

Iran-China Joint Workshop on Emerging Technologies and Methods for Climate Resilience



Aging Population in the Global Warming Era;

*Systemic Solution (Governmental & Technical) for
Enhancing Aging Communities Heat Resilience*

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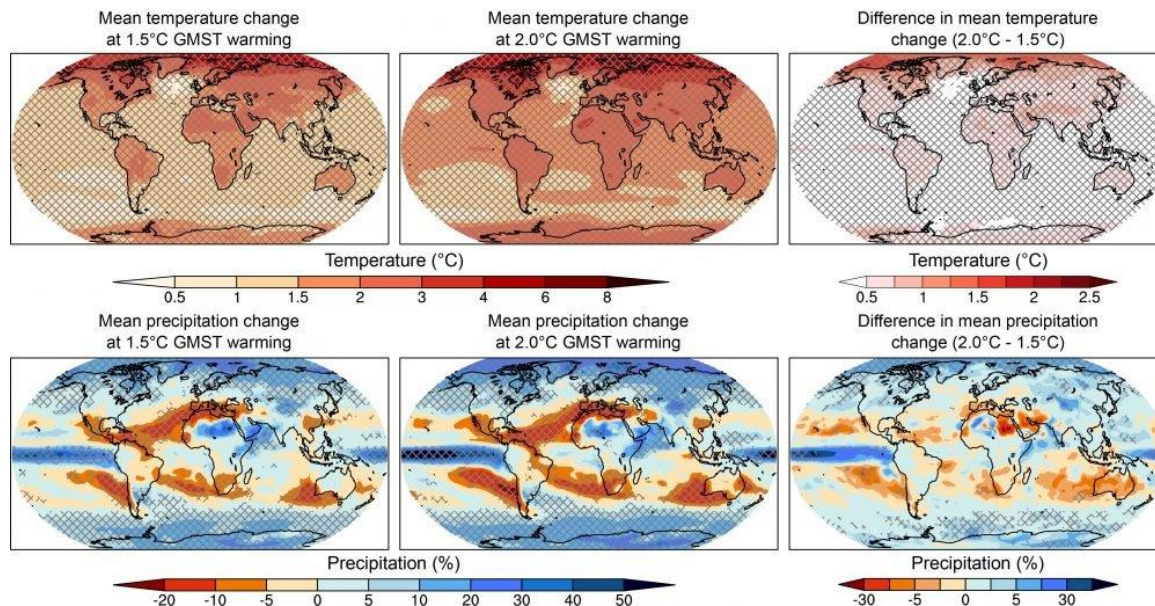


June 1, 2025

Extreme Heat Crisis and Iran's Position

A Global Crisis

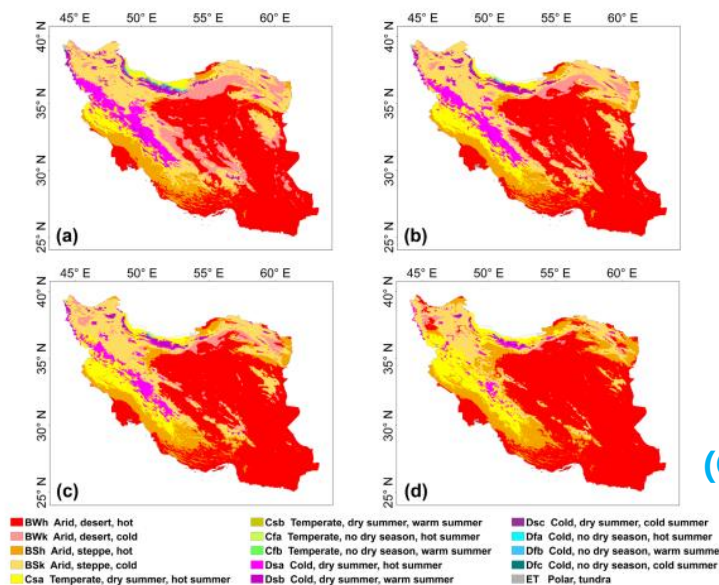
- ❑ Global heat trends: IPCC projects 1.5°C rise before 2050.
- ❑ Heatwaves caused ~489,000 deaths annually
- ❑ Extreme heat events are becoming more frequent and intense due to climate change. According to the Intergovernmental Panel on Climate Change (IPCC), heatwaves now occur more often and last longer, affecting health, agriculture, and infrastructure.



A National Threat : IRAN

- ❑ Rising land surface temperatures and urban heat island intensification.
- ❑ Limited green infrastructure in densely populated cities.
- ❑ Iran is highly vulnerable to extreme heat due to its arid and semi-arid climate, rapid urbanization, aging infrastructure, and uneven access to cooling systems.

(IPCC, 2018)

