European Climate Resilient Health Systems Course

SESSION 2: Methods for assessing vulnerability and adaptation of health systems

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The Association of Schools of Public Health in the European Region

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GLOBAL CONSORTIUM ON CLIMATE AND HEALTH EDUCATION

Assessing differential exposure, vulnerability and adaptation options of people and health infrastructures to climate change

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Introduction

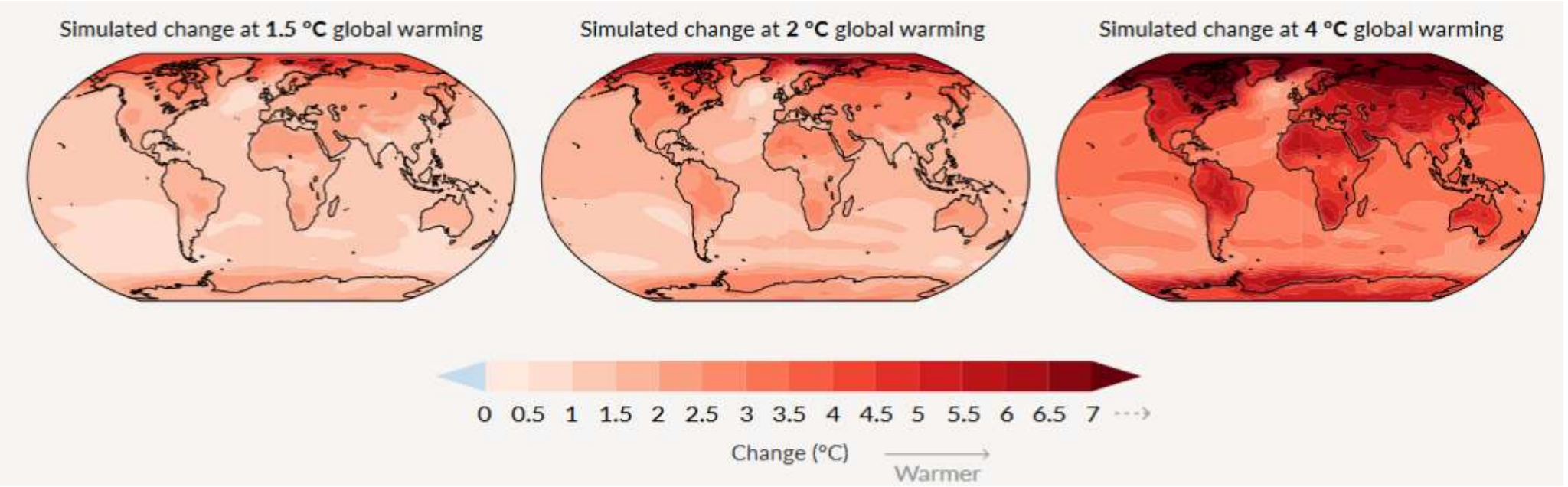
- Climate risks are increasing. Climatic risks are a product of hazard, exposure and vulnerability.
- Complex linkages between health services, critical infrastructures, climate change and human vulnerability are not sufficiently considered in emergency and spatial planning.
- Climate resilient health infrastructures encompasses aspects of robustness (physical side) and learning from crises.

Questions

- What are linkages between climate change, human vulnerability and health infrastructures?
- What are methods to assess selected linkages – e.g. impacts of extreme events on health infrastructures?
- Why is cross-sector cooperation necessary in order to enhance adaptive capacities of health infrastructures – e.g. hospitals?

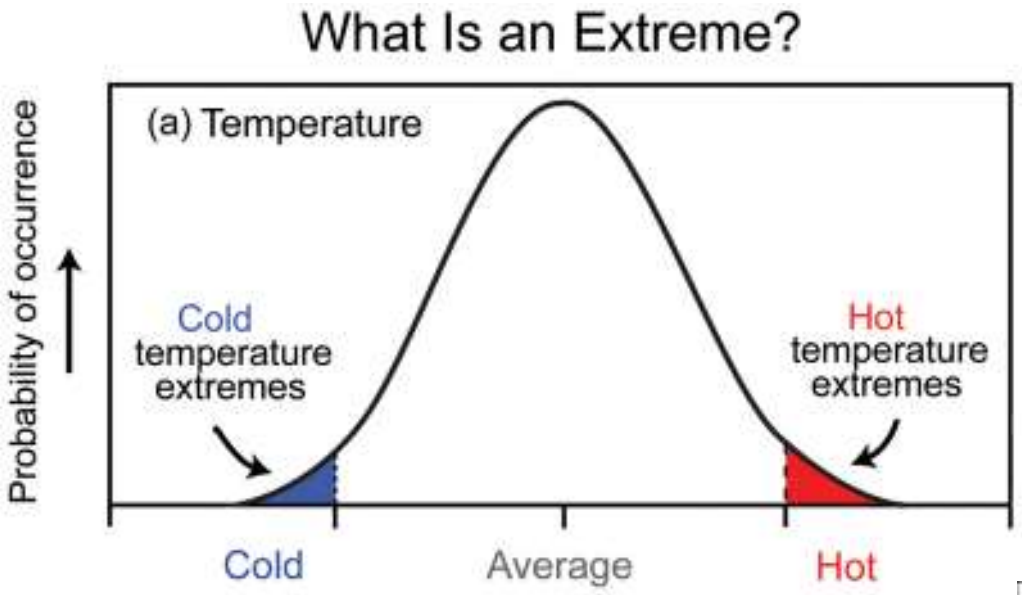
International Discourse - IPCC

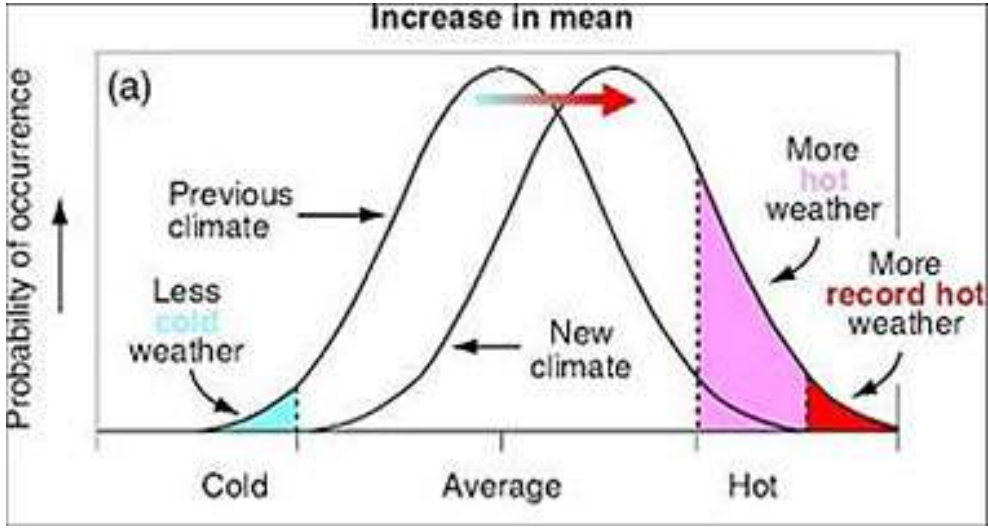
- Annual mean temperature change (°C) relative to 1850-1900



Source: IPCC 2021

Climate change leads to changes in extreme events





Source: IPCC 2012

The IPCC Risk Framework (AR 5 + AR6)

