Smart Healthy Urban Environments 7ZW5M0

INTRODUCTION

Astrid Kemperman

Built Environment, Urban Systems & Real Estate

TU/e EINDHOVEN UNIVERSITY OF TECHNOLOGY

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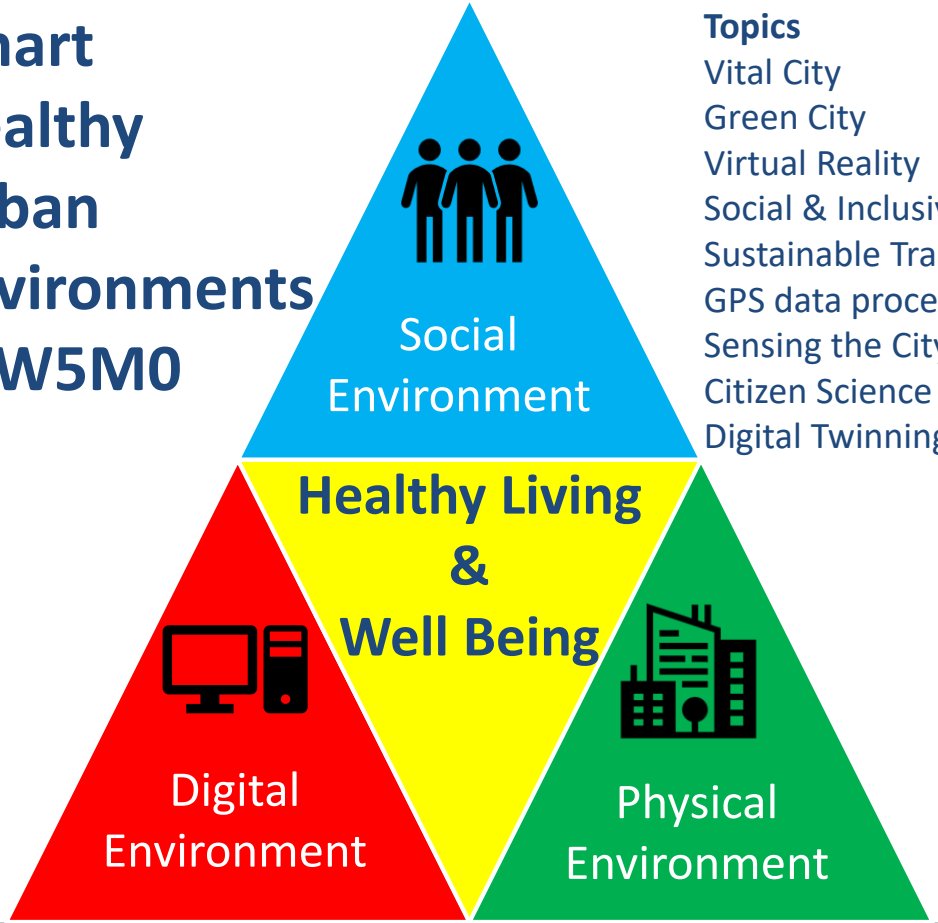

Topics

Vital City
Green City
Virtual Reality
Social & Inclusive City
Sustainable Transportation
GPS data processing
Sensing the City
Citizen Science
Digital Twinning

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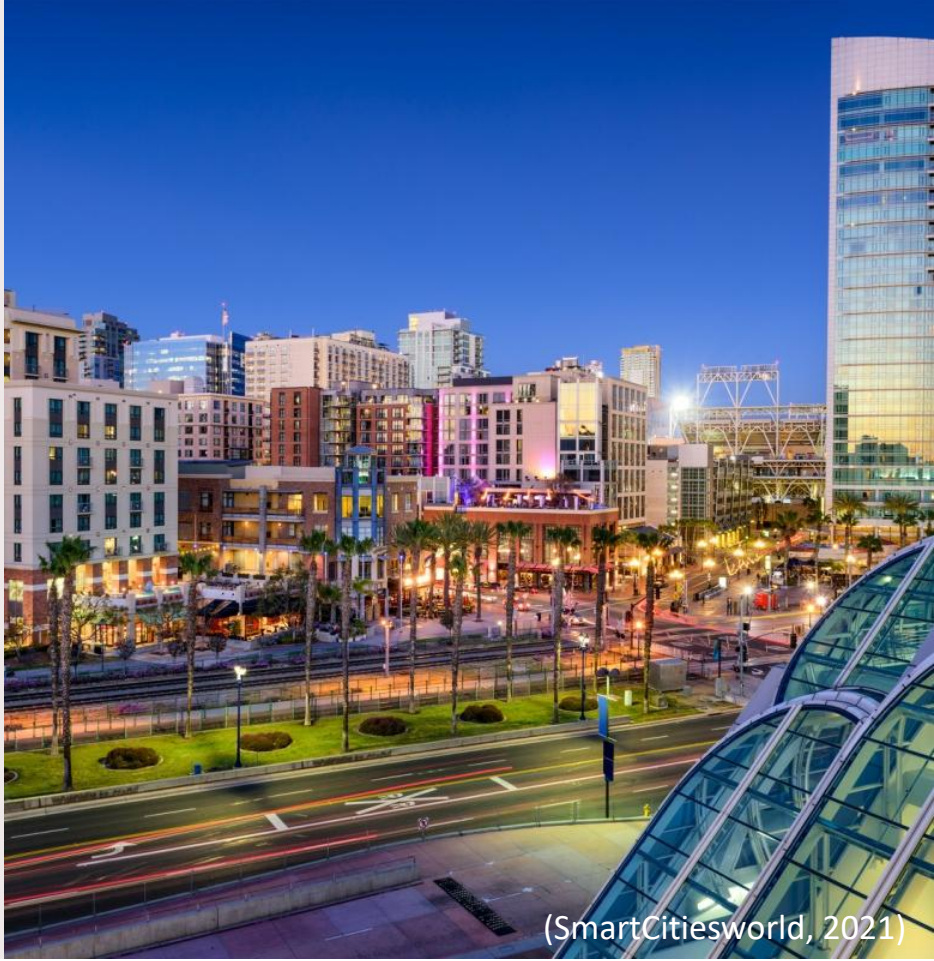
Agenda

- Organization Course

- Urban Trends, Problems & Challenges
- Healthy Cities
- Smart Cities
- Smart Healthy Urban Environments



(SmartCitiesworld, 2021)

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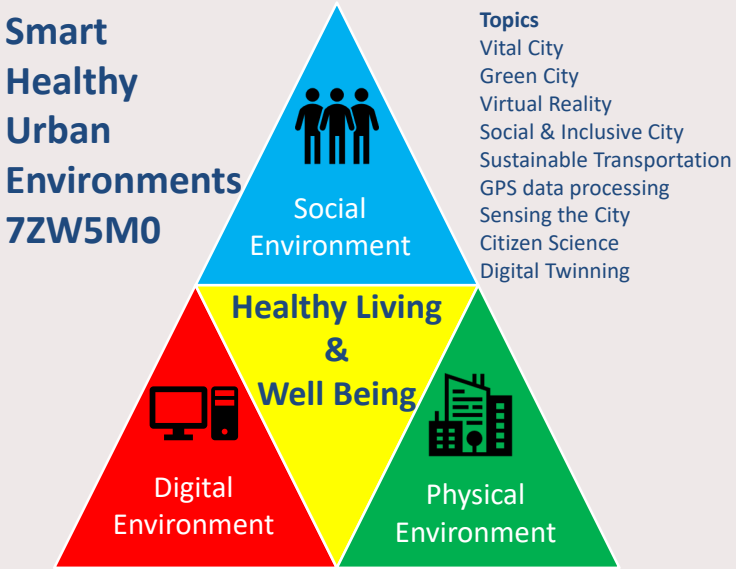
Organization Course

Content

This course considers current issues in creating healthier, livable, inclusive, safe, resilient, and sustainable urban environments and links these issues to new approaches in (big) data collection, urban analysis and decision support

New perspectives offered by emerging technologies and research are addressed



Lecturers

Gamze Dane
Sensing the City – Citizen Science

Ioulia Ossokina
Computer simulations and digital twins in urban planning

Peter van der Waerden
Sustainable Transportation & GPS

Lecturers

Robert van Dongen
Green city &
Virtual Reality

Suzan Evers
Vital City

Astrid Kemperman
Vital City
Social & Inclusive City

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CANVAS

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Planning Lectures & Questions Assignments

	Date	Time	Topic	Location
L1	12 Nov	13:30-16:30	Introduction Course and Assignments	Neuron -1.350
			Sustainable Transportation & GPS processing	
Q1			Questions Assignment - Via Canvas Discussions	
L2	19 Nov	13:30-15:30	Vital city	Neuron -1.350
Q2	21 Nov	9:45-10:30	Questions Assignment	Neuron -1.350
L3	26 Nov	13:30-15:30	Sensing the city & Citizen Science	Neuron -1.350
Q3			Questions Assignment - Via Canvas Discussions	

Planning Lectures & Questions Assignments

	Date	Time	Topic	Location
L4	3 Dec	13:30-15:30	Green city & Virtual Reality	Neuron -1.350
L5	10 Dec	13:30-15:30	Social & Inclusive city	Neuron -1.350
Q4&5			Questions Assignment - Via Canvas Discussions	
L6	17 Dec	13:30-15:30	Computer simulations and digital twins in urban planning	Neuron -1.350
Q6			Questions Assignment - Via Canvas Discussions	
L7	7 Jan	13:30-15:30	Guest lecture Digital Twins	Neuron -1.350
L8	15 Jan		Revise Assignments	