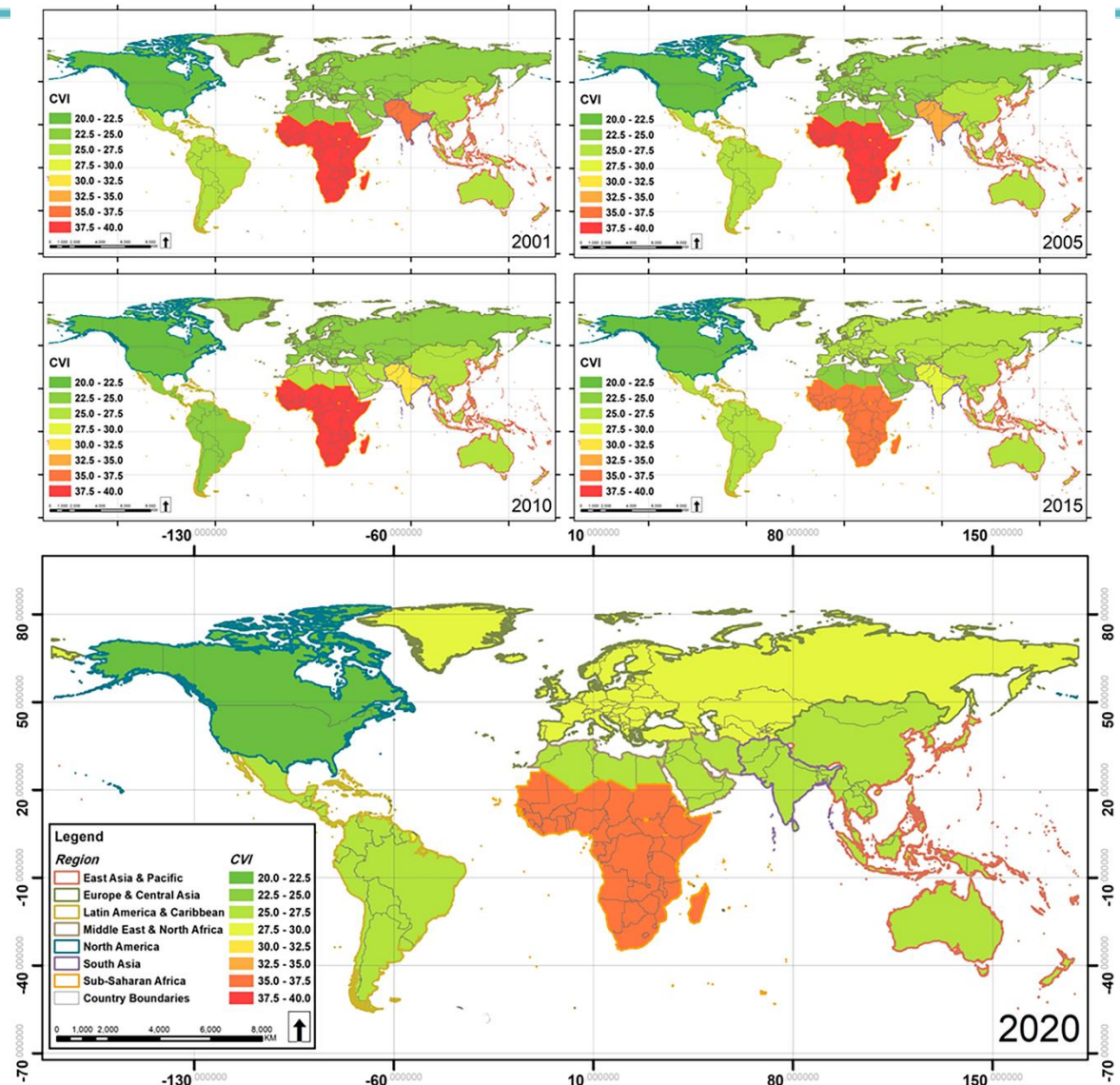
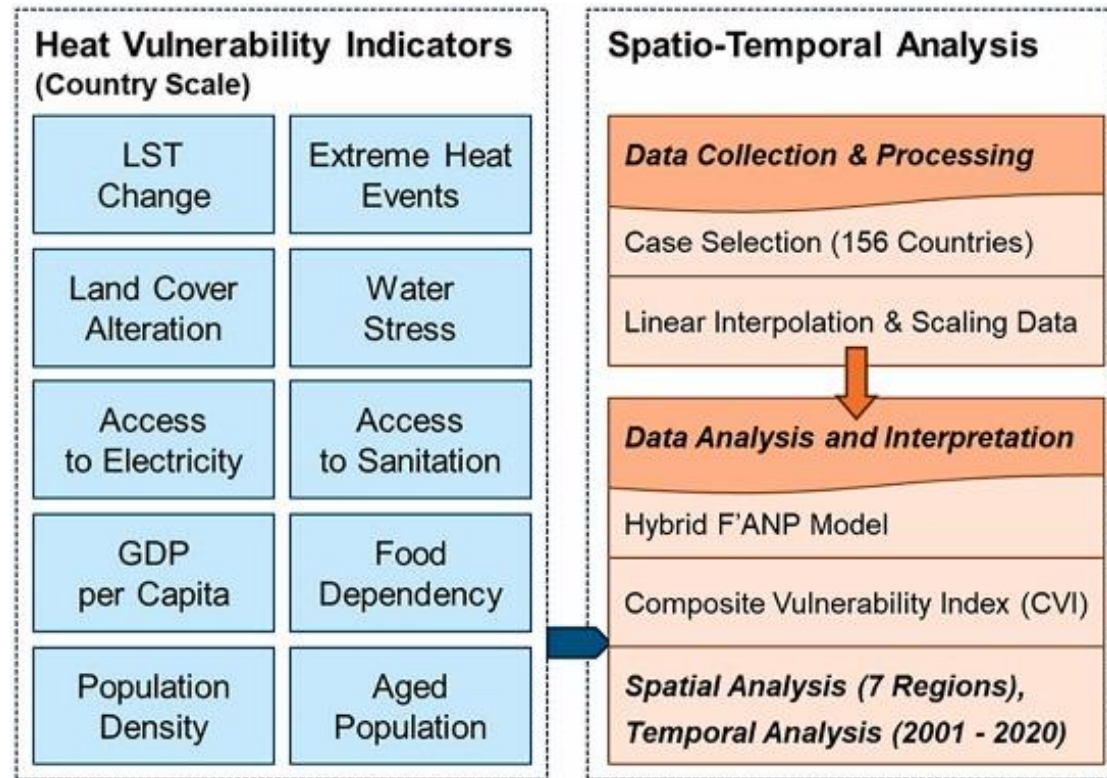


(Ghazi et al., 2024)

Heat Vulnerability in the World and Iran

Spatio-temporal analysis of countries' vulnerability to extreme heat, using the hybrid F'ANP model

- ❑ CVI method (F'ANP): integrates exposure, sensitivity, and adaptive capacity for heat risk analysis.
- ❑ The CVI value for Iran increased from 26.3 in 2001 to 27.53 in 2020



(Suleimany & Sulaimani, 2025)

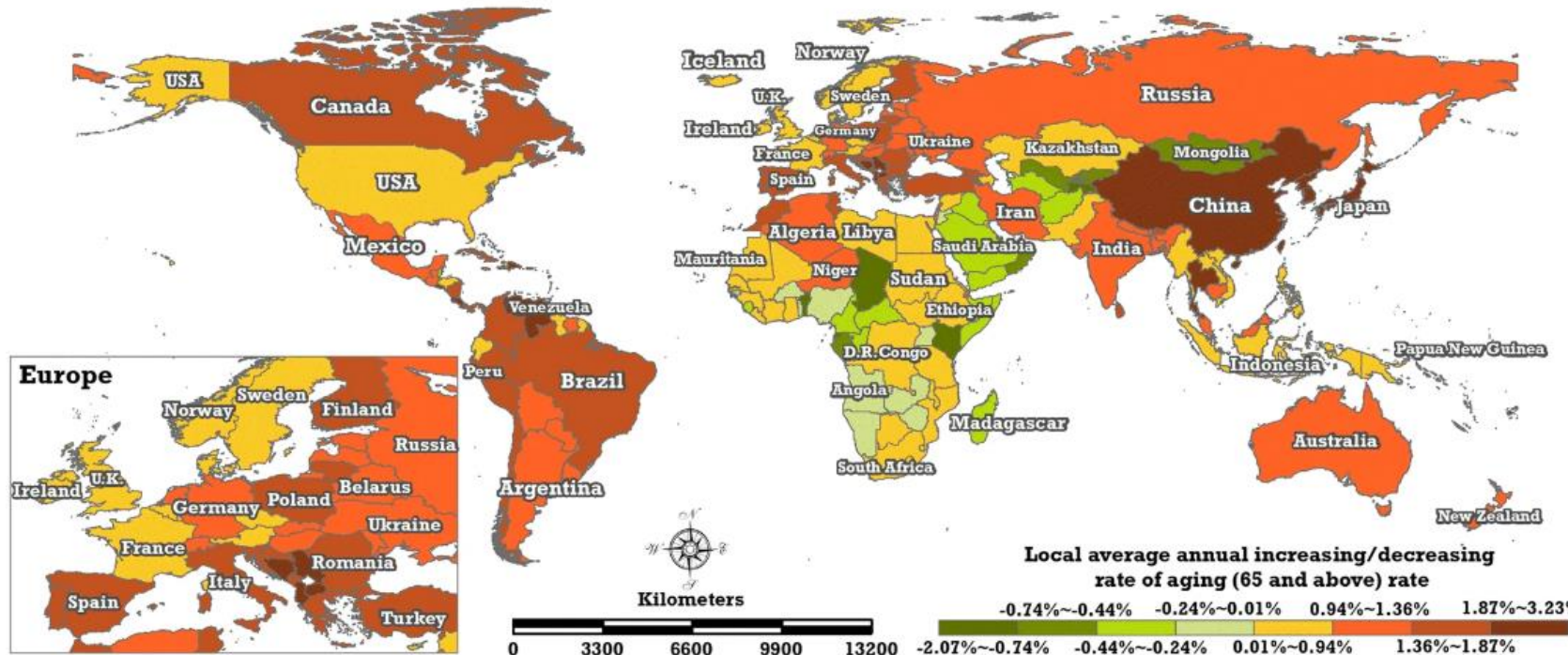
(Suleimany & Sulaimani, 2025)

Aging Populations: A Global and National Challenge

Base on WHO report 2024

- ❑ All countries face major challenges to ensure that their health and social systems are ready to make the most of this demographic shift.
- ❑ In 2050, 80% of older people will be living in low- and middle-income countries.
- ❑ The pace of population ageing is much faster than in the past.
- ❑ In 2020, the number of people aged 60 years and older outnumbered children younger than 5 years.
- ❑ Between 2015 and 2050, the proportion of the world's population over 60 years will nearly double from 12% to 22%.