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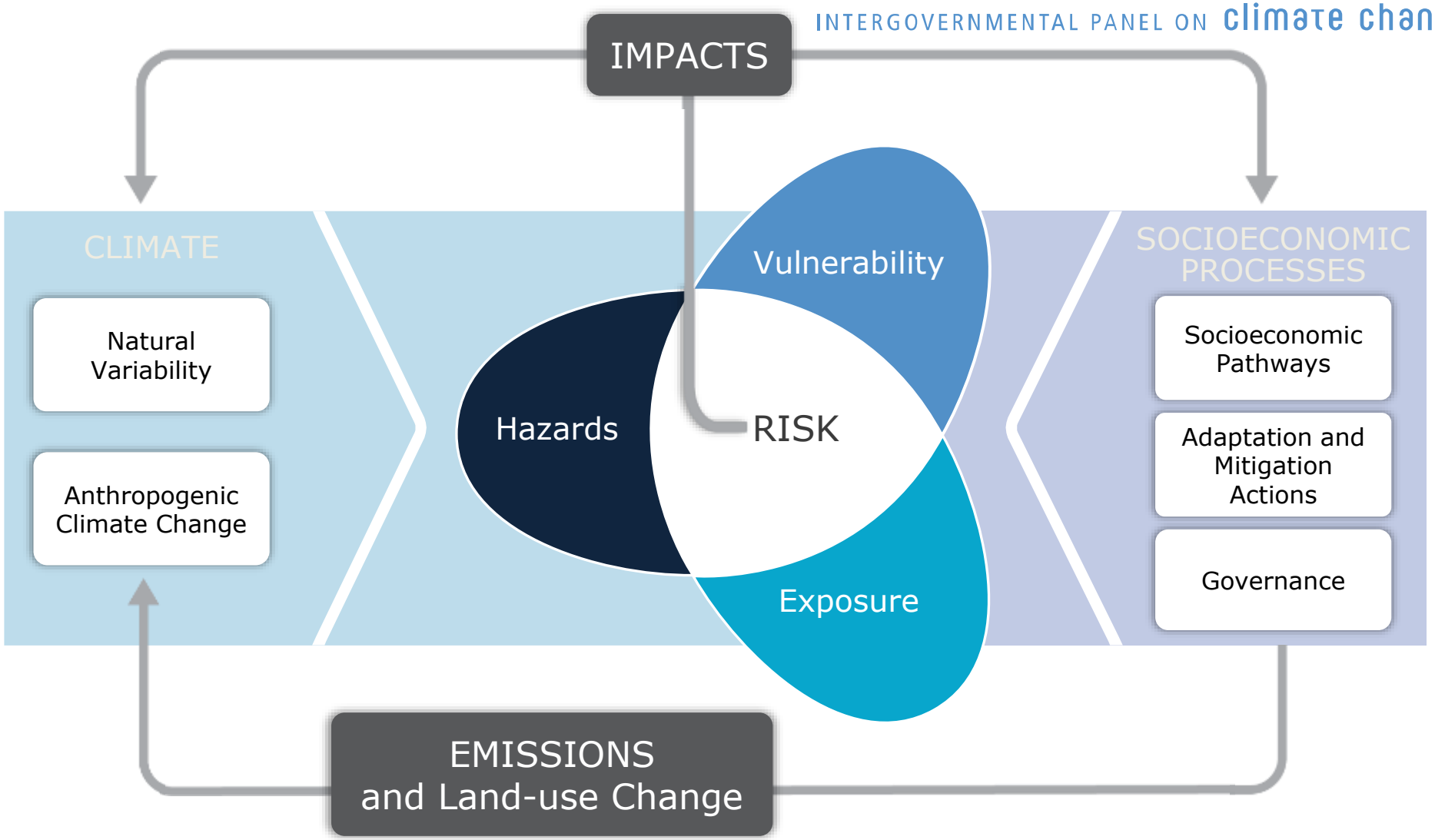
INTERGOVERNMENTAL PANEL ON climate change



- Risk is a product of the interaction of hazard, exposure and vulnerability

The IPCC Risk Framework - Public Health

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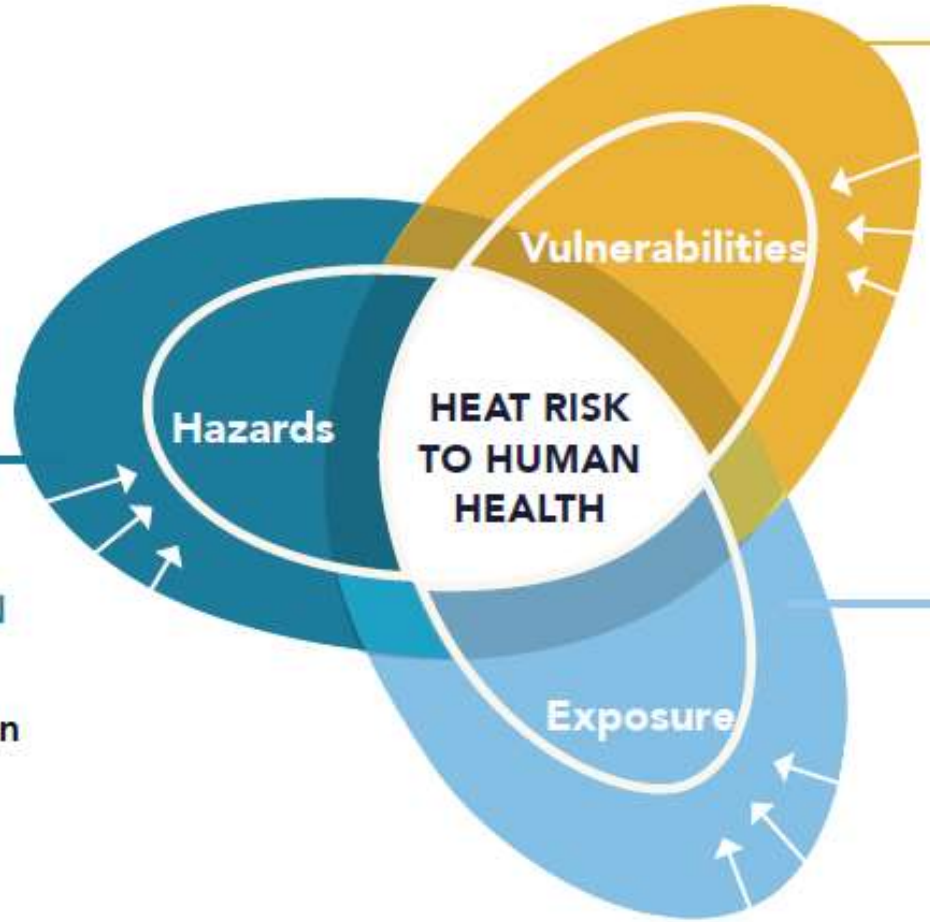


VULNERABILITIES REDUCTION

- Livelihood diversification
- Insurance
- Public health infrastructre

HAZARD REDUCTION

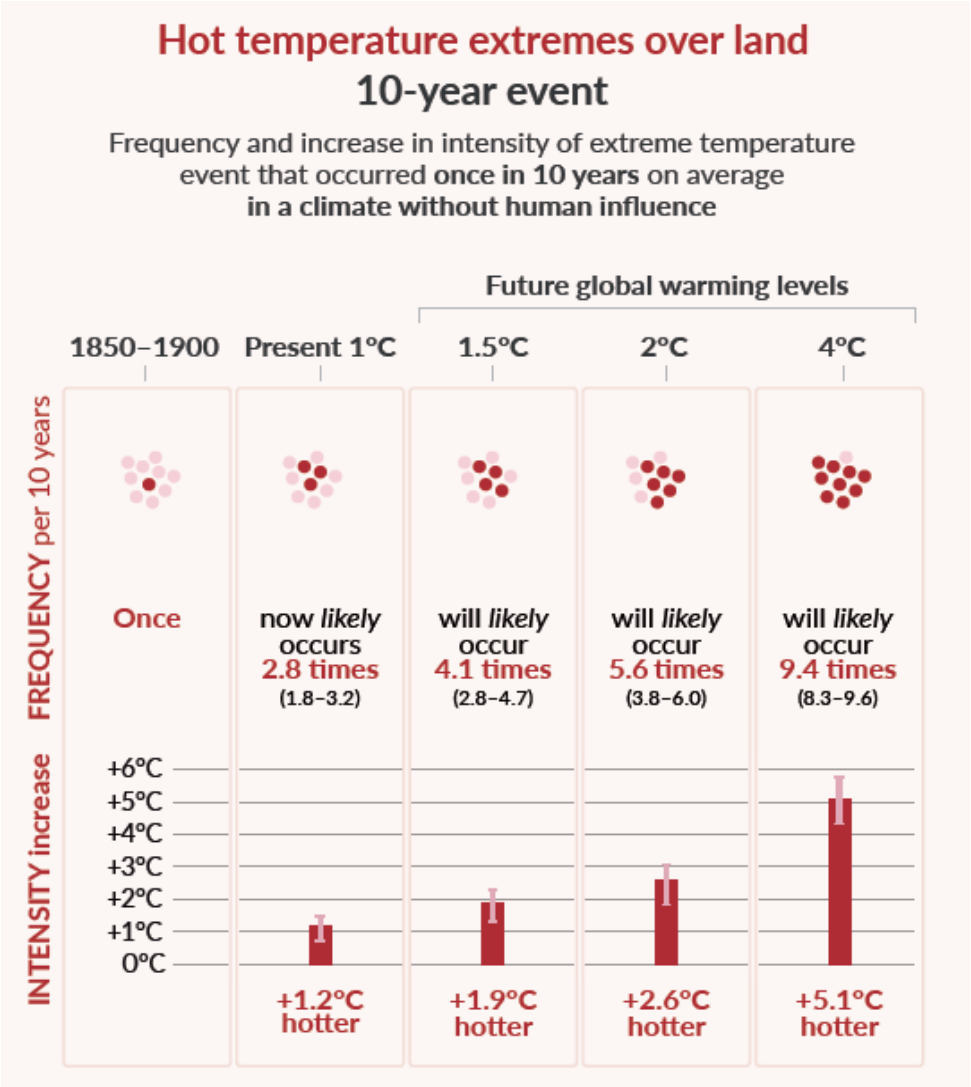
- Climate mitigation
- Reduced air pollution