Examination

4 Assignments & assessment criteria:

1. Active transportation in built environment
2. Sensing the city & Citizen science
3. Green, social & inclusive city & Virtual Reality
4. Computer simulations and digital twins in urban planning

2 individual & 2 group assignments

Sign up in Canvas

➔group of 3 students - Sensing the City & citizen science assignment

➔group of 3 students – VR experiment

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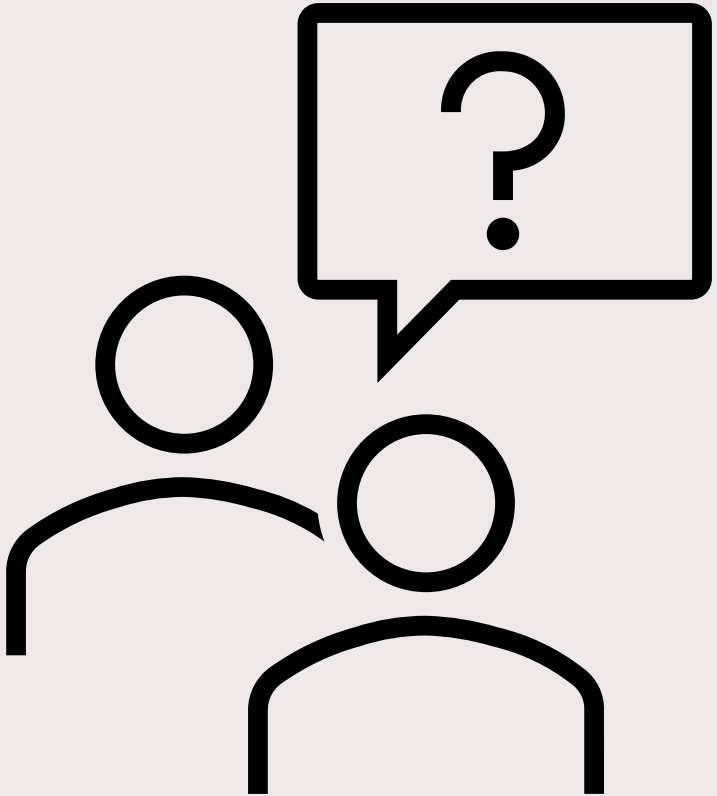


Examination – Assignments

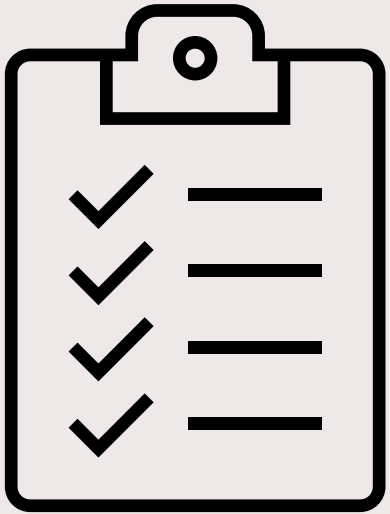
Questions Assignment:

➔Students can ask questions about the assignment, on campus or via Canvas Discussions

Assignments need to be uploaded
➔in Canvas- see Deadline!

Feedback/mark for assignment:
➔within 2 weeks in Canvas

Examination - Grade



For each assignment **100 (assignment 2**) or
200 points (assignments 1, 3 & 4) can be obtained

Final Grade = Sum points for the assignments/70 &

!A minimum of 50 (assignment 2)/100 points (assignments 1, 3 & 4) per assignment is required!

Assignments can be **revised** before the **end of the Exam period, but only in case of a score below 60 (assignment 2)/120 (assignment 1, 3 & 4) points**

Literature Introduction

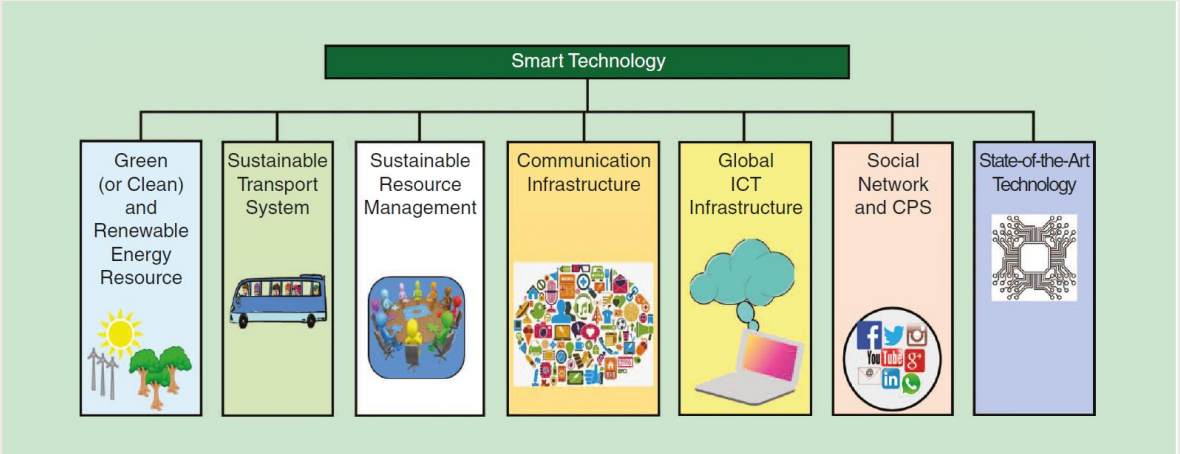
Literature

Nieuwenhuijsen, M. J., & Khreis, H. (Eds.). (2019). *Integrating human health into urban and transport planning : a framework*. Springer - Chapter 1: Urban and Transport Planning, Environment and Health

Giles-Corti B, et al (2022). What next? Expanding our view of city planning and global health, and implementing and monitoring evidence-informed policy

WHO (2024). Sustainable cities Health at the heart of urban development

Hye Su Jeong , Haejoo Chung (2024). Bridging Smart Technologies and Healthy Cities: A Scoping review using WHO's 6P Framework. *Sustainable Cities and Society*



Urban Trends, Problems & Challenges

World Population

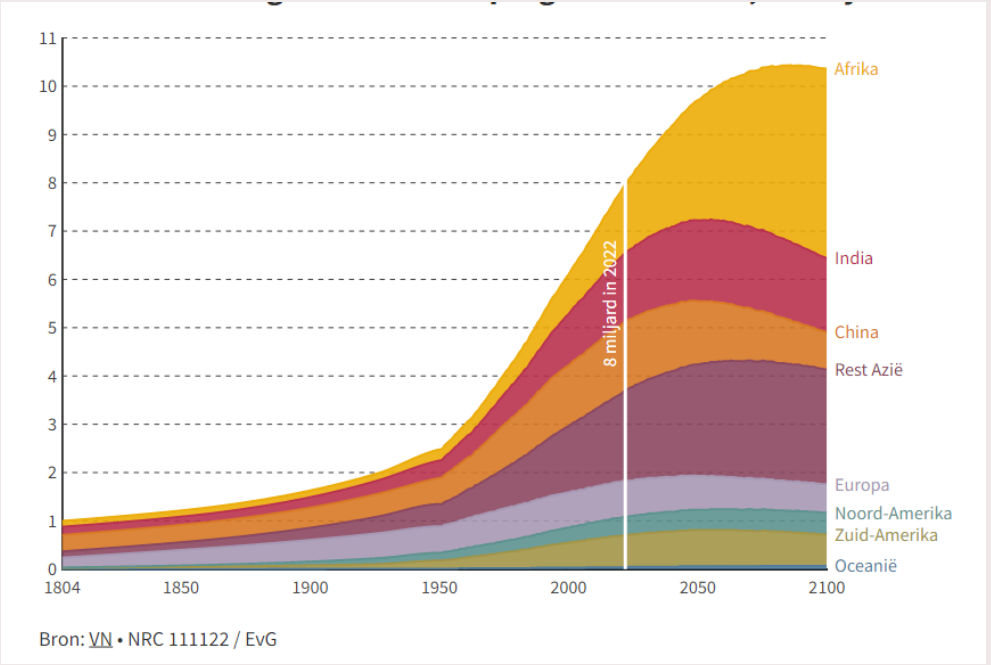
(in billion)

➔During the 20th century the world population grew from 1.65 billion to 6 billion

➔In 1970, there were roughly half as many people in the world as there are now

➔World population reached 8 billion in 2022

➔Global population projected to peak around 10.4 billion in the 2080s



Urban Age

The majority of people live in a city

- 100 years ago, two in every 10 people lived in urban areas
- by 1990, 40 percent, 3.4 billion
- and by 2010 exceeded 50 percent