(Mokhtarzadeh et al., 2025)



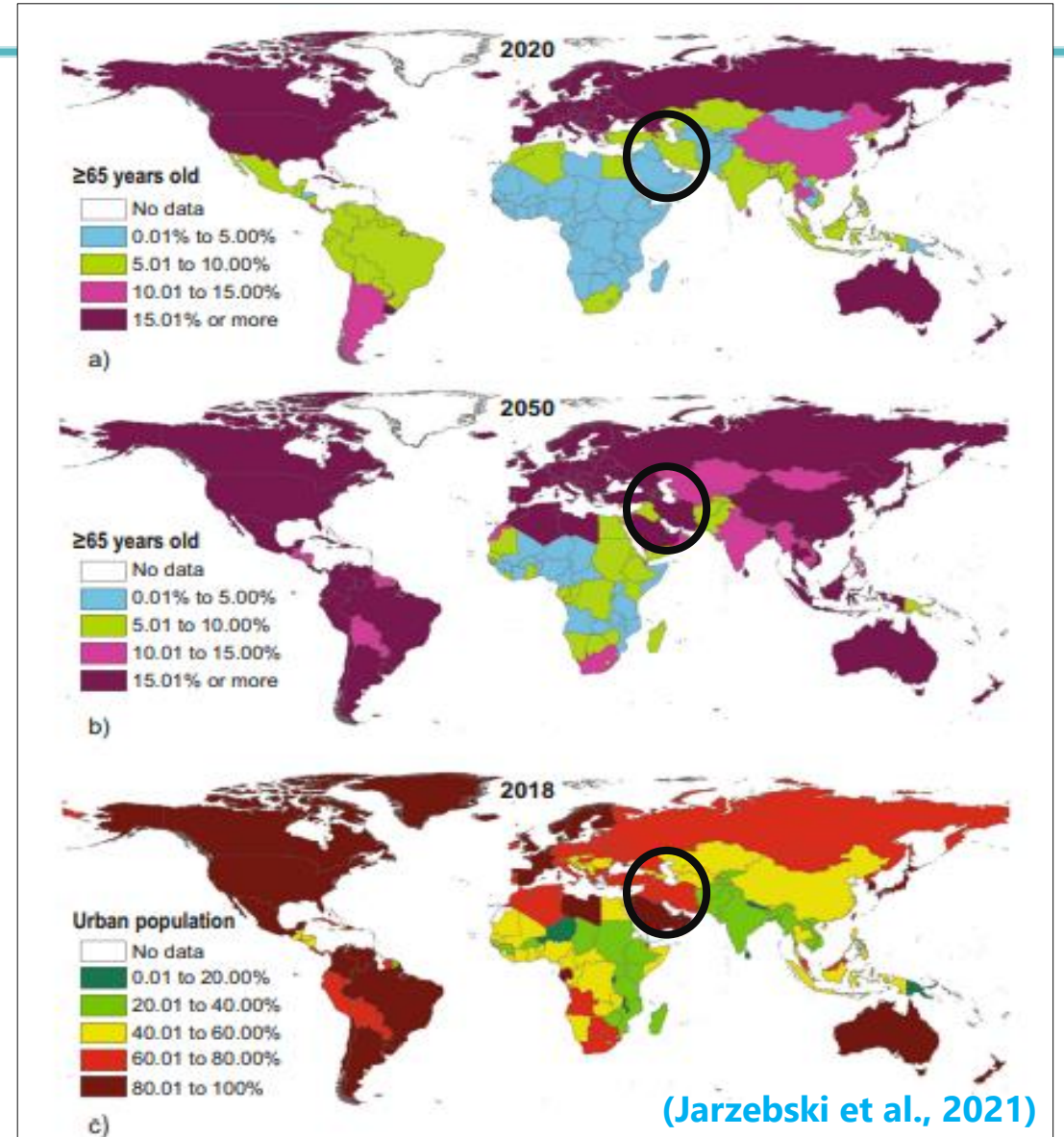
(Li, et al., 2019).

<https://doi.org/10.1186/s12889-019-6465-2>

Aging Populations: A Global and National Challenge

Iran

According to United Nations sexual and reproductive health agency reports (2022) **“Iran’s population of 85.8 million (2021) is ageing rapidly. In fact, Iran is the second fastest ageing country in the world (after South Korea) in terms of the percentage increase in the population aged 60 and over between 2015 and 2050.**



(Jarzebski et al., 2021)

Unjust Patterns of Aging Climate Vulnerability - Mashhad

Who Benefits More from Urban Cooling Strategies? Exploring Climate Justice in Vulnerable Groups' Access to Blue-Green Infrastructure in Mashhad City, Iran

Temperature Changes and Warming in Mashhad

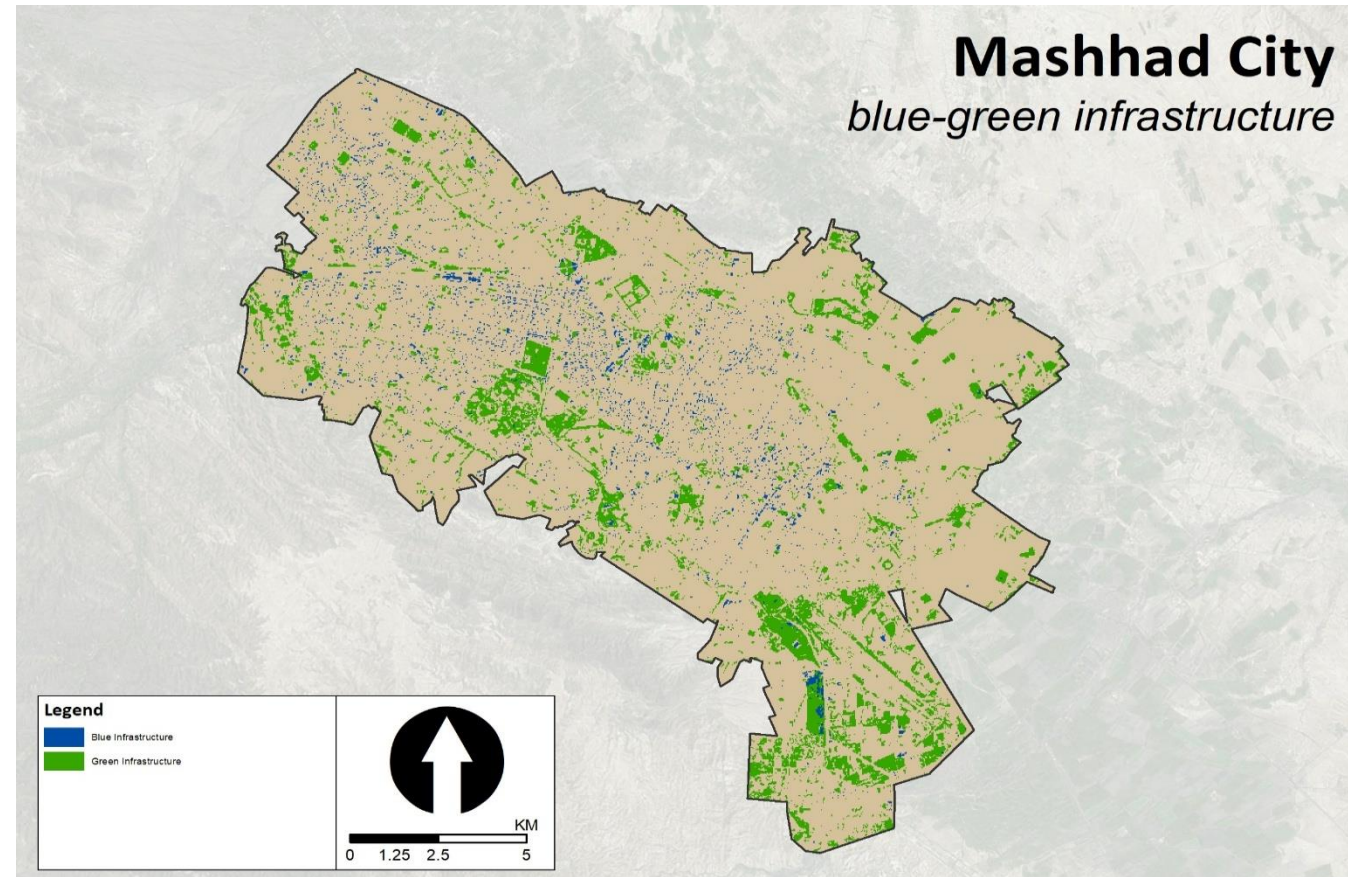
Rising surface and air temperatures are among the major climate challenges facing the city. Between **1988 and 2017**, Mashhad experienced **rapid growth and significant land cover changes**.