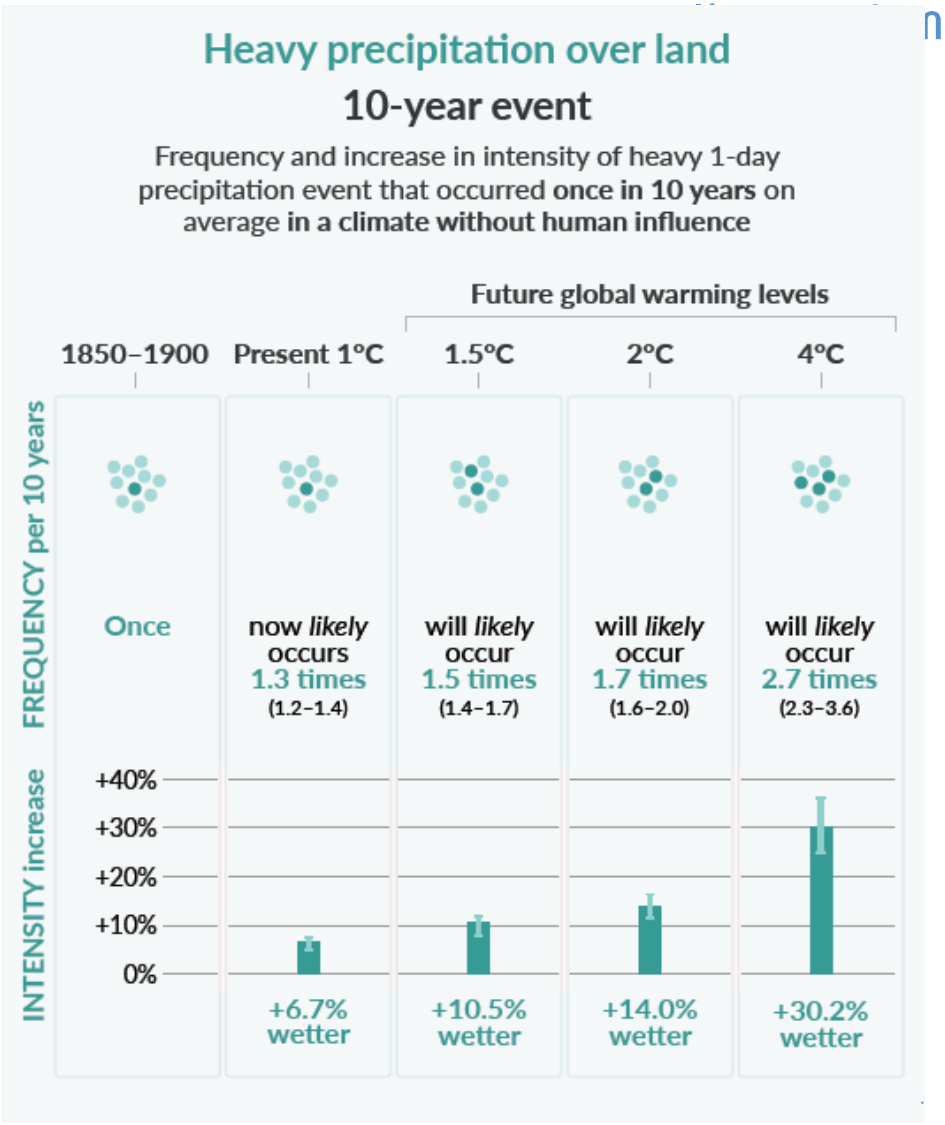
EXPOSURE REDUCTION

- Increased public green spaces
- Altered outdoor work times
- Active and passive cooling
- Early warning systems
- Cooling shelters

Source: IPCC 2022

Extreme events: Heavy Precipitation and Heat





Source: IPCC 2021

International Discourse - IPCC

- Health infrastructures, services and vulnerable groups experience adverse impacts due to climate change and these impacts are likely to increase in the future due to climate change.

- In the near term, climate-associated risks to natural and human systems depend more strongly on changes in their vulnerability and exposure than on differences in climate hazards between emissions scenarios (high confidence).

- Adaptation efforts have increased, but are often still insufficient to deal effectively with future climate change and climate resilience of health infrastructures and services, particularly for most vulnerable groups.