In 2050, 70% of the World's population will live in cities, 6.4 billion

➔growing importance of cities in modern economies

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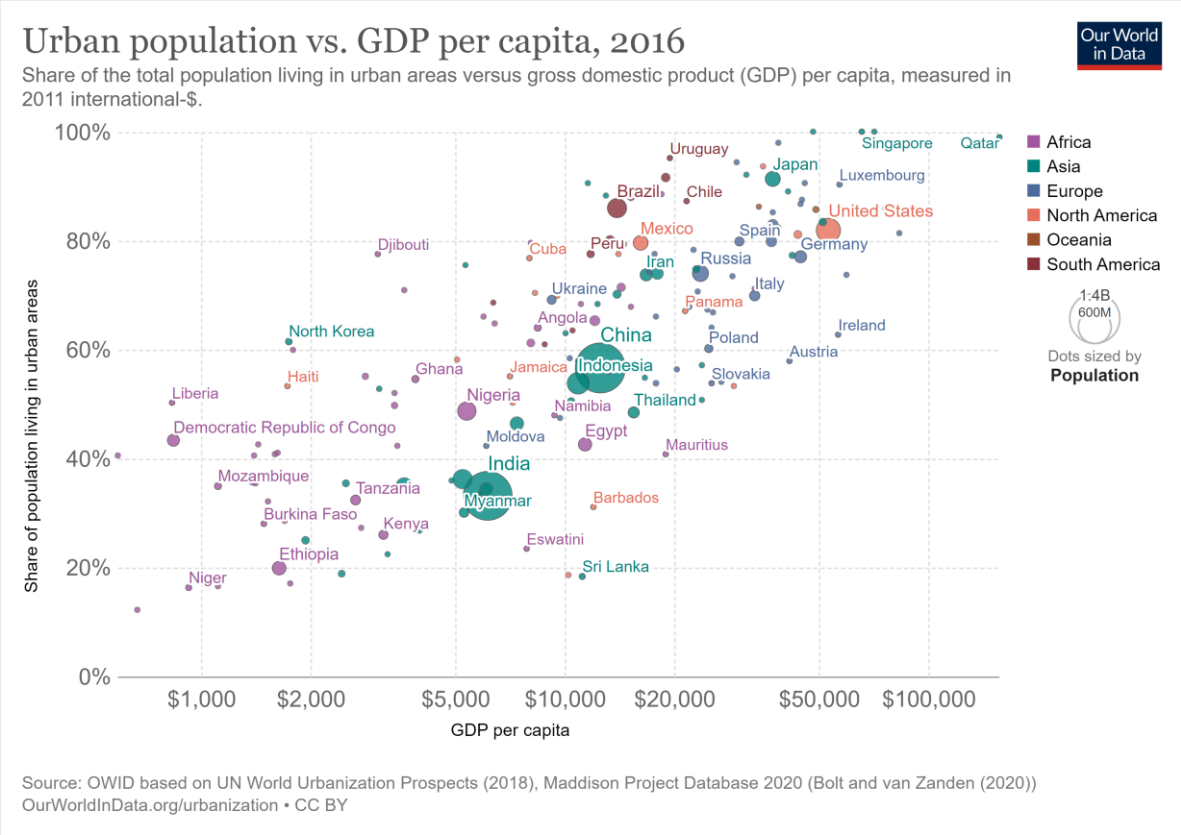
Cities

are engines of economic growth

➔accounting for 80% of the global Gros Domestic Product



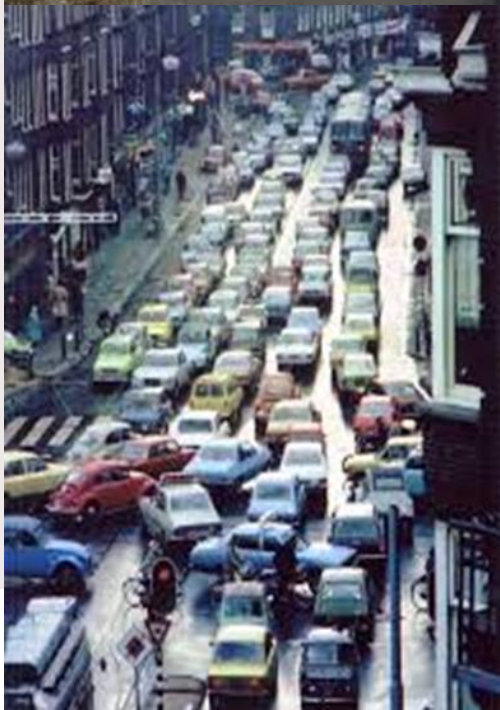
but Cities also:

- consume around 75% of global primary energy
- are responsible for 70% of the global greenhouse gas (GHG) emissions
- led to growth of slums, sprawl, housing and infrastructure shortages, social segregation, and exclusion
- accompanied by motorization, has caused congestion and hazardous air pollution

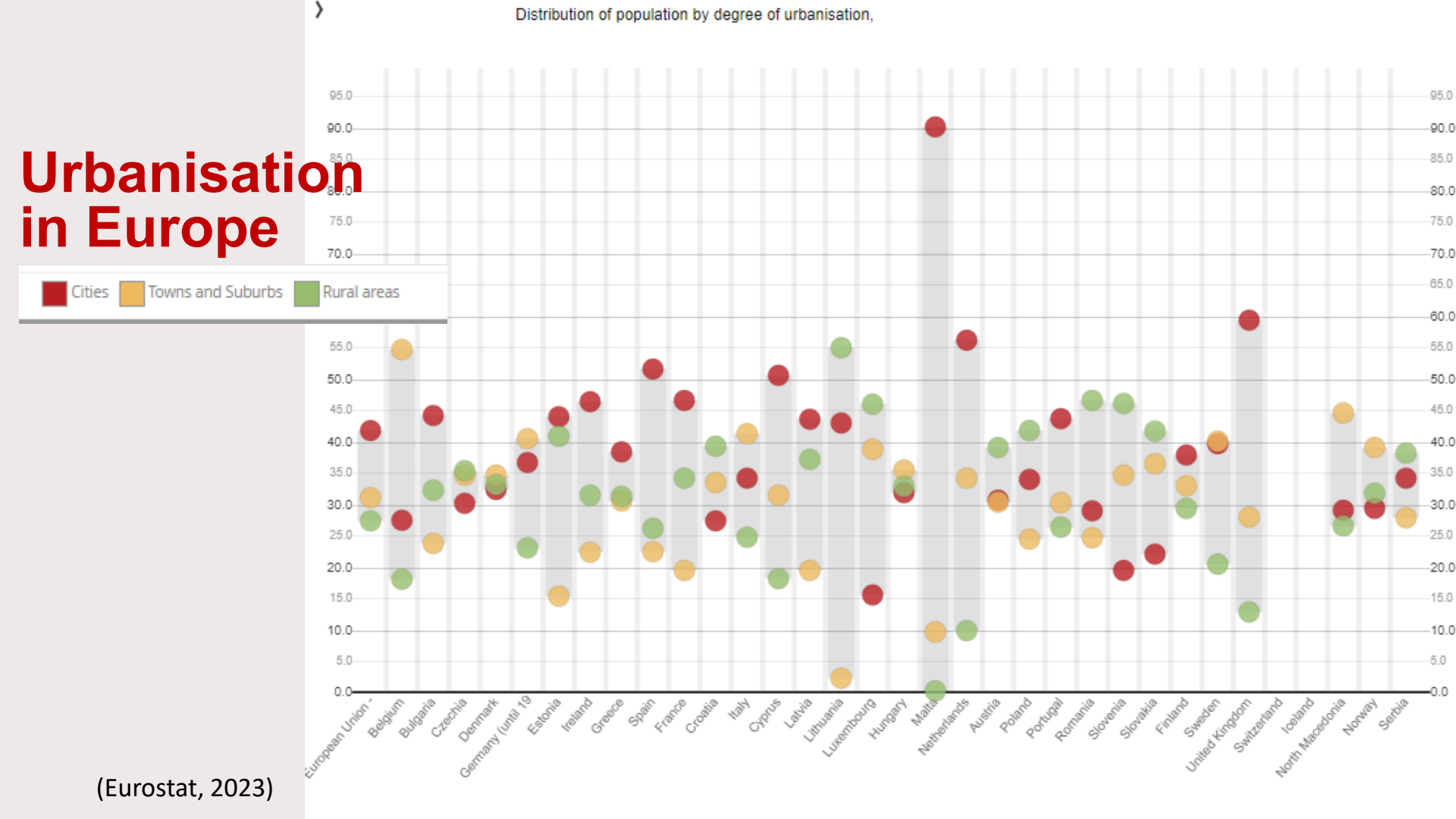
Cities are

- where inequalities are most acute
  (one-third of urban dwellers in the developing world, for example, live in slums)
- where threats to culture and heritage are rising
- where the heavy concentration of people and assets poses high level of challenges and disaster risks