Green Infrastructure in Mashhad:

- ❑ Scattered and unevenly distributed across the city, especially in peripheral areas.
- ❑ Significant degradation of green areas in northeastern and eastern neighborhoods.
- ❑ Western neighborhoods have preserved green spaces, mostly private gardens with limited public access.

Blue Infrastructure in Mashhad:

- ❑ No sustainable natural blue infrastructure (only a seasonal waterway, often dry).
- ❑ Most blue infrastructures are artificial (ponds, artificial lakes, irrigation systems).
- ❑ Northern, northeastern, and eastern margins are significantly deprived of blue infrastructure.

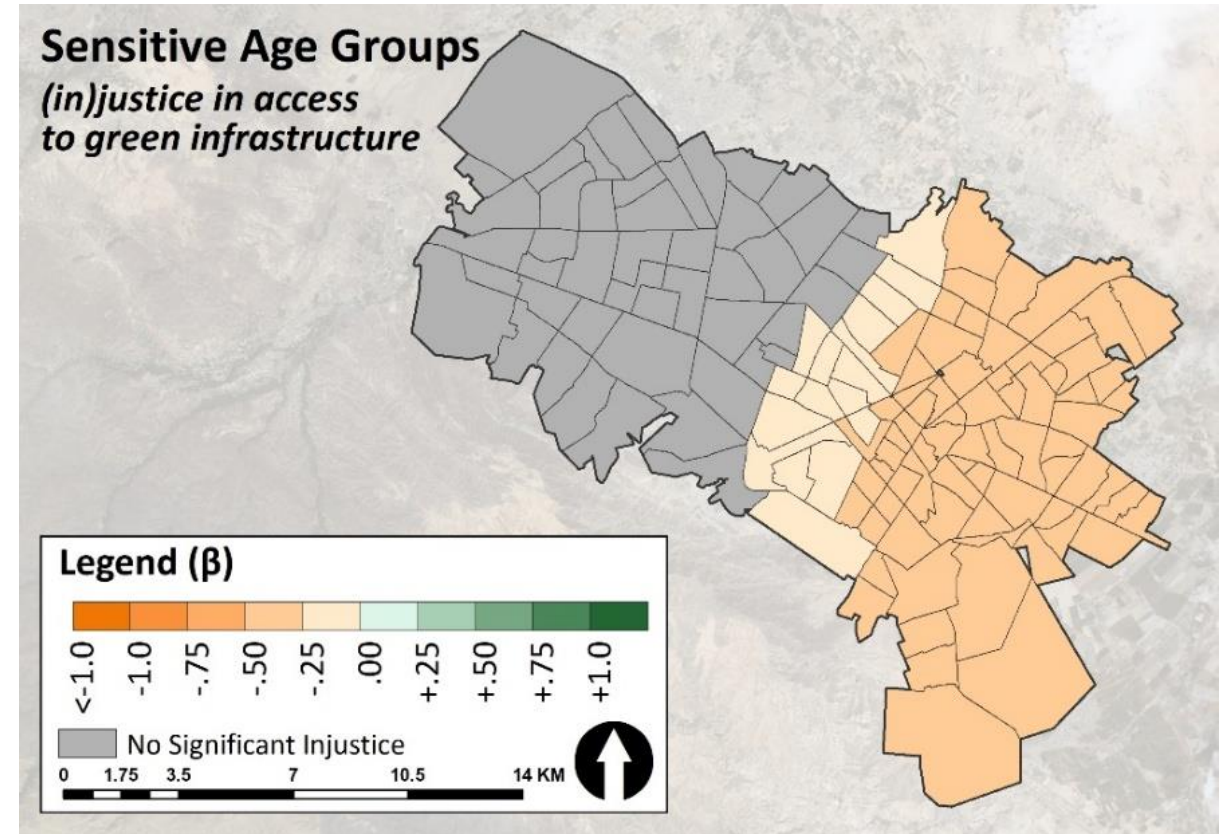
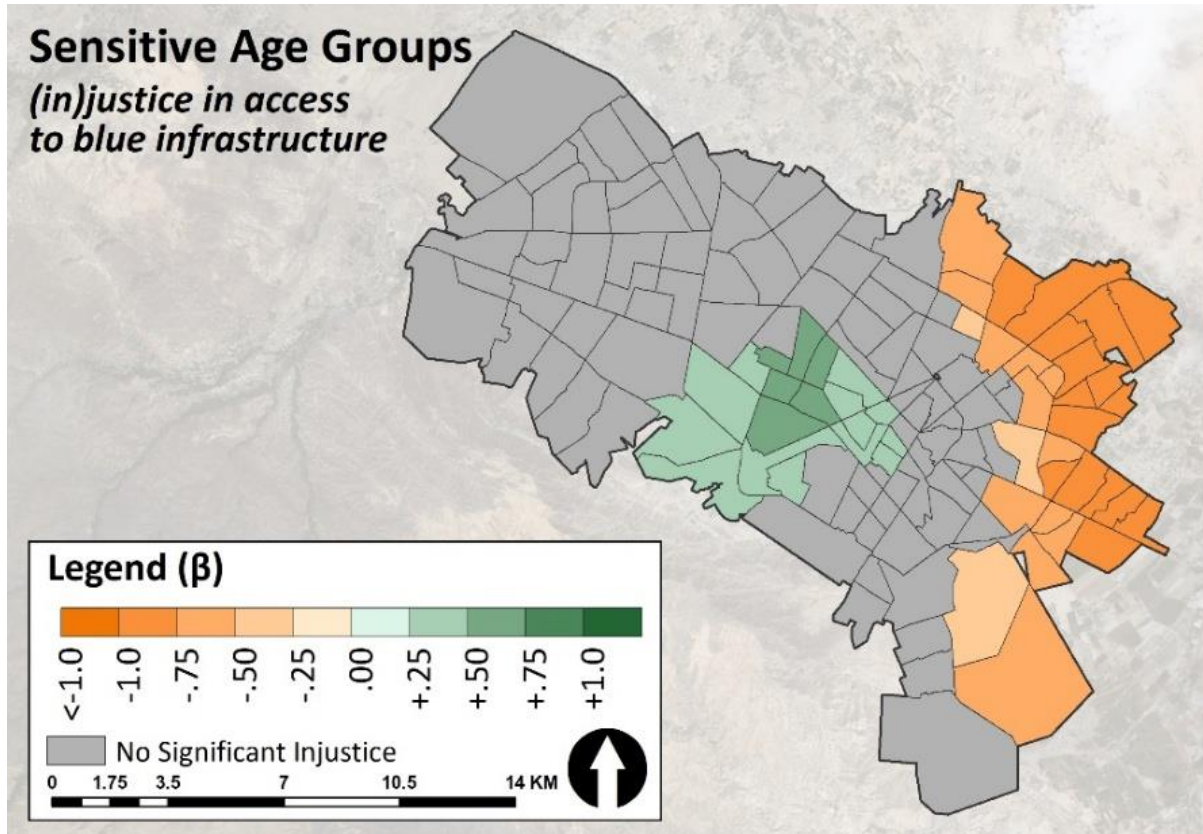