Source: IPCC 2021

Synergies: adaptation and mitigation options

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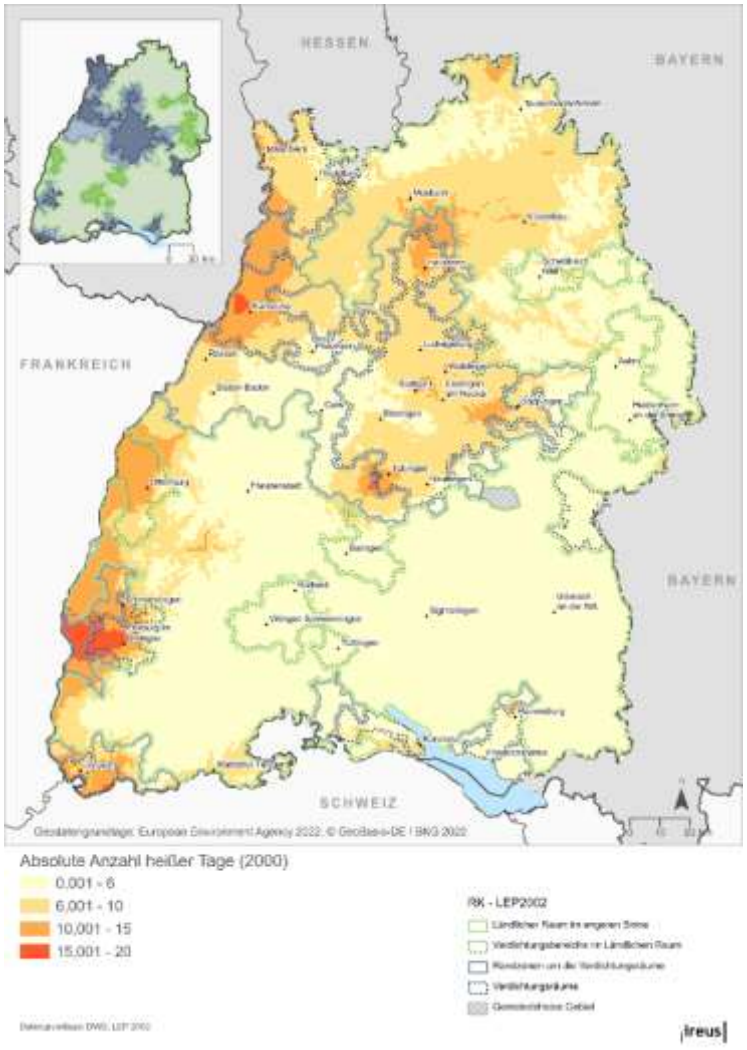
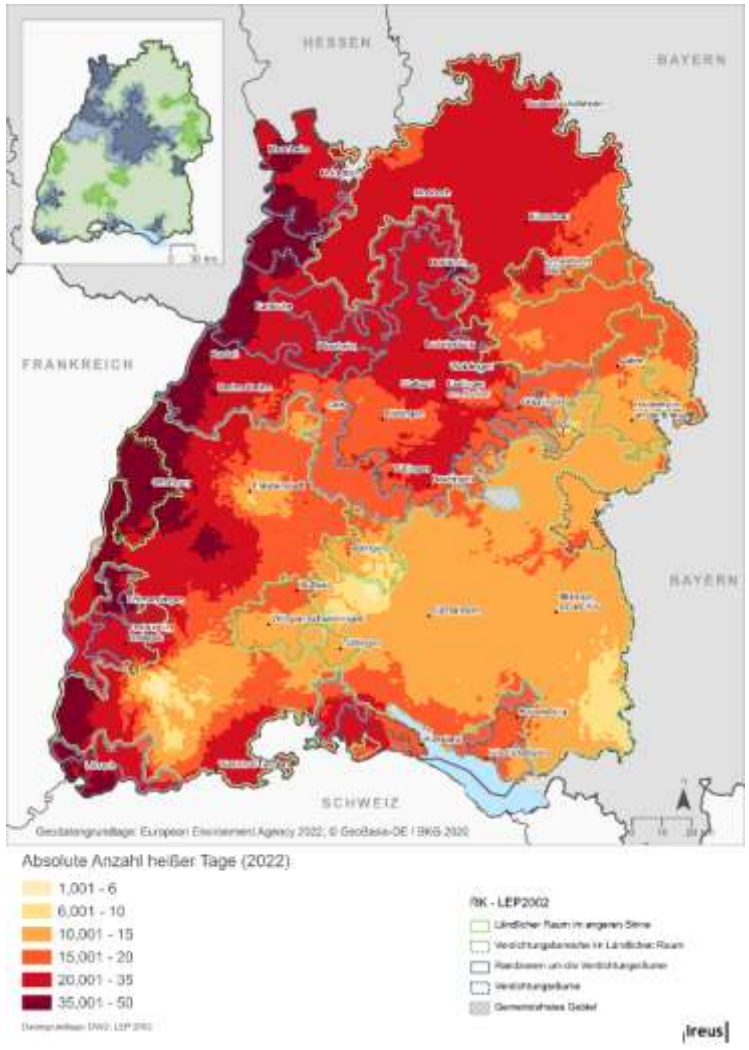
INTERGOVERNMENTAL PANEL ON climate change

Representative Key Risks (RKRs)	System Transitions	Adaptation options	Potential feasibility	Mitigation synergies
Critical infrastructure, networks and services	**Urban and infrastructure systems**	Urban green infrastructure	●	●
		Sustainable land use and planning	●	●
		Sustainable urban water management	●	●
Human health	**Cross-sectoral**	Health and health systems adaptation	●	●
Other cross-cutting risks		Disaster risk management	●	●
		Early Warning Systems	●	/
		Social safety nets	●	●

Source: IPCC 2022

Increasing exposure to heat stress and hot days in Germany - example State of Baden-Wuerttemberg

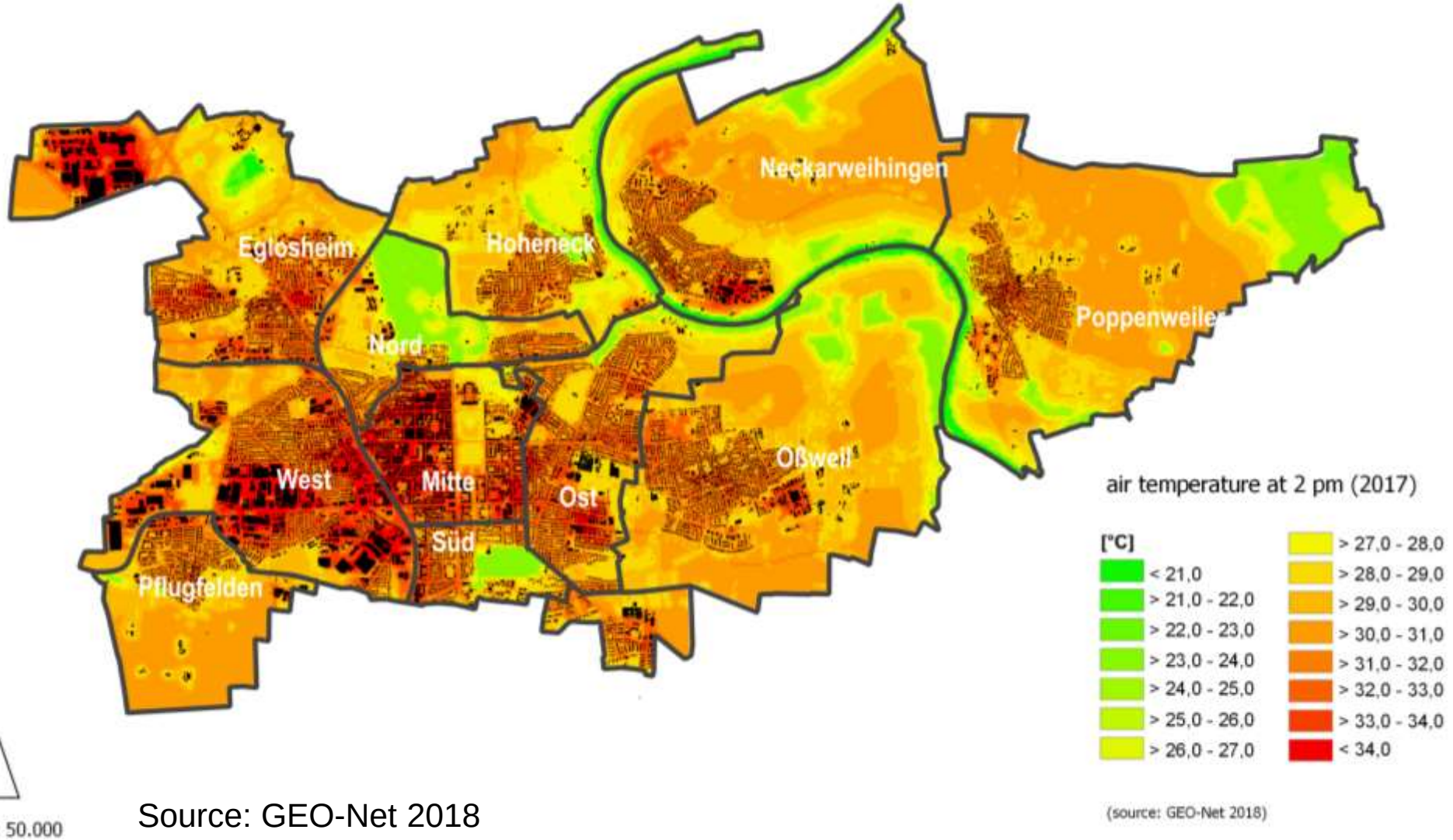




- Changes in heat stress (hot days) in the state of Baden-Wuerttemberg: 2000 and 2022

Source: IREUS on the basis of data of LUWB + spatial categories in the state development plan