➔**increasing economic, social and environmental challenges**

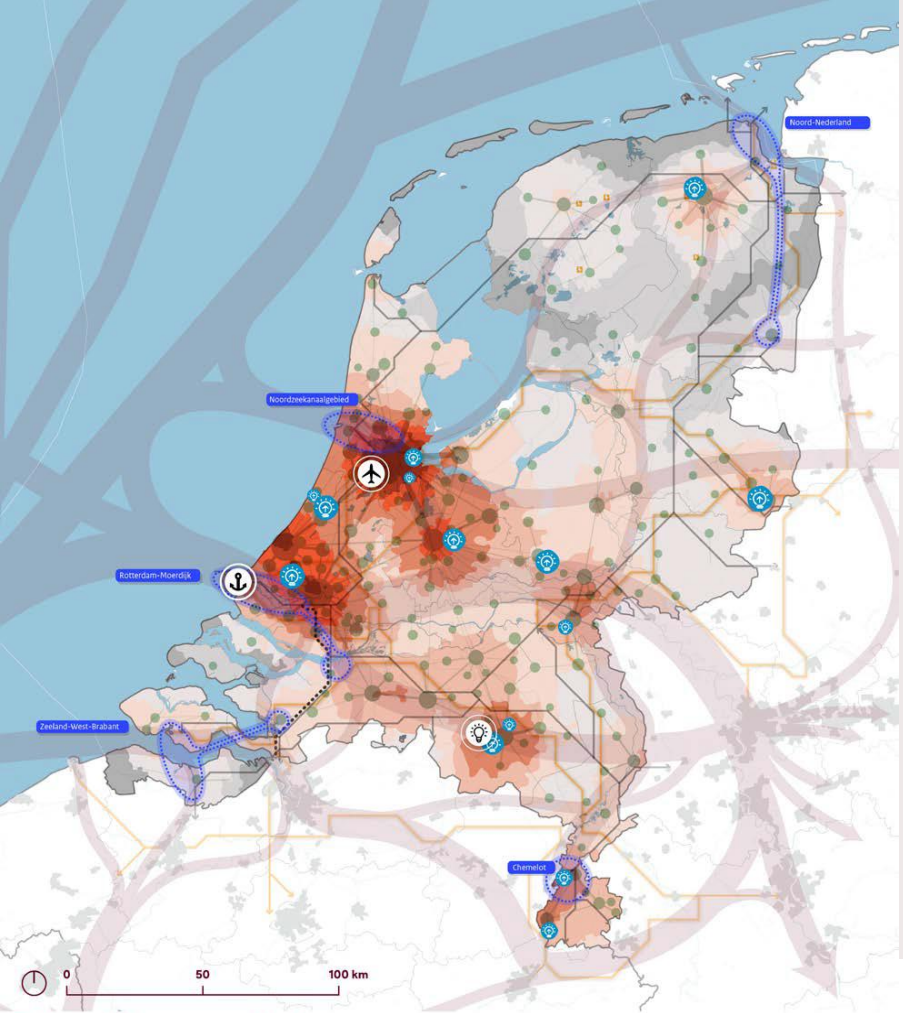


Urbanisation in Europe



(Eurostat, 2023)

Urbanization Netherlands



Ruimtelijke economische hoofdstructuur 2024

Legenda

Toegevoegde Waarde (2022):

Toegevoegde waarde per vierkante kilometer

- €127.000 of meer
- €78.000 - €127.000
- €35.000 - €78.000
- €22.000 - €35.000
- €12.000 - €22.000
- €6.000 - €12.000
- €4.000 - €6.000
- tot €4.000

Bron: LISA, uitgewerkt door Bureau Louter, 2022

Industrieclusters

5 energie intensieve industrieclusters

Bron: Voorontwerp Nota Ruimte, 2024

Economische kerngebieden

- Brainport Eindhoven
- Mainport Amsterdam - Schiphol
- Mainport Rotterdam

Goederenstromen

Grootte in tonnages (indicatief)

Bronnen: NOVI, 2021; Voorontwerp Nota Ruimte, 2024; Vereniging Deltametropool, 2022

Daily Urban Systems:

Bevolking per gemeente

Pendel

Grootte in verhouding tot het aantal inwoners per gemeente en, respectievelijk, het aantal bewegingen tussen steden.
Als een gemeente meerdere kernen heeft wordt gebruik gemaakt van de centrale locatie tussen de kernen (bevolkingscentroide).
Bron: CBS uitgewerkt door PosadMaxwan, 2022

Campussen

Volwassen

Grootte in verhouding tot het aantal innovatieve bedrijven
Bron: Innovatiespotter, 2023

Energie hoofdinfrastructuur

- Hoogspanningsnet (220 kV en 380kV)
- Aangewezen buisleidingen tracé (Bkl)
- Leidingenstrook (LSNED)

Bron: Programma Energie Hoofdstructuur, 2023

Environmental Economic structure

(Min Economic Affairs, 2024)

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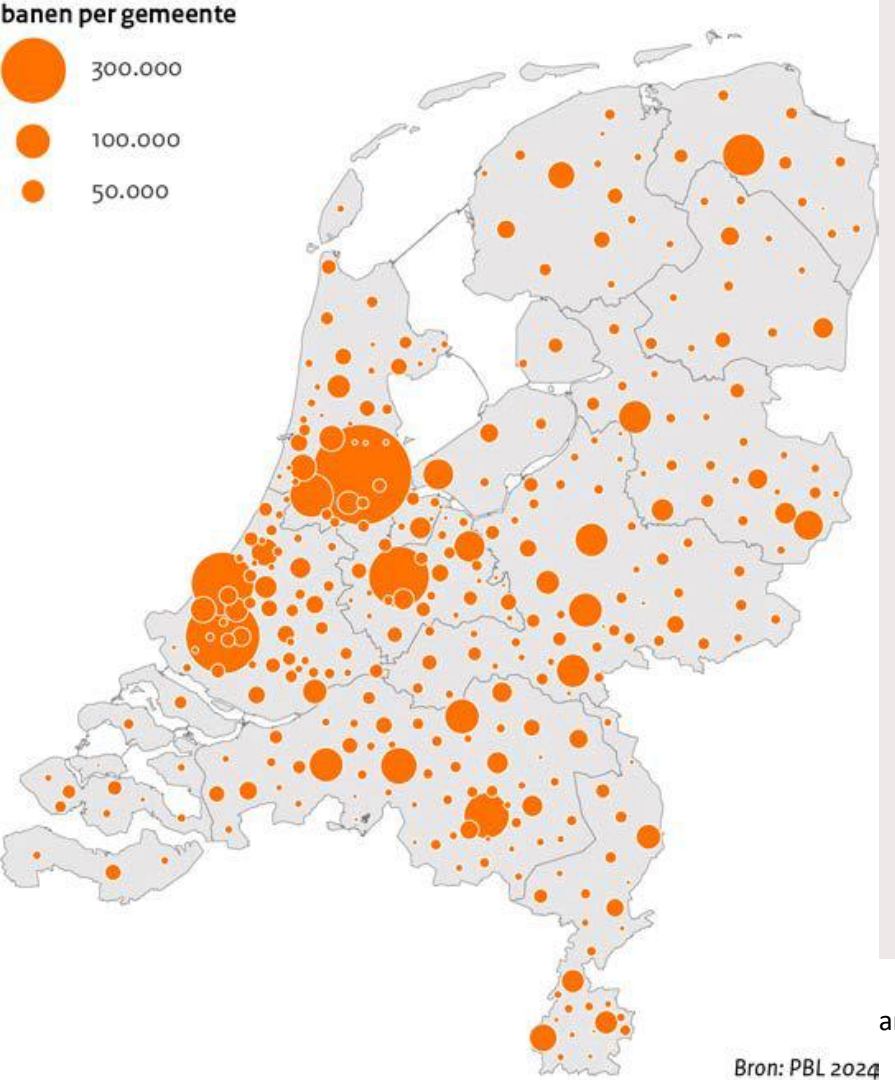
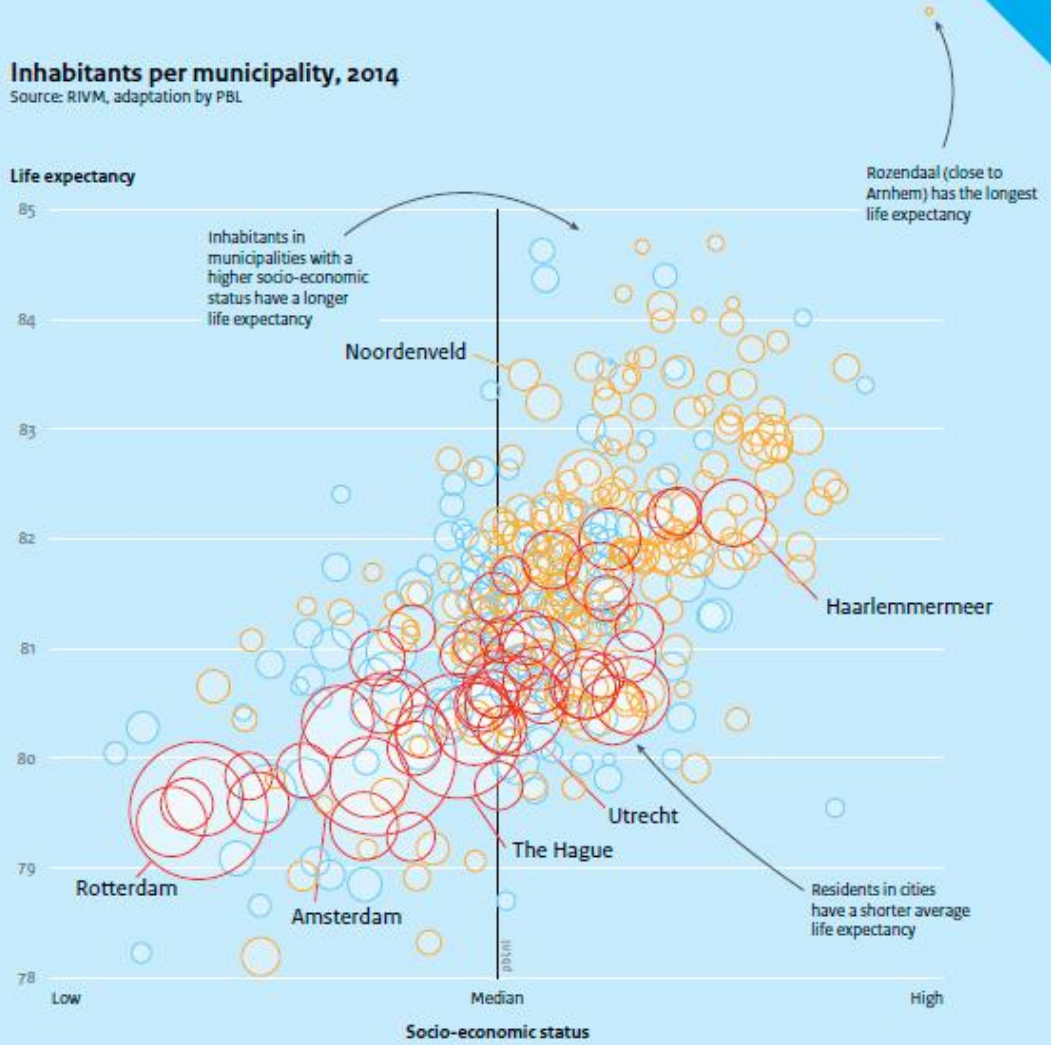