(Mokhtarzadeh & Suleimany, 2023)

Unjust Patterns of Aging Climate Vulnerability - Mashhad

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Impact of Green-Blue Infrastructure Distribution on the aging population



(Mokhtarzadeh & Suleimany, 2023)

Unjust Patterns of Aging Climate Vulnerability – Isfahan

Urban climate justice in hot-arid regions: Vulnerability assessment and spatial analysis of socio-economic and housing inequality in Isfahan, Iran

- ❑ Isfahan has a hot-arid climate with water scarcity, high land surface temperature (LST), and insufficient blue-green infrastructure (BGI).
- ❑ Northern and central neighborhoods are the most vulnerable due to:
 - ❑ High population and building density
 - ❑ Lack of green and water infrastructure
- ❑ Peripheral eastern and western areas have more green cover but lack essential infrastructure (e.g., fire stations, hospitals).
- ❑ The Multiple Vulnerability Index (MVI) reveals that heat and drought impacts are concentrated in the dense, historical urban core.

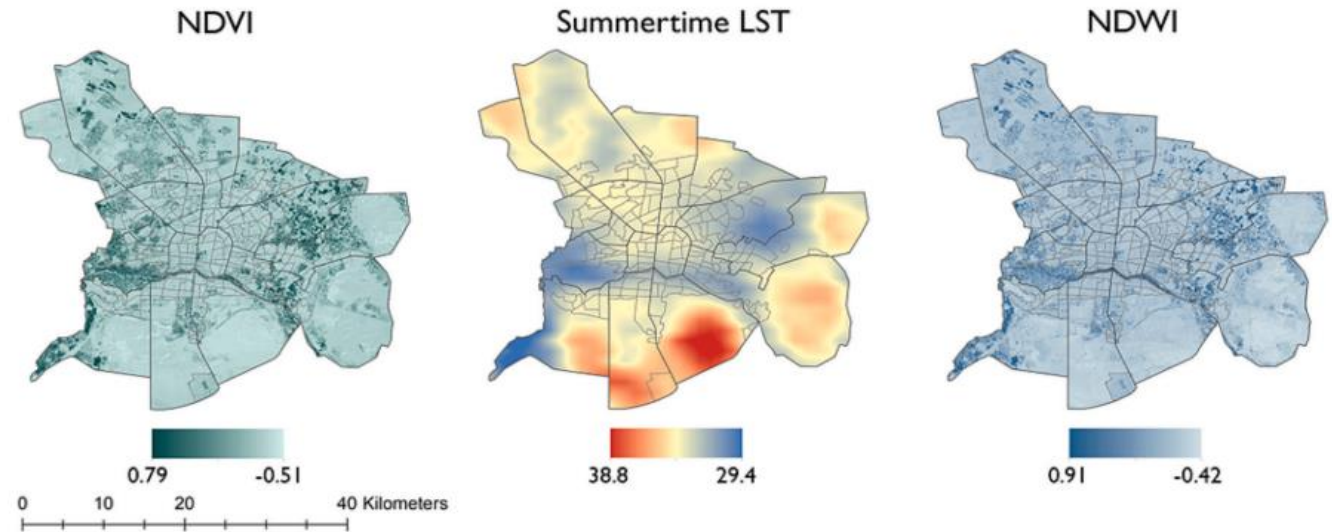
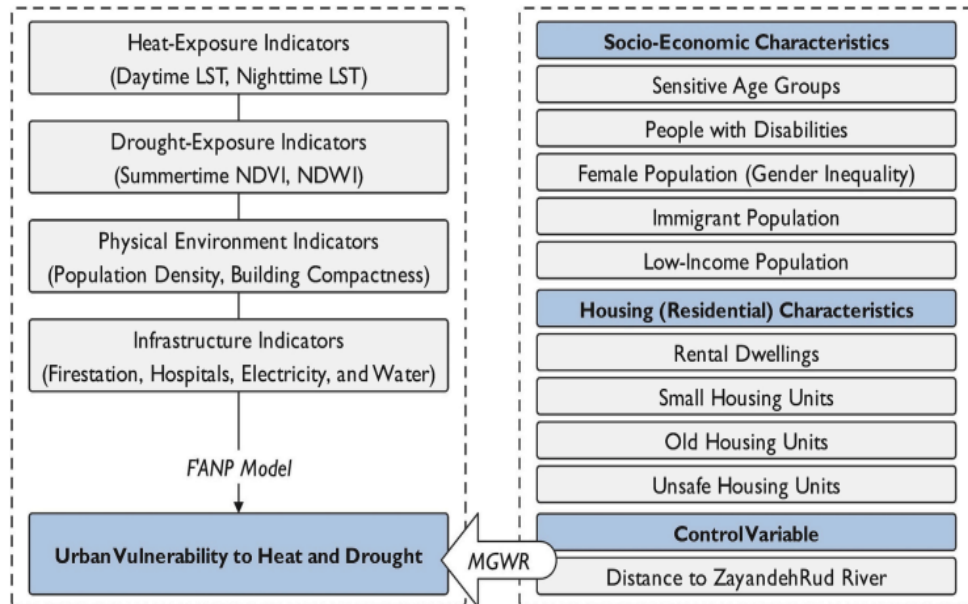


Fig. 2. Isfahan's land cover, average summer LST, NDVI, and NDWI maps.
Source: Author (by processing images from the ESRI landcover, MODIS, and Landsat datasets).