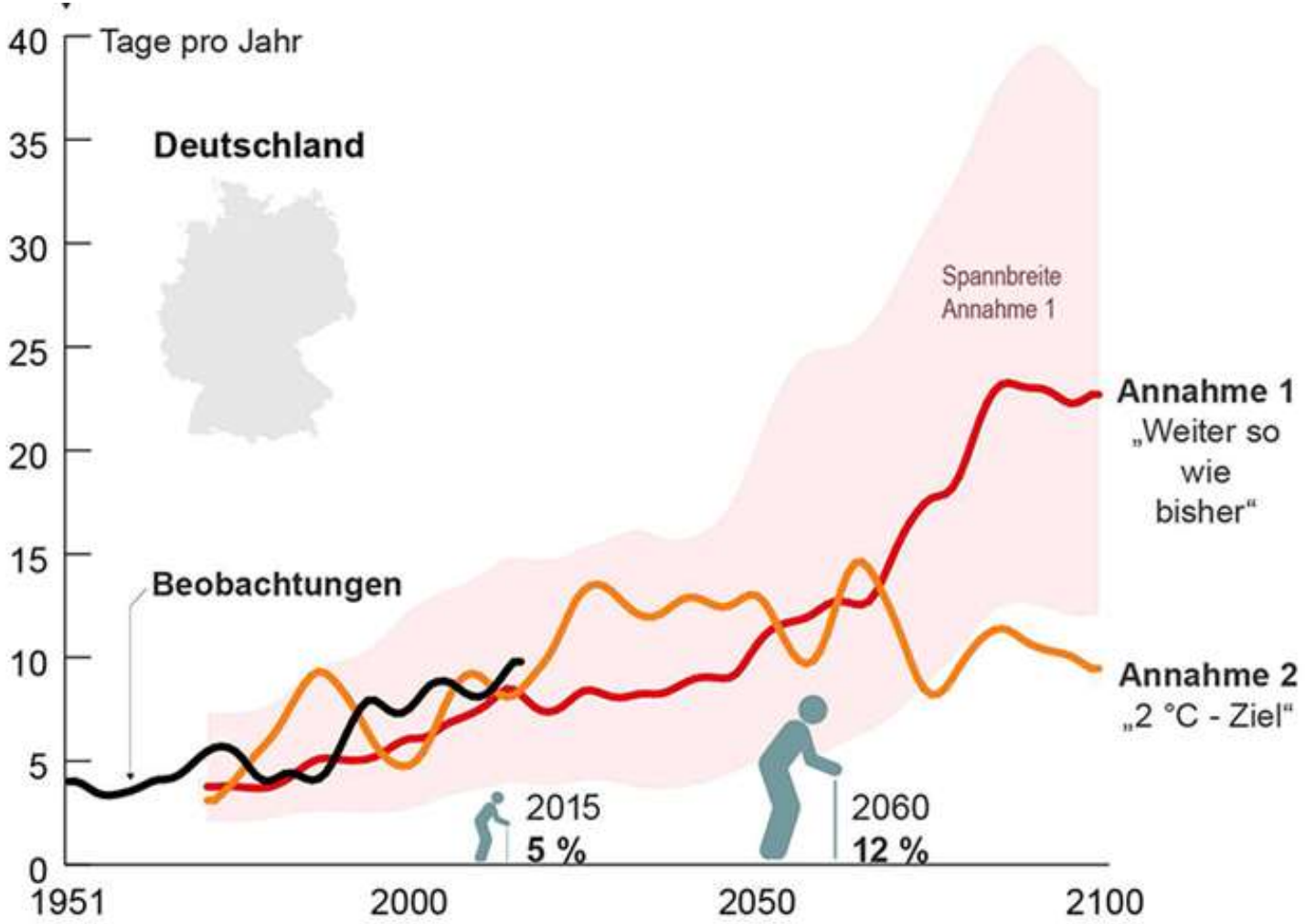
Urban structure and heat stress at 2pm in the city of Ludwigsburg (near Stuttgart)



1 : 50.000

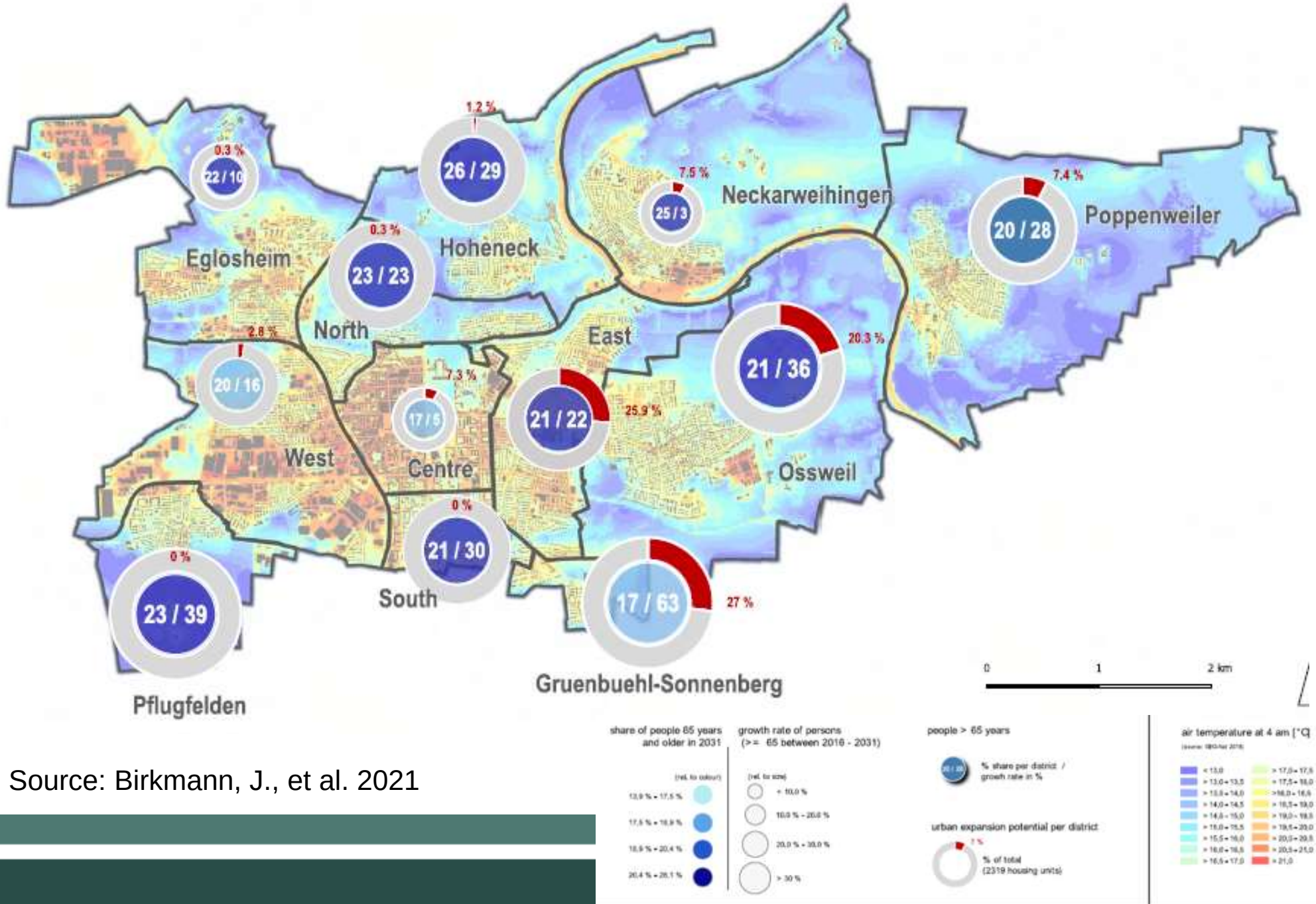
Source: GEO-Net 2018

Aging population in Germany and human vulnerability



Source: DWD und Stat. Bundesamt (Thema: Steigende Anzahl an heißen Tagen)

Urban Heat stress and aging in the city of Ludwigsburg



Source: Birkmann, J., et al. 2021

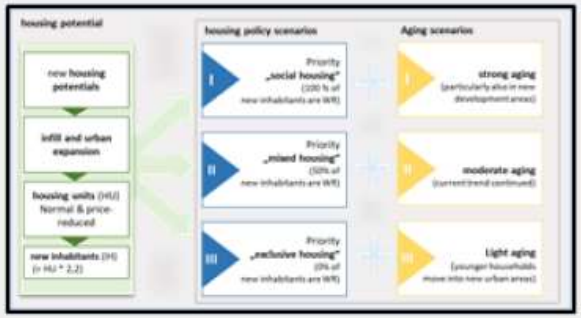
Assessment method behind - hotspot identification

observed development patterns and trends

general storylines (considering qualitative research, SSPs and expert discussions)

future population development corridors (based on biregio and StaLa)

local specific scenarios (considering different aging, social housing and welfare recipients (WR))



comp. Fig. 6

combined scenarios for human vulnerability in 2031

scenario I
high vulnerability (high aging & increasing poverty)