Jobs in NL in 2022

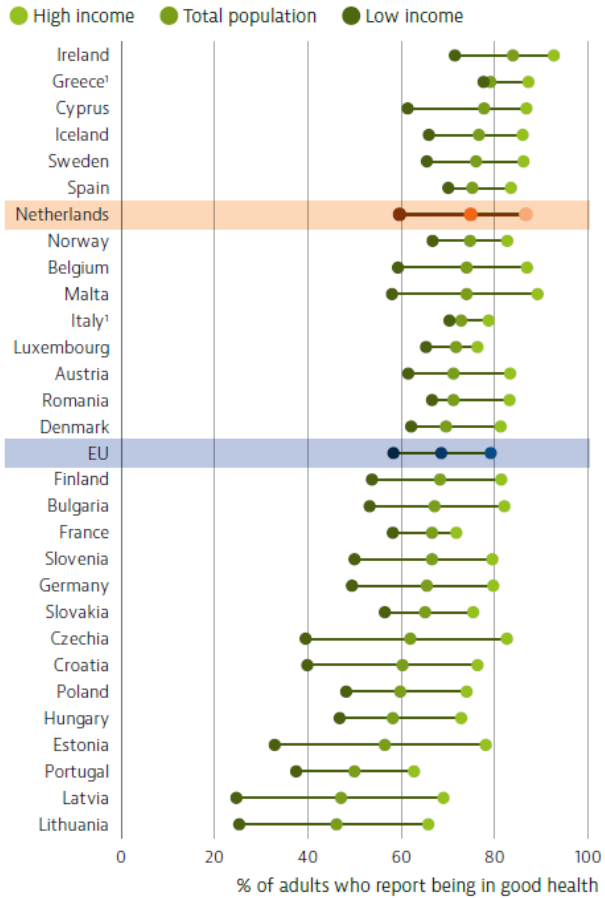
and Footer text

Urbanization
Lower SES
Less Healthy



Differences Income & Health

Figure 4. Inequalities in self-reported health by income level are relatively large in the Netherlands



Note: 1. The shares for the total population and the population on low incomes are roughly the same.
Source: Eurostat Database, based on EU-SILC (data refer to 2019).

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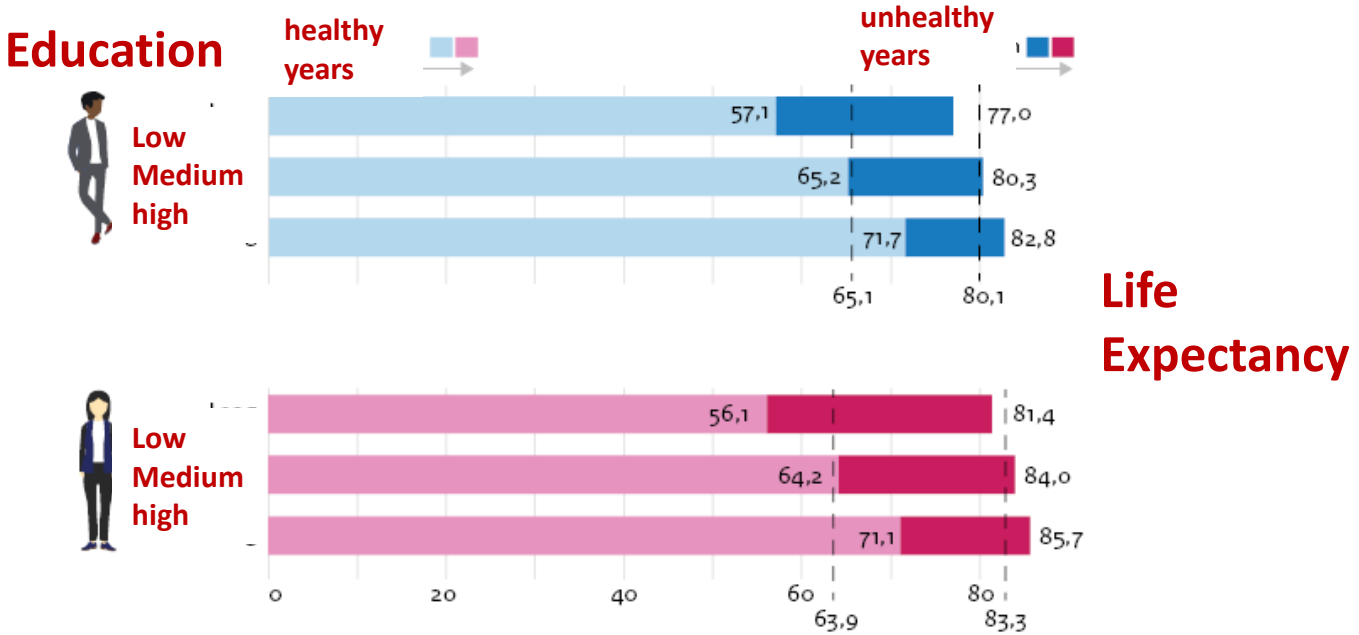
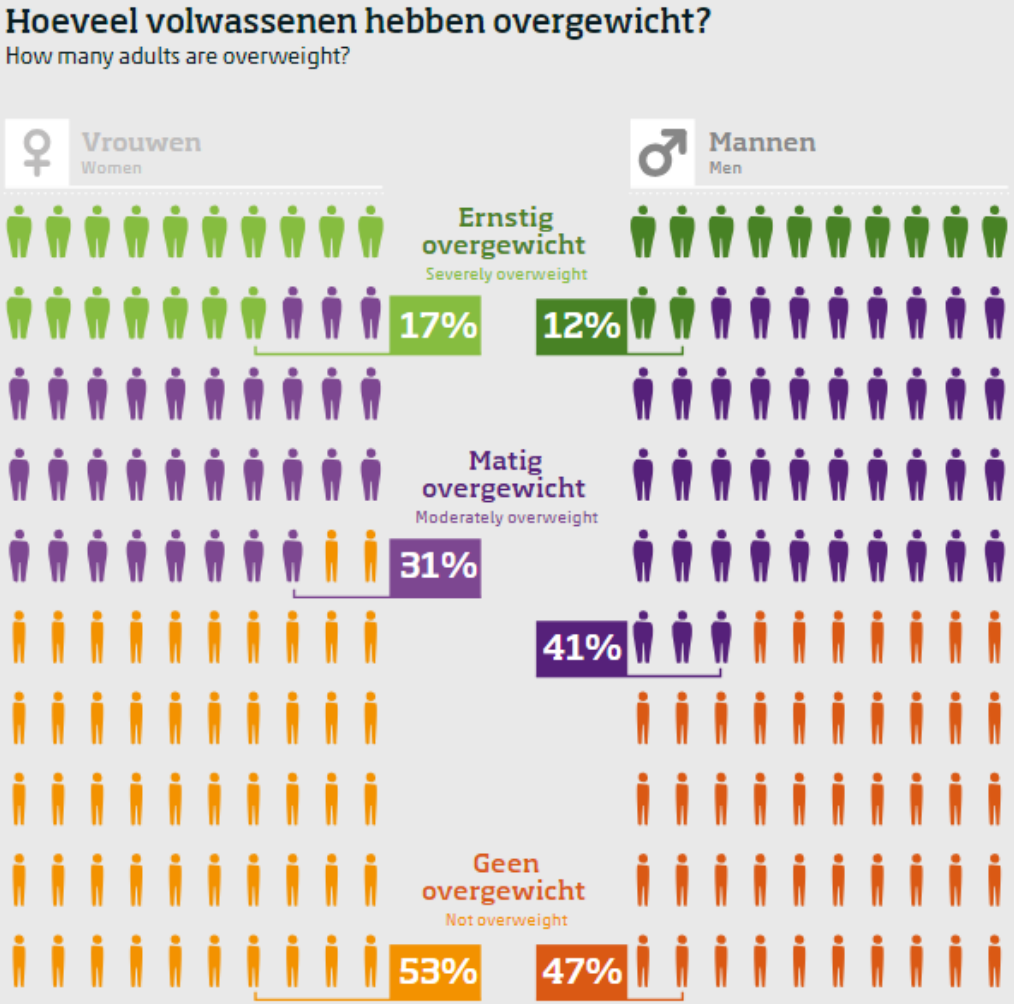
Life Expectancy born 2017-2020