(Suleimany, 2023)

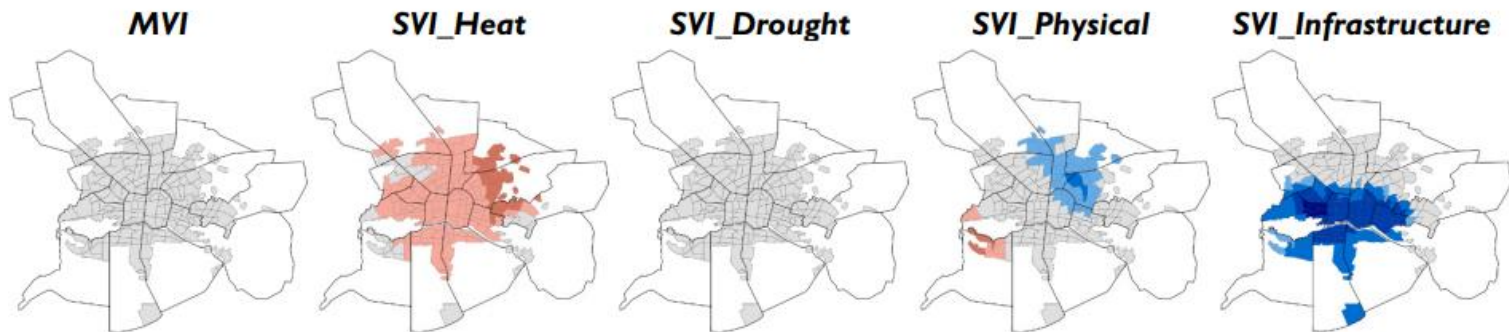
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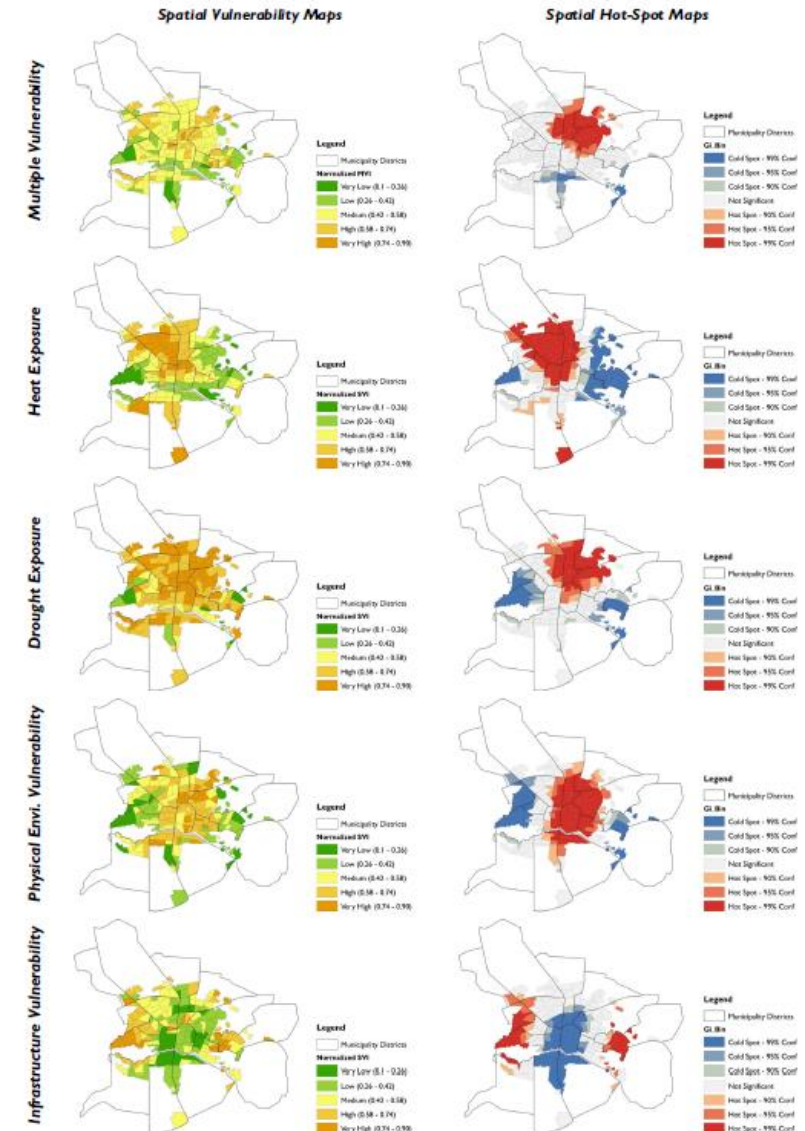
Aging and Climate Justice in Urban Planning

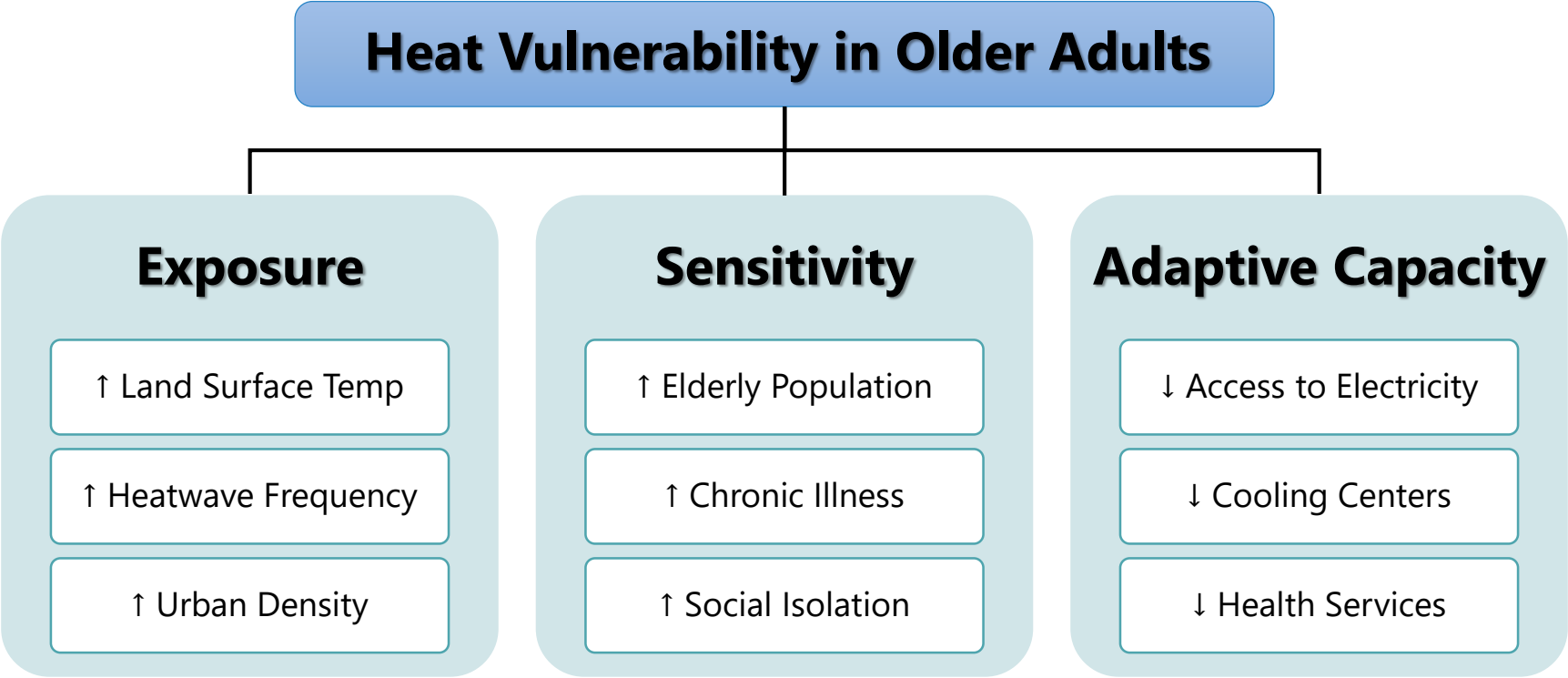
- ❑ Aging population residents mostly live in central, historical neighborhoods:
 - ❑ High density, heat-absorbing surfaces, poor ventilation
 - ❑ Good access to services but highly exposed to heat
- ❑ MGWR analysis shows that in most neighborhoods, the aging are more exposed to heat than others.
- ❑ Lack of cooling infrastructure, green space, and climate-adaptive design reduces resilience of the elderly.