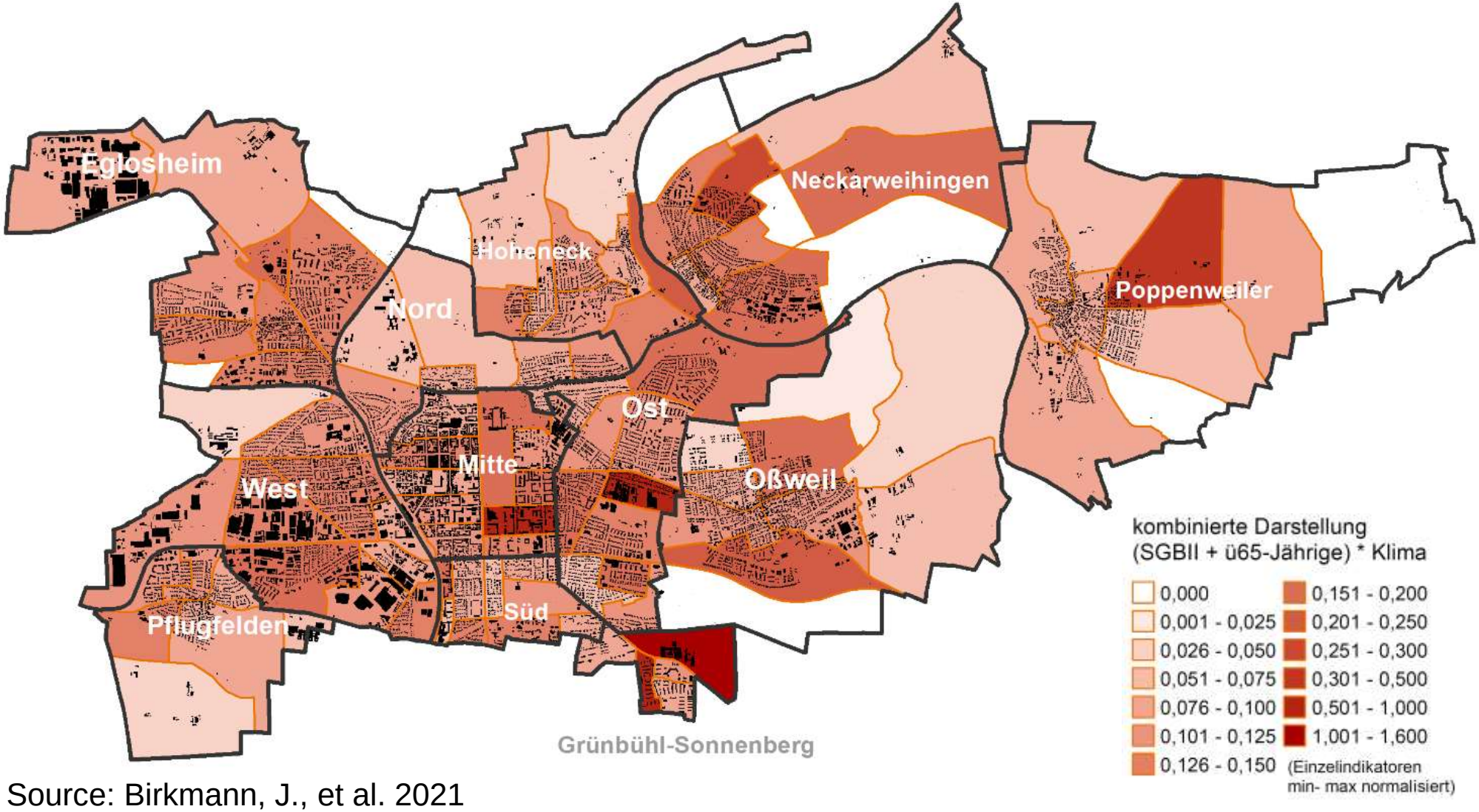
scenario II
middle of the road (aging trends continue & moderate growth of poverty)

scenario III
divided future (younger population & exclusive housing)

city scale → district and ward scale

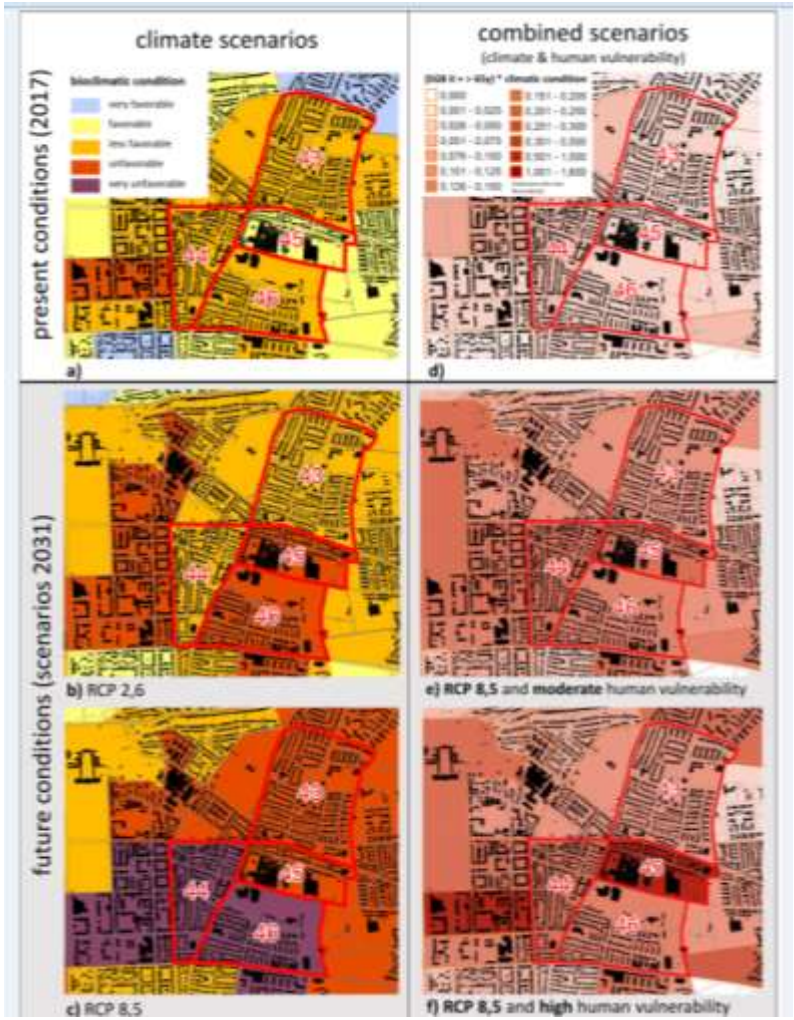
Quelle: Birkmann et al. 2021

Scenario high level of climate change and vulnerability (high vulnerability in 2031 and RCP 8,5)