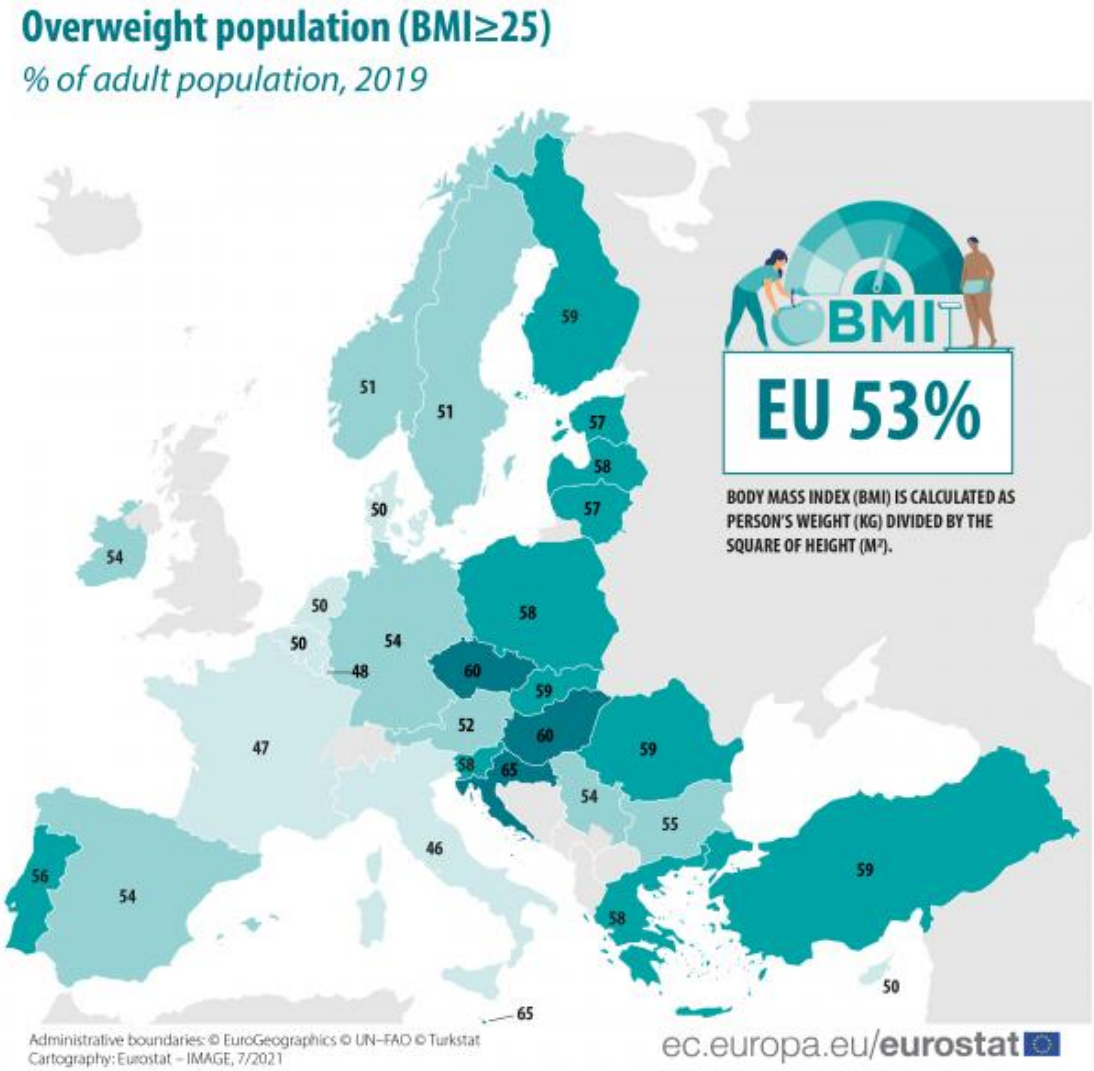


Cities are challenged by
Increases in the frequency of chronic diseases, obesity and sedentary lifestyles

➔**Physical inactivity is a major contributor to these problems**

➔**Physical inactivity is the fourth leading risk factor for global mortality**
(WHO, 2022)




Overweight population (BMI≥25)
% of adult population, 2019
BMI
EU 53%
BODY MASS INDEX (BMI) IS CALCULATED AS PERSON'S WEIGHT (KG) DIVIDED BY THE SQUARE OF HEIGHT (M²).
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Administrative boundaries: © EuroGeographics © UN–FAO © Turkstat
Cartography: Eurostat – IMAGE, 7/2021
ec.europa.eu/eurostat

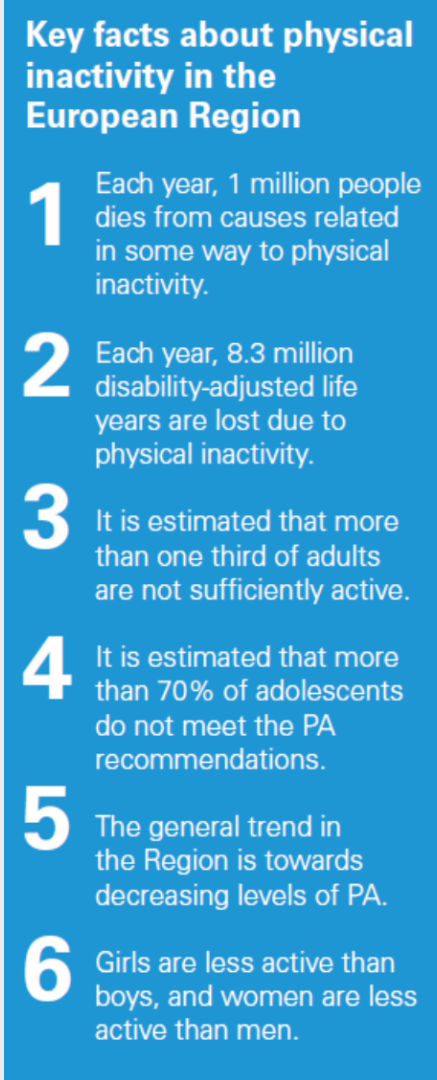
Facts (WHO)- Physical inactivity

Caused by:

- built environment of cities & neighborhoods
- less physically demanding work
- increasing use of automated transport,
- technology in the home
- more passive leisure activities

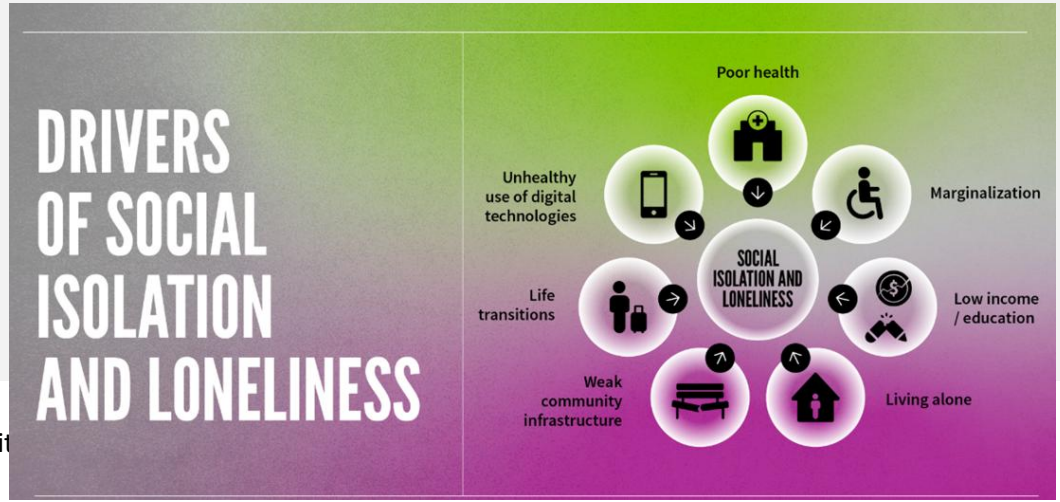
➔increase in sedentary lifestyles & less physical activity major threat to public health

➔*PA is any force exerted by skeletal muscles that results in energy expenditure above rest*




SOCIAL HEALTH: THE MISSING PILLAR
WHO defines health as complete **physical**, **mental** and **social well-being** – social health is not optional.
HEALTH
PHYSICAL well-being
MENTAL well-being
SOCIAL well-being


LONELINESS IS A GLOBAL PROBLEM
Loneliness affects
1 IN 6
people worldwide
It affects
PEOPLE OF ALL AGES AND REGIONS
Rates are highest among
YOUNG PEOPLE
and in
LOW-INCOME COUNTRIES


DRIVERS OF SOCIAL ISOLATION AND LONELINESS
Poor health
Unhealthy use of digital technologies
Marginalization
SOCIAL ISOLATION AND LONELINESS
Life transitions
Low income / education
Weak community infrastructure
Living alone

(WHO, 2025)

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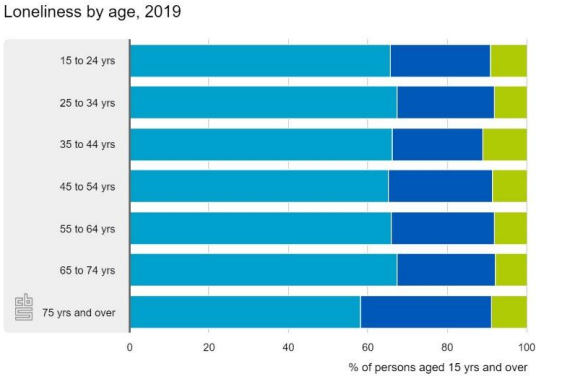
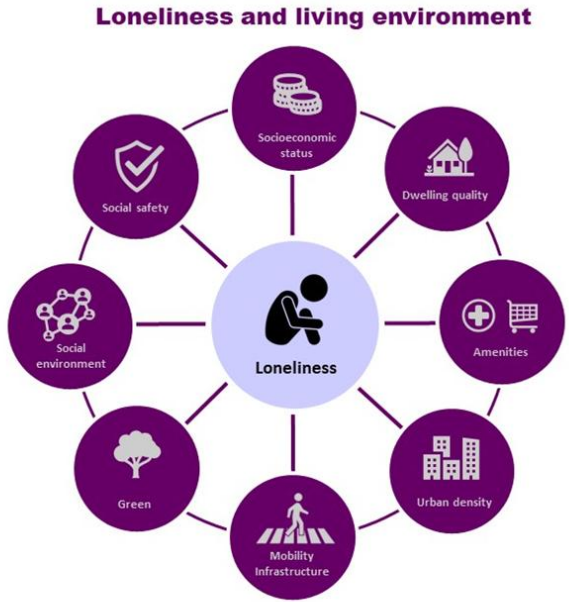
Challenges Loneliness