Older Adults Exposure



(Suleimany, 2023)



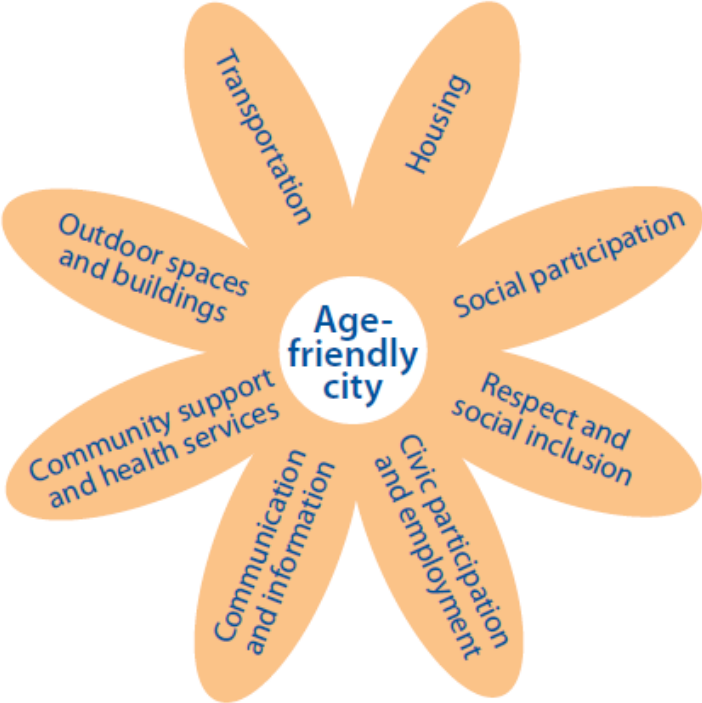


Urban Planning & Aging Climate Resilience

By merging the **Age Friendly City framework** with **urban climate adaptation**

WHO AFC Domain	Relevance to Heat Resilience
Outdoor Spaces & Buildings	Shade structures, reflective materials, cool pavements, green spaces reduce heat exposure in public areas.
Transportation	Safe, cooled public transit, shaded walkways, accessible cooling shelters near bus stops protect mobility.
Housing	Retrofitting old housing with passive cooling, ventilation, and insulation helps reduce indoor heat stress.
Social Participation	Community centers as cooling hubs; social networks ensure check-ins during heatwaves.
Civic Participation & Employment	Engaging older adults in climate planning increases equity and local adaptability.
Communication & Information	Heat alerts in accessible formats (radio, SMS, visual signage) prevent health crises.
Community Support & Health	Age-aware healthcare, outreach services, and rapid response teams mitigate heat-related illness and death.

Age-friendly city topic areas

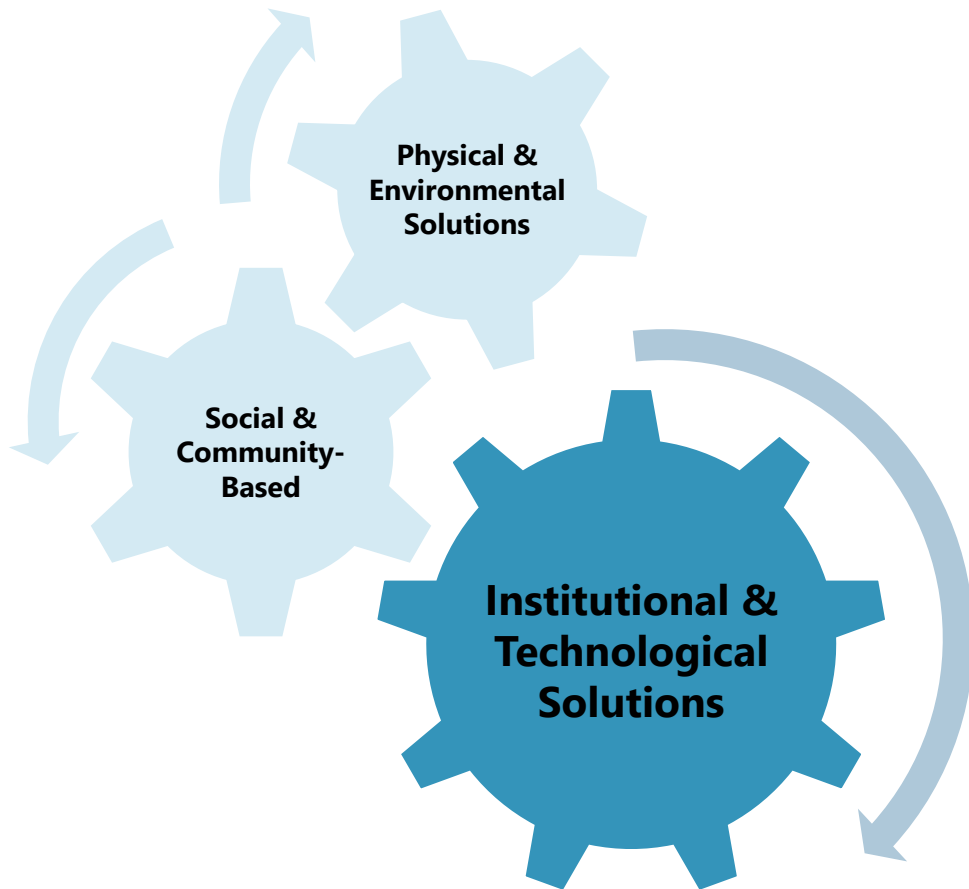


(WHO, 2007)



Solutions

for Building Climatically Resilient
(Aging) Cities and Societies



Higher Adaptive Capacity for/in
Older Adults



Lower Older Adults' Exposure to
Climate Change (e.g., Extreme Heat)



Lower Older Adults' Sensitivity (e.g.,
health conditions)

Institutional/ Governmental Solutions

for Building Climatically Resilient (Aging) Cities and Societies



Integrated Aging-Climate Responsive Planning

Design urban infrastructure and related policies that jointly address climate risks and aging needs to ensure safe, accessible, and resilient communities.



Aging Groups Empowerment and Participation

Engage older adults in planning processes to reflect their needs, build resilience, and foster inclusive, community-based decision-making.