Source: Birkmann, J., et al. 2021

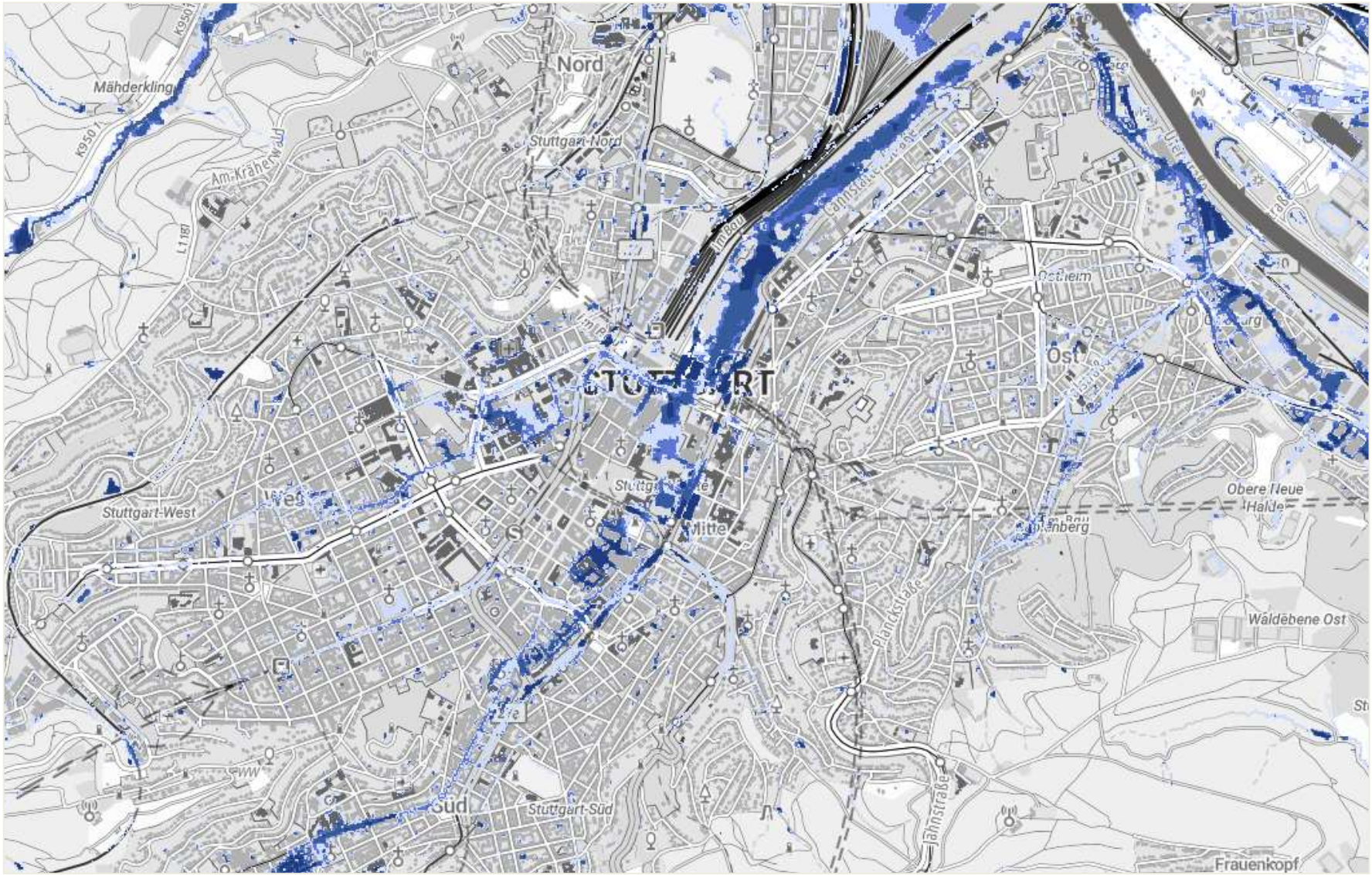
Scenario high level of climate change and vulnerability (Scenarios at ward scale - City of Ludwigsburg)



- Combined assessment allows to detect both: areas highly exposed to heat and highly vulnerable
- Specific adaptation measures within cities can be developed, that account for future heat stress, population structure and green spaces at the same time to reduce health risks to heat

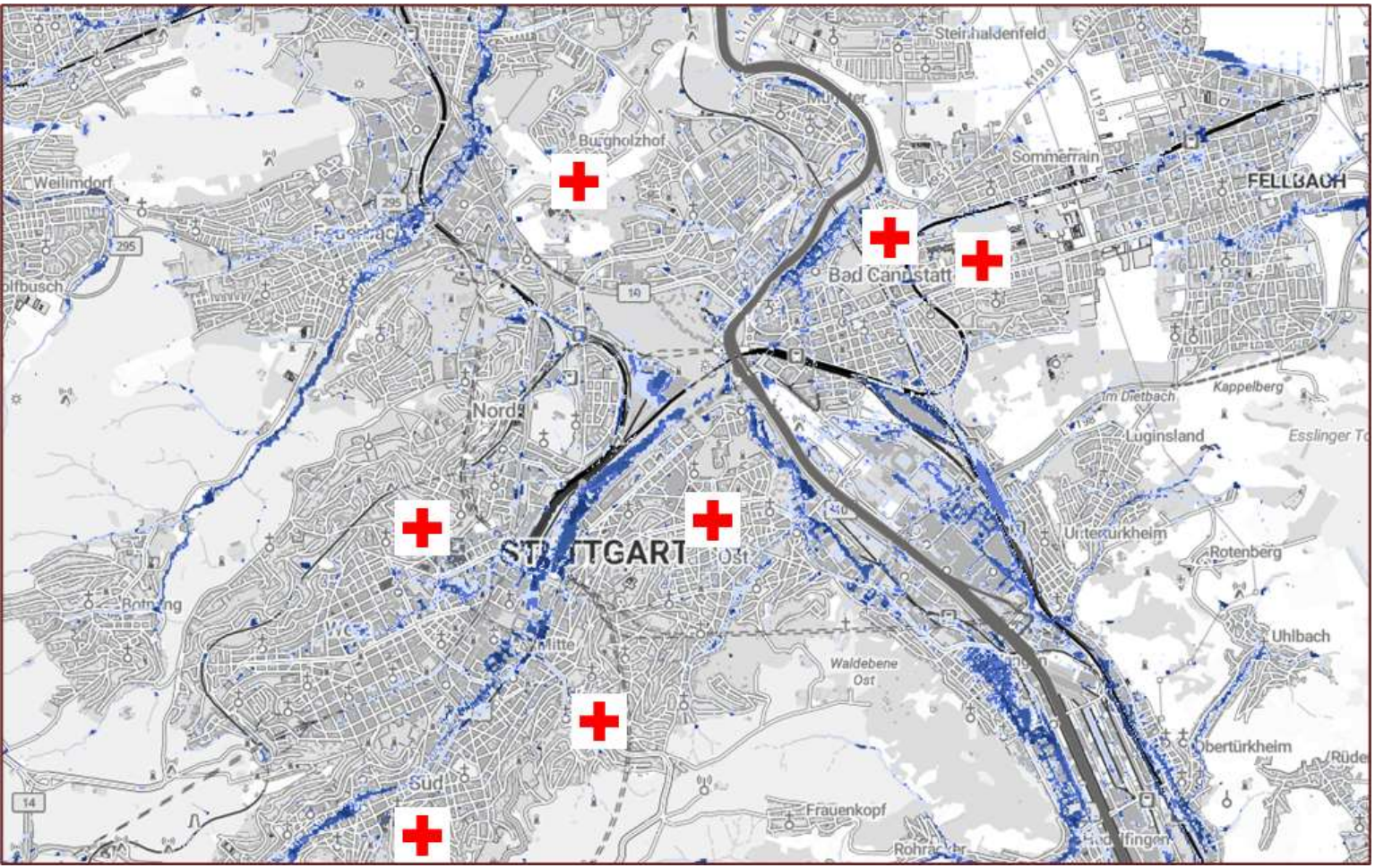
Source: Birkmann, J., et al. 2021

From Heat to Heavy Precipitation



Quelle: ISAP Project 2024

City of Stuttgart - hospitals



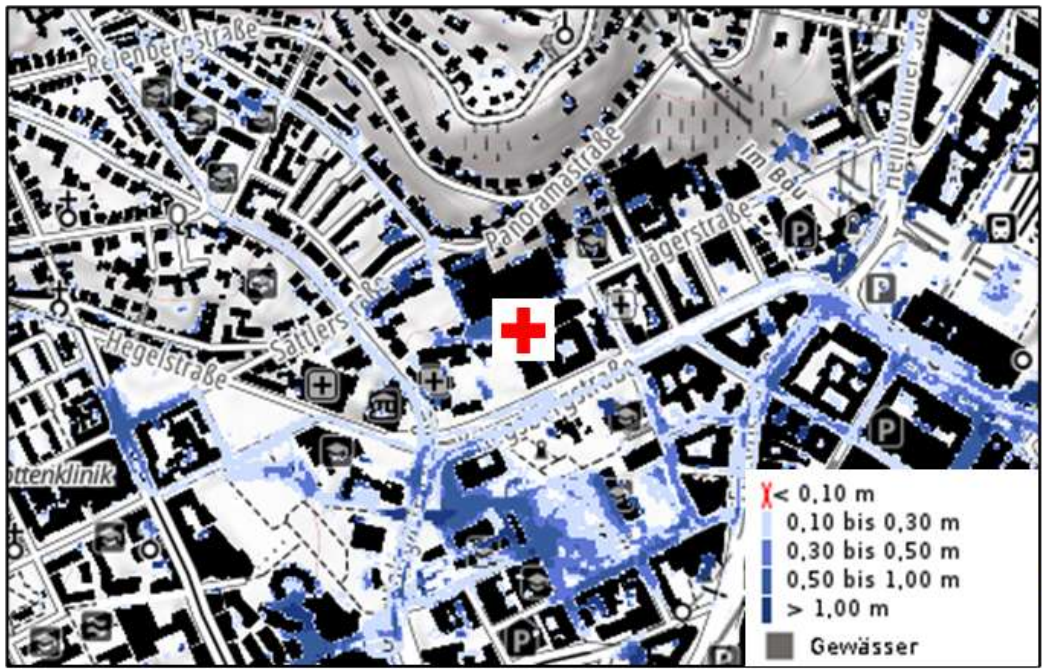
Heavy rain, flood depths (progressing climate change, extraordinary event)