(CBS, 2019)

(© Hollandse Hoogte / Stijn Rademaker)





Conclude - Urbanization Trends 1

Around 50% of the world's population currently lives in an urban environment, and this is increasing:

Opportunities

Cities are important for economic growth
A high concentration of people makes it easier to supply a larger part of the population with adequate health and water services, & improve the efficiency of energy, water and land use

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Conclude - Urbanization Trends 2

Challenges:

The increasing number of people migrating to urban areas leads to:

- congestion & air pollution
- housing and infrastructure shortages
- increased demand for a limited pool of resources including energy, water, green spaces, cultural heritage, education and healthcare services
- social segregation, and exclusion
- In general, lower health & life expectancy

Healthy Cities

Healthy City

A healthy city is one that puts health, social well-being, equity and sustainable development at the centre of local policies, strategies and programmes based on core values of the right to health and well-being, peace, social justice, gender equality, solidarity, social inclusion and sustainable development and guided by the principles of health for all, universal health coverage, intersectoral governance for health, health-in-all-policies, community participation, social cohesion and innovation

(WHO, 2020)

Healthy Cities & Sustainable Development Goals (SDGs)

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Healthy cities – key to SDG attainment

Action in cities can drive progress towards multiple SDGs:

- Reduce air pollution (SDGs 3.9 and 11.6)
- Combat noncommunicable diseases (NCDs) and related risks like obesity (SDG 3.4)
- Access to public transport with special attention to women, children, persons with disabilities and older persons (SDG 11.2)
- Sanitation and waste management (SDGs 3.9 and 11.6)
- Equity (SDG 10)
- Access to safe public and green spaces, particularly for women, children, older persons and persons with disabilities (SDG 11.7)
- Climate action – climate resilience (SDG 13)

Healthy Cities Action Domains

(WHO, 2020)

text

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WHO European Healthy Cities Network: Urban solutions

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Smart Cities

Smart Cities

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Smart City

An innovative city that uses information and communication technologies (ICTs), clever urban planning and design and citizen participation to improve quality of life, efficiency of urban operation and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social and environmental aspects (Kondepudi, 2014)

(Future-city.nl, 2021)

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Smart Healthy Urban Environments

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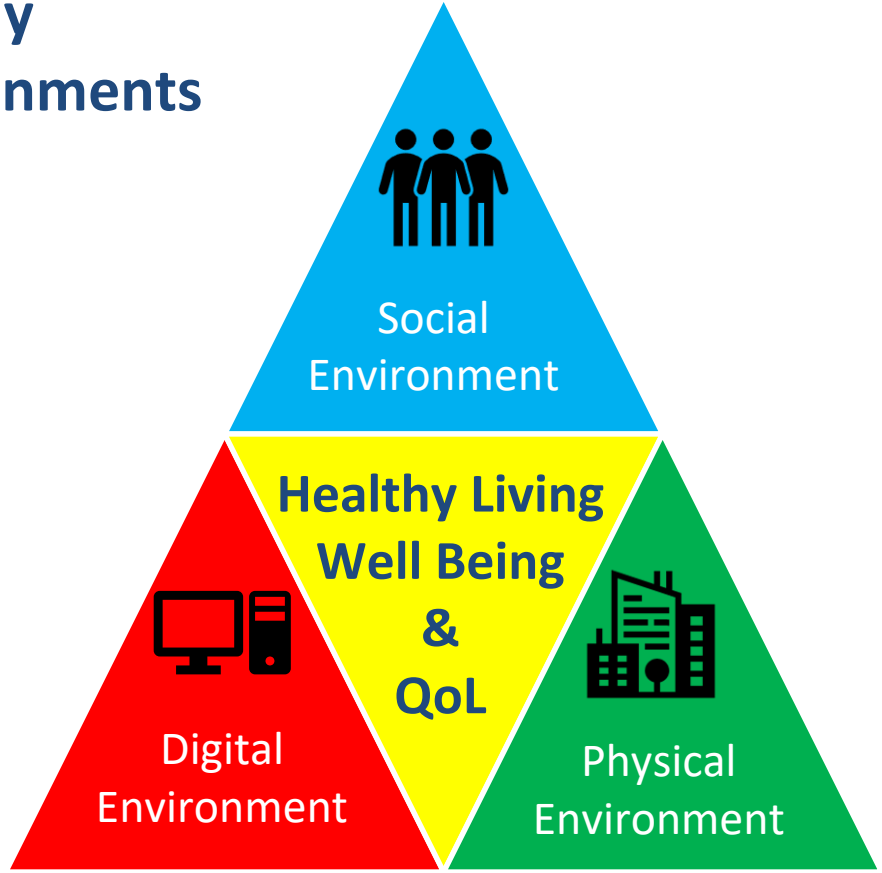

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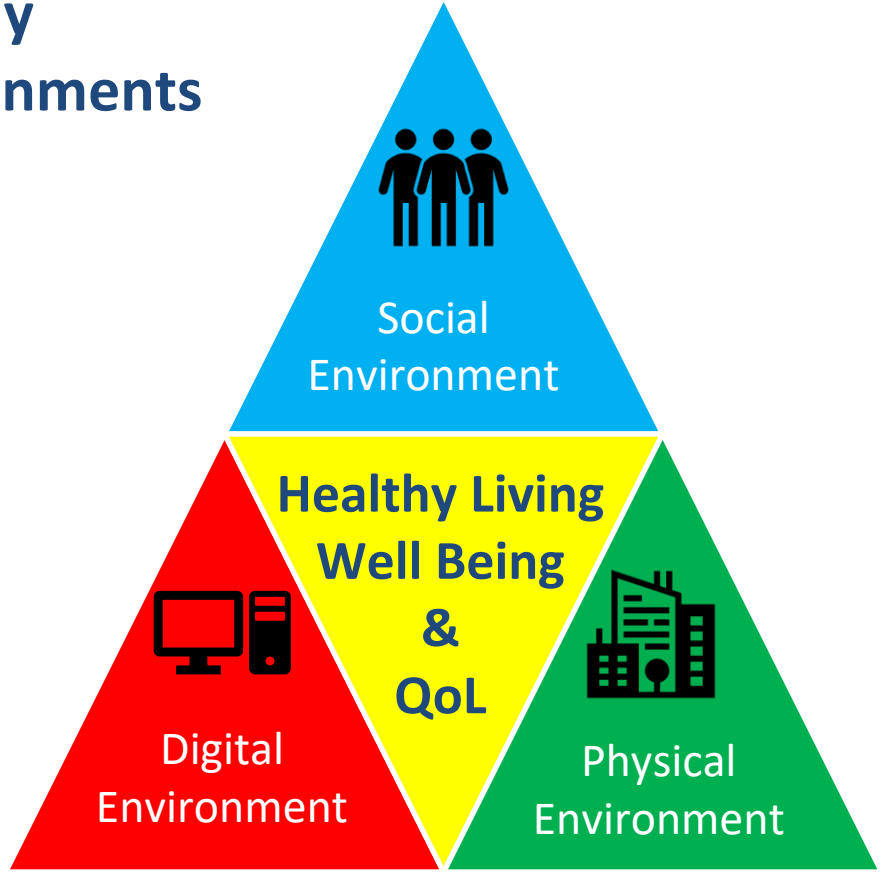

Physical Environment
Natural and built environment in which people live, learn, work, recreate, play, and travel

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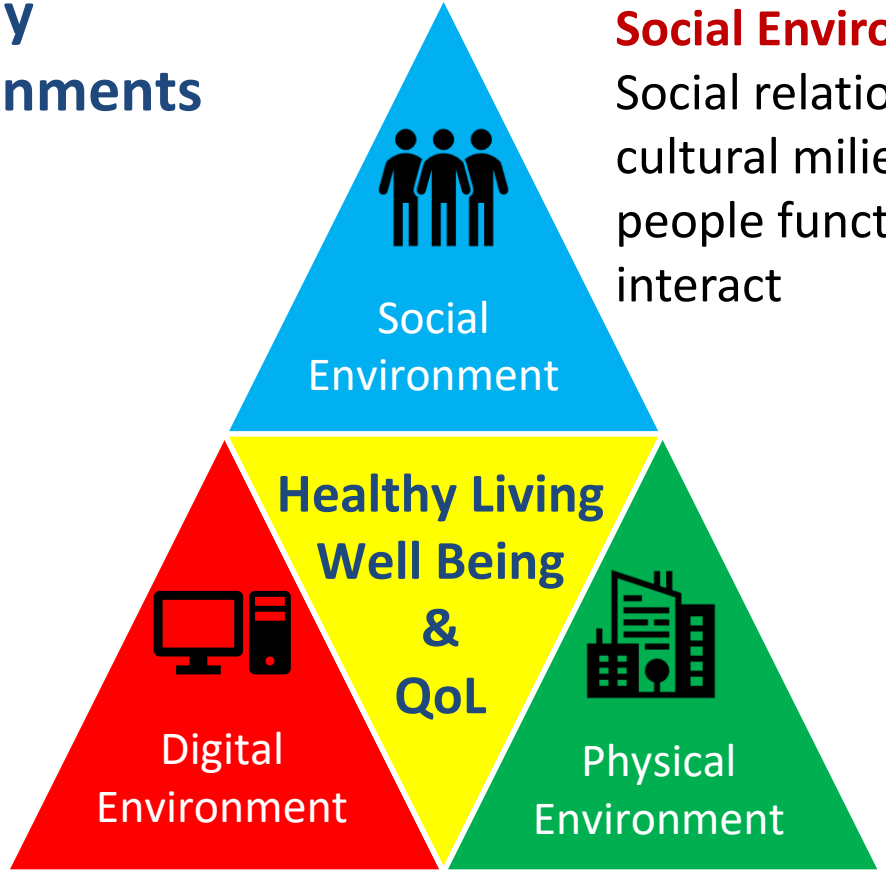
Smart Healthy Urban Environments



