN THE
RESOURCE BASE

INCLUSIVE, SOCIETAL DEBATE
ON THE NORMATIVE
STARTING POINTS



GAP

**CONTEXT-SENSITIVE
DIVERSIFICATION**

Low community awareness and tailored risk communication.

RECOMMENDATION

Localised FR assessments; maps & evacuation protocols

GAP

RECOMMENDATION

CONTEXT-SENSITIVE
DIVERSIFICATION

Low community awareness and
tailored risk communication.

Localised FR assessments; maps &
evacuation protocols

LINKAGE AND ALIGNMENT
OF STRATEGIES

Mainly top-down w/ low community
involvement & coordination

Link experiences & initiatives,
strategies; internally and externally

GAP

CONTEXT-SENSITIVE DIVERSIFICATION

Low community awareness and tailored risk communication.

LINKAGE AND ALIGNMENT OF STRATEGIES

Mainly top-down w/ low community involvement & coordination

INVOLVEMENT OF PRIVATE ACTORS (CITIZENS)

Limited community participation; socioeconomic vulnerabilities (e.g., language barriers)

RECOMMENDATION

Localised FR assessments; maps & evacuation protocols

Link experiences & initiatives, strategies; internally and externally

Multilingual informative/ training initiatives and communication means

GAP

RECOMMENDATION

CONTEXT-SENSITIVE
DIVERSIFICATION

Low community awareness and
tailored risk communication.

Localised FR assessments; maps &
evacuation protocols

LINKAGE AND ALIGNMENT
OF STRATEGIES

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INVOLVEMENT OF
PRIVATE ACTORS
(CITIZENS)

Limited community participation;
socioeconomic vulnerabilities (e.g.,
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Multilingual informative, training &
educational initiatives

INCLUSIVE, SOCIETAL
DEBATE

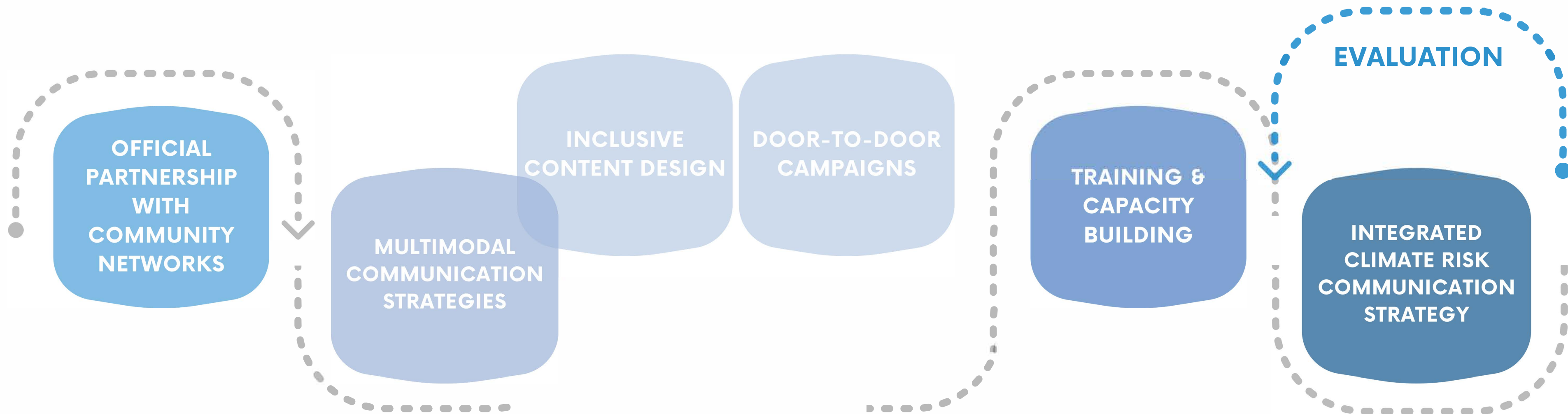
Communication gaps among
vulnerable groups

Public dialogues; various media
platforms & communication methods

FOCUS ON CITY'S PRIORITIES



RISK COMMUNICATION



EVACUATION PLANNING

MAPPING AND RESOURCE ALLOCATION

DENSITIES OF VULNERABLE POPULATIONS, POTENTIAL SUPPORTIVE SHELTER BUILDINGS

COMMUNITY ENGAGEMENT

FORUMS, WORKSHOPS WITH THE VULNERABLE GROUPS/ COMMUNITIES

PARTNERSHIPS

LOCAL HOSPITALS, NURSING HOMES, DISABILITY ADVOCACY ORGS

INCLUSIVE POLICY DEVELOPMENT

INCLUSIVE POLICIES, COMPLYING W/ ADA ETC.