- < 0,10 m
- 0,10 bis 0,30 m
- 0,30 bis 0,50 m
- 0,50 bis 1,00 m
- > 1,00 m
- Gewässer

Source: ISAP Draft Project

Focus on specific hospitals: exposure and access

Capacity: 1500 beds



Heavy rain, flood depths (progressing climate change, extraordinary event)

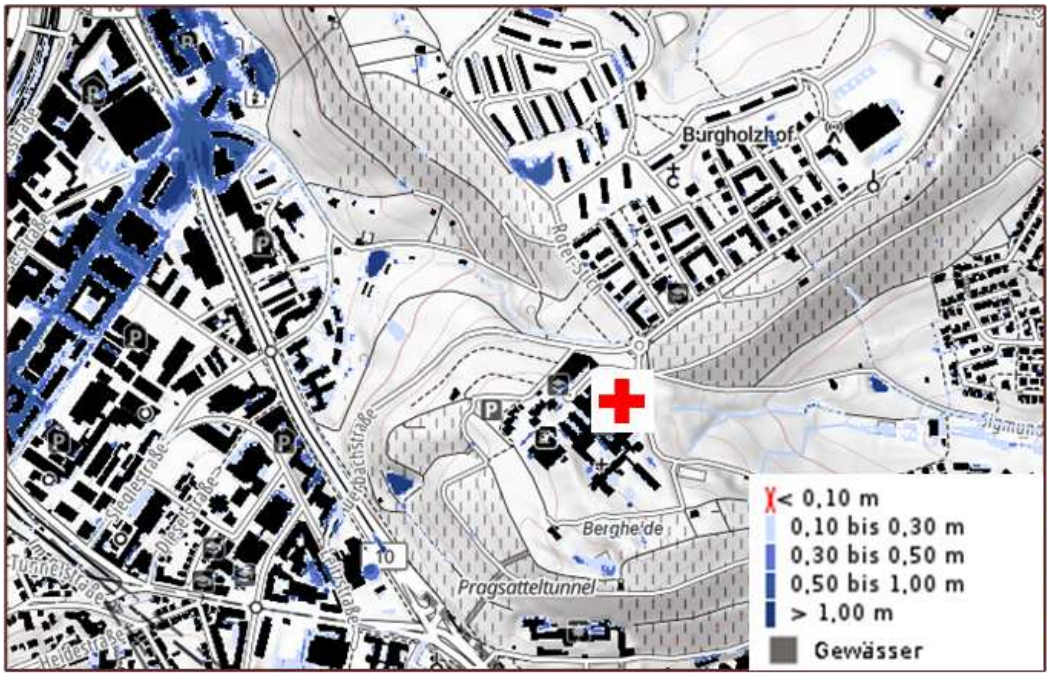
Heavy rain, flow velocities (progressing climate change, extraordinary event)

- Heavy rain occurs around buildings and along streets, with flooding depths of up to 1 m. This is also true for the access road to the emergency room! High flow speeds on all access roads!

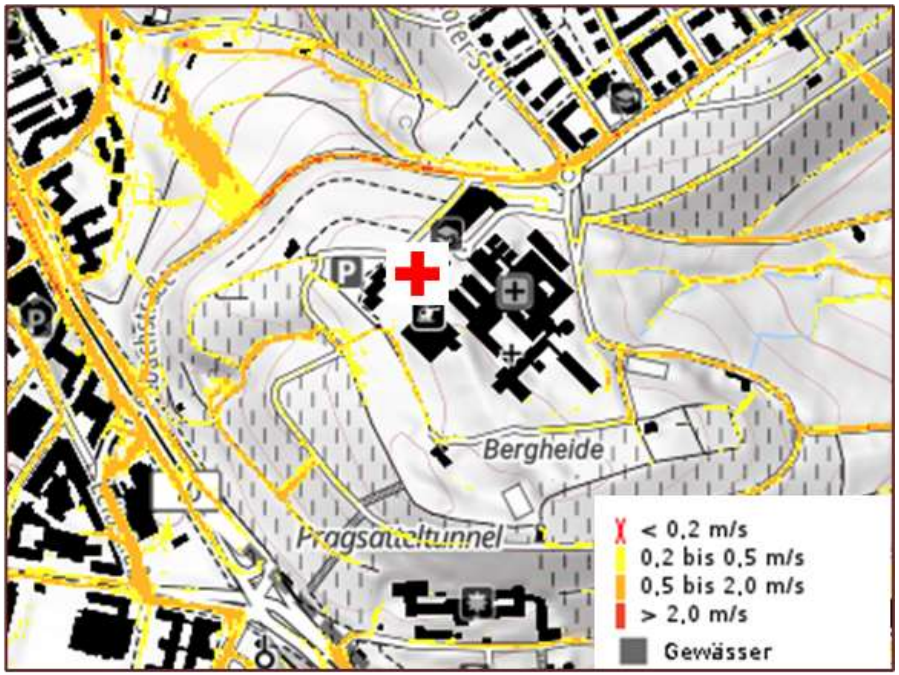
Source: ISAP Draft Project

Robert-Bosch-Hospital on a hill

Capacity: 880 beds



Heavy rain, flood depths (progressing climate change, extraordinary event)



Heavy rain, flow velocities (progressing climate change, extraordinary event)

- Flood areas especially in the spaces between the building sections due to the flat location (this also affects the access to the emergency room). Access via Borsigplatz from the north is severely restricted. Otherwise, all access roads are free.

Source: IREUS / ISAP Draft Project

Supply deficits and dependency on other services

Source: Birkmann and Hampel

Potential supply deficits in hospitals

<u>Lack of resources:</u>
- Blood supplies
- Medicines / drugs
- Consumables and hygiene items
- Oxygen
- Food / groceries

<u>Lack of personal:</u>
- Shortage of staff due to delayed shift changes

<u>Lack of time:</u>
- Longer travel times to emergency sites and hospitals

Direct impact:
- Hospitals
- Dialysis stations
- Day clinics
- Maternity facilities
- …

Indirect impact:
- Emergency services
- Outpatient care services
- Doctors' offices
- Preventive or rehabilitation facilities
- …

Cross-sector collaboration needs more attention


Source: Birkmann

- There is an urgent need to enhance the focus from individual hospitals to broader services and supply networks.

- Hospitals, health care departments, fire brigades and urban planning need to work together to better understand the resilience of supply networks that need to function during extreme events

Conclusions

- Methods to assess exposure and vulnerability of people to extreme events are important to better understand the “demand side”
- Vulnerability and risk assessments in terms of critical infrastructures – hospitals – often focus on the building and processes inside the building/facility
- Current methods need to also assess the resilience of supply networks and broader medical services that hospitals need
- Strengthening the resilience of health systems requires changes in the physical structure but also in planning processes and methods.
- Cross-sectoral cooperation's are essential.

Selected literature

- Birkmann, J., Sauter, H., Garschagen, M. et al. New methods for local vulnerability scenarios to heat stress to inform urban planning—case study City of Ludwigsburg/Germany. Climatic Change 165, 37 (2021). https://doi.org/10.1007/s10584-021-03005-3

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THANK YOU

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