Social Environment
Social relationships, and cultural milieus within people function and interact

Physical Environment
Natural and built environment in which people live, learn, work, recreate, play, and travel

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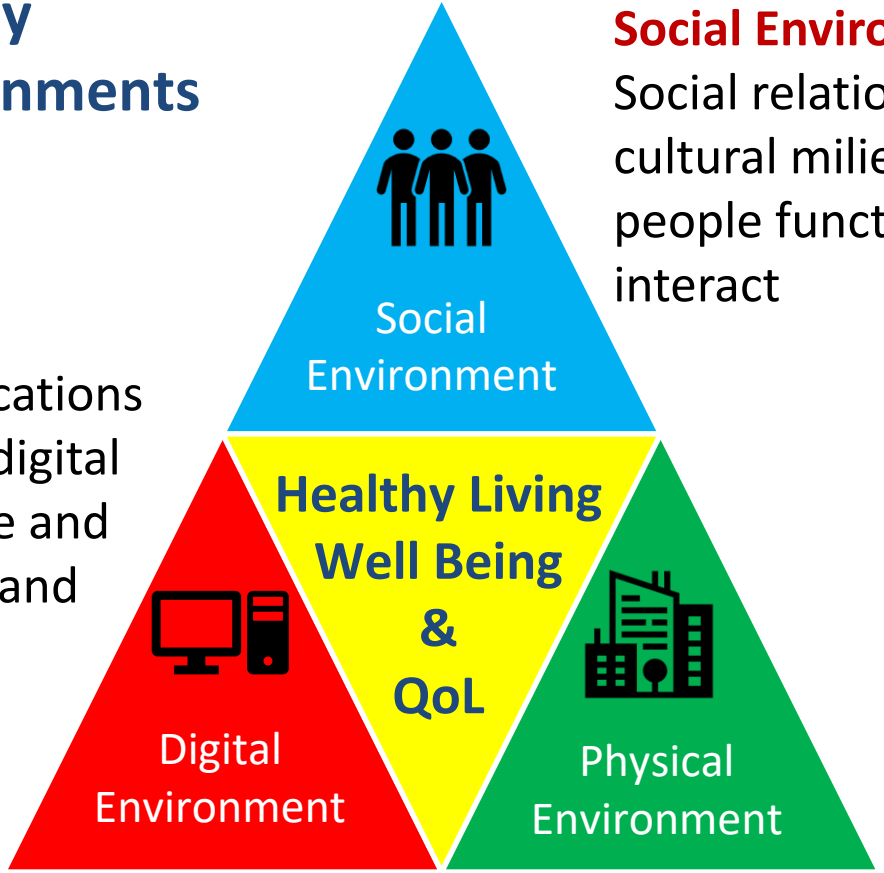
Smart Healthy Urban Environments

Social Environment
Social relationships, and cultural milieus within people function and interact

Digital environment
Integrated communications environment where digital devices communicate and manage the content and activities within it



Physical Environment
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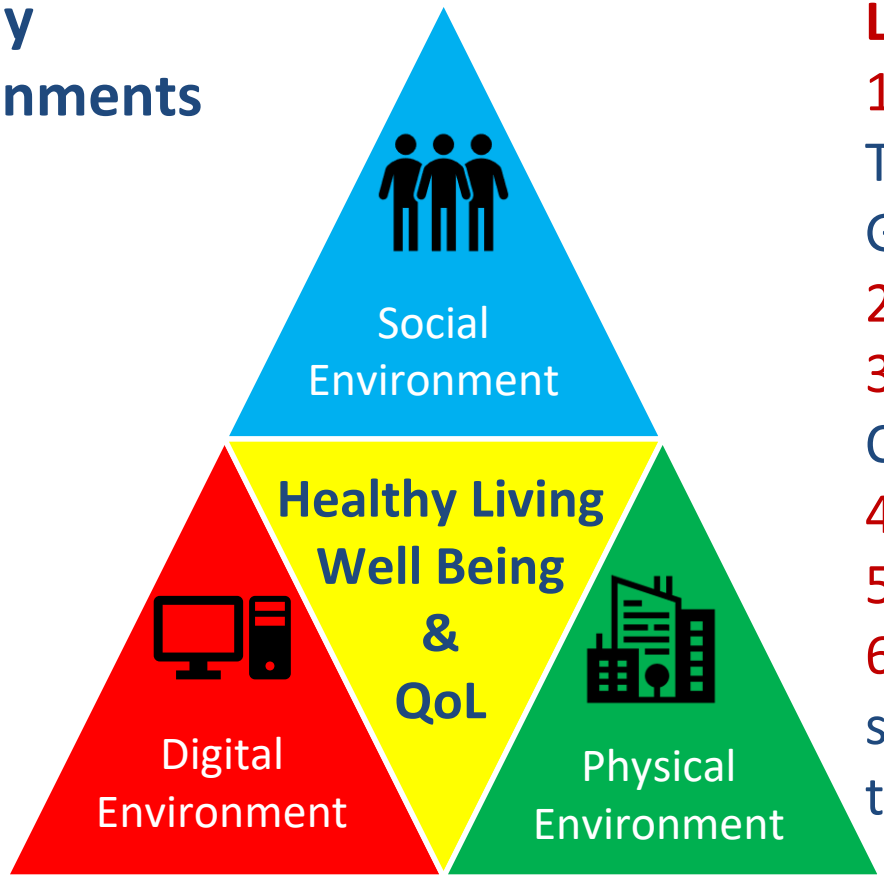

Lectures

1-Sustainable Transportation & GPS data processing

2-Vital city

3-Sensing the city & Citizen Science

4-Green city & VR

5-Social & Inclusive city

6&7- Computer simulations and digital twins in urban planning

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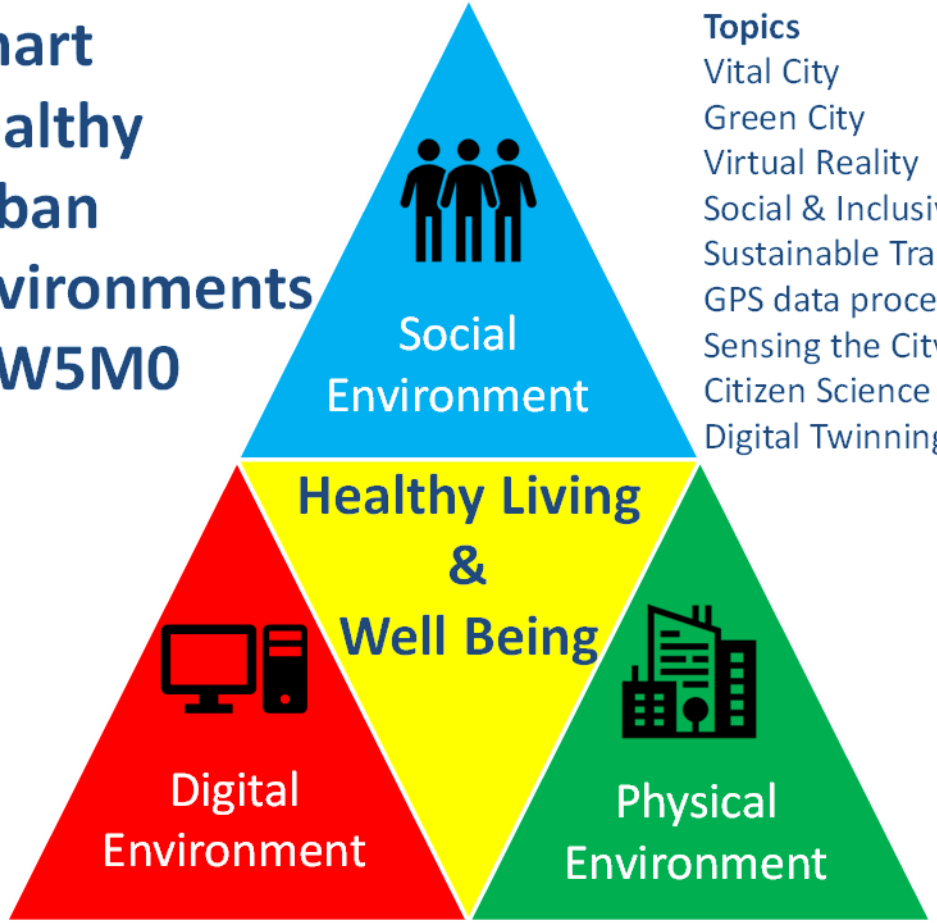

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Questions?

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