PUBLIC AWARENESS CAMPAIGN

ORGANISE EVENTS AT THE EVACUATION ROUTE, ADVERTISE THE PLAN



CONCLUSION

What flood governance strategies do governmental actors develop and implement to enhance resilience against climate-change-induced fluvial flooding in vulnerable neighbourhoods in the Netherlands?

Which governmental actors are involved in flood resilience strategies, and what specific strategies have been implemented to address flood resilience?

How have vulnerabilities to flooding been recognized and articulated by governmental actors, particularly in socioeconomically vulnerable communities, such as Krispijn and De Staart?

What are the perceptions of non-governmental actors regarding the flood governance strategies and actions in Krispijn and De Staart (Dordrecht), and what barriers or challenges have been highlighted?

Considering the current strategies and the perceptions of both governmental and non-governmental stakeholders, how can flood governance be improved or refined to better support flood resilience in vulnerable neighbourhoods?

Currently...

Multi-level governmental cooperation:MLS

Multi-dimensional, city-wide flood resilience approach

Focus on younger generations



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Multi-level governmental cooperation:MLS

Multi-dimensional, city-wide flood resilience approach

Focus on younger generations

However...

Insufficient consideration of local socioeconomic factors

Limited engagement & inclusivity with vulnerable groups

(migrants, elderly; communication barriers)



Currently...

Multi-level governmental cooperation:MLS

Multi-dimensional, city-wide flood resilience approach

Focus on younger generations

However...

Insufficient consideration of local socioeconomic factors

Limited engagement & inclusivity with vulnerable groups
(migrants, elderly; communication barriers)

Need for...

Inclusive, tailored communication strategies.

Better integration of local socioeconomic realities.

Enhanced community participation across all demographic groups.



KEY TAKEAWAYS ON ENHANCING RESILIENCE TRANSFERABLE TO OTHER CONTEXTS





ENTIRE VILLAGES REMAIN BLOCKED - NEIGHBOURHOODS WIPED OFF THE MAP

ΟΛΟΚΛΗΡΑ ΧΩΡΙΑ ΠΑΡΑΜΕΝΟΥΝ ΑΠΟΚΛΕΙΣΜΕΝΑ - ΓΕΙΤΟΝΙΕΣ ΣΒΗΣΤΗΚΑΝ ΑΠΟ ΤΟΝ ΧΑΡΤΗ



PAIN AND TEARS FOR THE VICTIMS OF THE BAD WEATHER

ΠΟΝΟΣ ΚΑΙ ΔΑΚΡΥΑ ΓΙΑ ΤΑ ΘΥΜΑΤΑ ΤΗΣ ΚΑΚΟΚΑΙΡΙΑΣ

KEY TAKEAWAYS ON ENHANCING RESILIENCE

Strengthening & investing in preparedness phase

Context-specific support & resource allocation

- Geographical adaptation
- Socioeconomic adaptation

Multi-level / Collaborative governance

- Top-down and bottom-up initiatives; both horizontal and vertical strategic coordination

Community involvement

- Public awareness & community support system
- Local knowledge & experience



Language barrier: researcher - community members

Limited scope & representation: 2 communities

Primarily qualitative data: depth but not breadth

RESEARCH LIMITATIONS



FURTHER RESEARCH

Cross-case: transferable practices

Long-term studies: risk communication (test)

Emerging technologies: socioeconomic lens

Language barrier: researcher - community members

Limited scope & representation: 2 communities

Primarily qualitative data: depth but not breadth

RESEARCH LIMITATIONS



THANK YOU!

Q & A



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BUILDING FLOOD RESILIENCE

A CASE STUDY ON CLIMATE-DRIVEN FLUVIAL
FLOODING IN VULNERABLE NEIGHBOURHOODS