Funding and Support

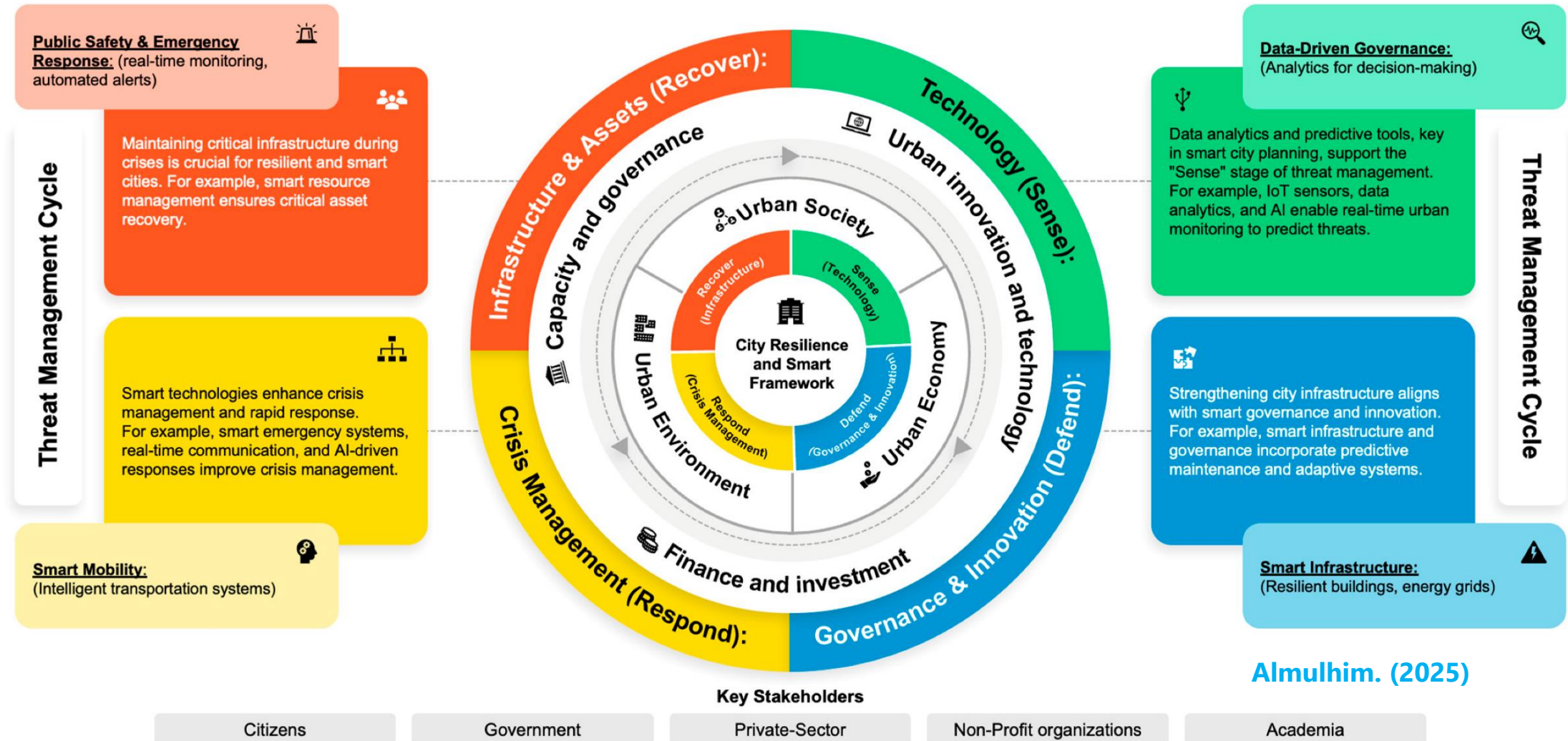
Provide targeted subsidies, grants, and technical assistance for aging populations to retrofit homes and access climate-resilient infrastructure and services.



Educating and Public Awareness

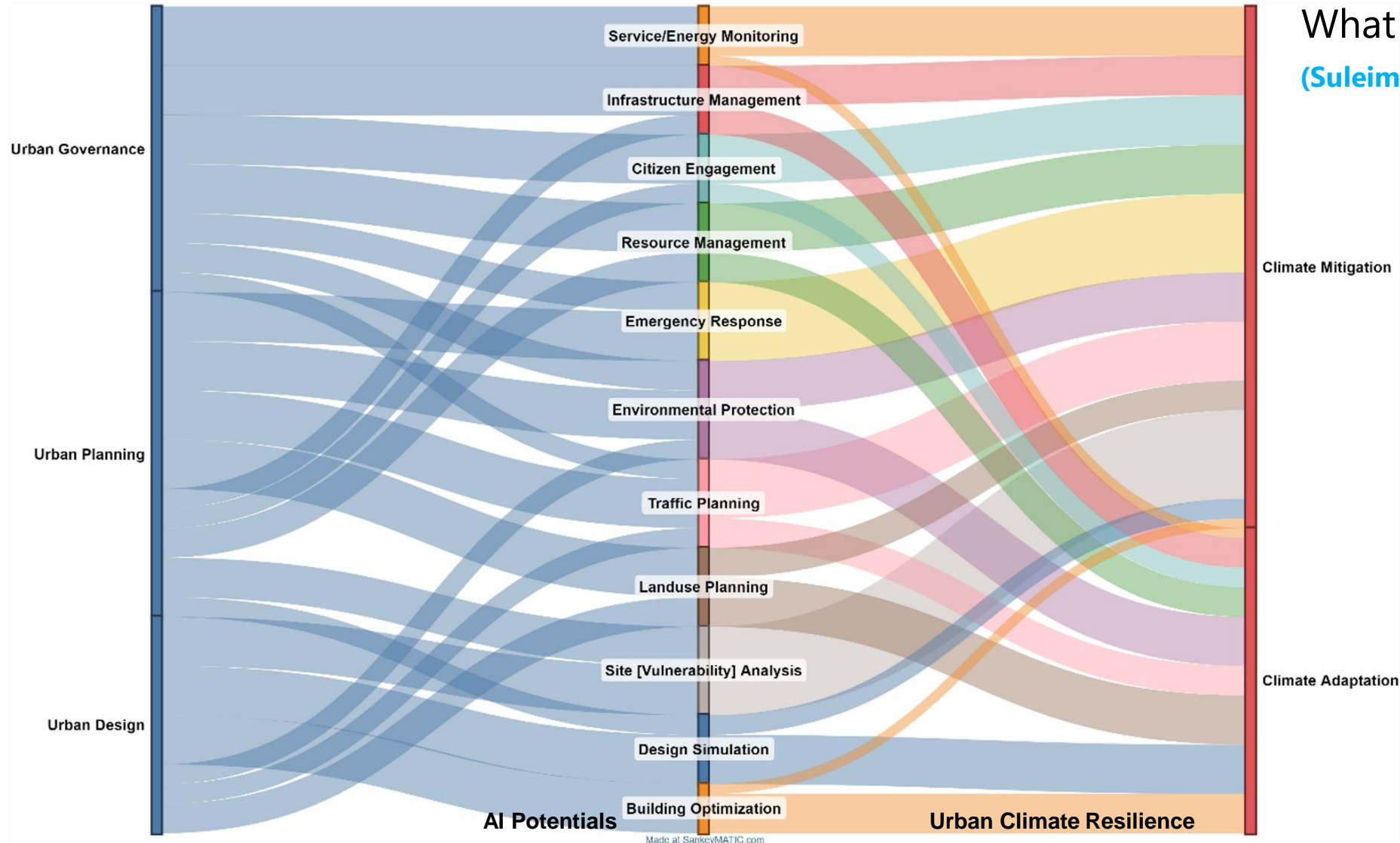
Develop tailored education programs to raise awareness among seniors about climate risks, preparedness strategies, and available support services.

Technical/Technological Solutions for Building Climatically Resilient (Aging) Cities and Societies



Almulhim. (2025)

Technical/Technological Solutions for Building Climatically Resilient (Aging) Cities and Societies



What role can AI play?
(Suleimany et al. 2025)

1. Digital Twins for Climate-Aging Urban Planning

- ❑ How can digital twins model and project climate-driven stresses on urban infrastructure used by older adults?
- ❑ How can digital-twin platforms facilitate elderly participation in climate-adaptive urban design?

2. AI-Driven Heat Vulnerability Mapping for Aging Populations

- ❑ How can machine learning best uncover urban heat-risk hotspots among seniors?
- ❑ Which social, environmental, and physiological factors most improve AI-based heat-health risk maps for the elderly?

3. Smart Homes (Accommodation) for Climate-Resilient Aging-in-Place

- ❑ How should smart-home systems be configured to optimize elderly comfort, safety, and energy use during heatwaves?
- ❑ What role can intelligent, self-learning home controls play in helping seniors stay safely at home under extreme climate events?

Thanks For Your Attention!



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