Spring Campus, 2018
Workshop I: “Implementing the Agenda 2030 (Sustainable Development Goals) and Climate Policies”

Nikolai Bobylev

Sustainable Development Goal 11: Make cities inclusive, safe, resilient and sustainable – exploring three-dimensional cities

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Alexander von Humboldt Foundation Research group linkage programme
Green Underground: Unlocking the Environmental Potential of Urban Underground Space Use
Nikolai Bobylev, Saint Petersburg State University
Wolfgang Wende, Technische Universität Dresden & Leibniz Institut für ökologische Raumentwicklung

Overview

-United Nations Global Goals – aspirations

-United Nations Global Goals – state of the art

-Durban density discussion

-Urban Underground Space Statistics

-Policy recommendations - Three-Dimensional Planning

-Tunnelling and Underground Space Technology, Elsevier. Special Issue Volume 55 – UUS Research & Development Agenda

United Nations Global Goals

http://www.un.org/sustainabledevelopment/cities/

United Nations Global Goals

UN SDGs

Goal 11: Make cities inclusive, safe, **resilient and sustainable**

Goal 9: Build **resilient infrastructure**, promote sustainable industrialization and foster innovation

Goal 7: Ensure access to affordable, reliable, **sustainable and modern energy** for all

Goal 13: Take urgent action to combat **climate change and its impacts**

United Nations Global Goals

Goal 11: Make cities inclusive, safe, resilient and sustainable

Cities are hubs for ideas, commerce, culture, science, productivity, social development and much more. At their best, cities have enabled people to advance socially and economically.

However, many challenges exist to maintaining cities in a way that continues to create jobs and prosperity while not straining land and resources. **Common urban challenges include congestion, lack of funds to provide basic services,** a shortage of adequate housing **and declining infrastructure.**

The challenges cities face can be overcome in ways that allow them to continue to thrive and grow, while improving resource use and reducing pollution and poverty. The future we want includes cities of opportunities for all, with access to basic services, energy, housing, transportation and more.

http://www.un.org/sustainabledevelopment/cities/

United Nations Global Goals

Goal 11: Make cities inclusive, safe, resilient and sustainable

Half of humanity – 3.5 billion people – lives in cities today

By 2030, almost 60 per cent of the world's population will live in urban areas

95 per cent of urban expansion in the next decades will take place in developing world

The world's cities occupy just 3 per cent of the Earth's land, but account for 60-80 per cent of energy consumption and 75 per cent of carbon emissions

UN-HABITAT

UN Environment Programme : Cities – investing in energy and resource efficiency

UN Environment Programme Climate Neutral Network

UN Environment Programme: Cities and Climate Change

UN Population Fund: Urbanization

ICLEI – Local Governments for Sustainability

SUSTAINABLE DEVELOPMENT GOALS

17 GOALS TO TRANSFORM OUR WORLD

http://www.un.org/sustainabledevelopment/cities/

United Nations Global Goals

Goal 11: Make cities inclusive, safe, resilient and sustainable

Targets:

By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums

By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons

By 2030, enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries

Strengthen efforts to protect and safeguard the world's cultural and natural heritage

By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations

By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management

By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities

Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning

By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels

Support least developed countries, including through financial and technical assistance, in building sustainable and resilient buildings utilizing local materials

http://www.un.org/sustainabledevelopment/cities/

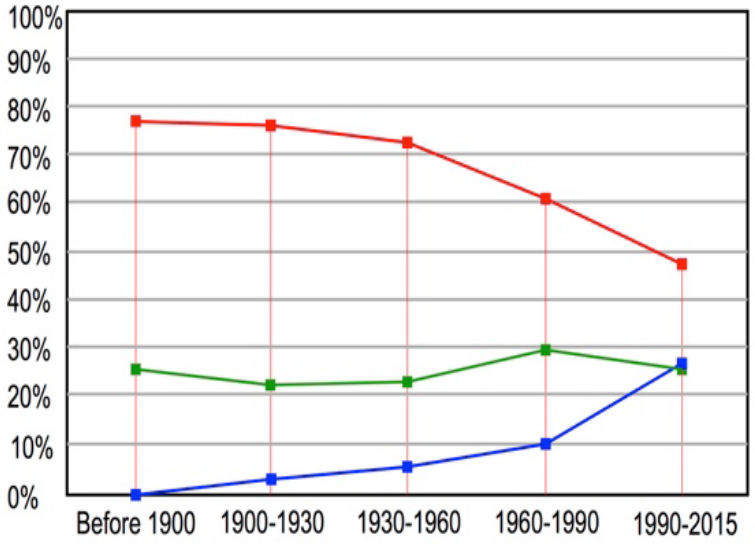
United Nations Global Goals – vision + agenda

The Five Pillars of the New Urban Agenda

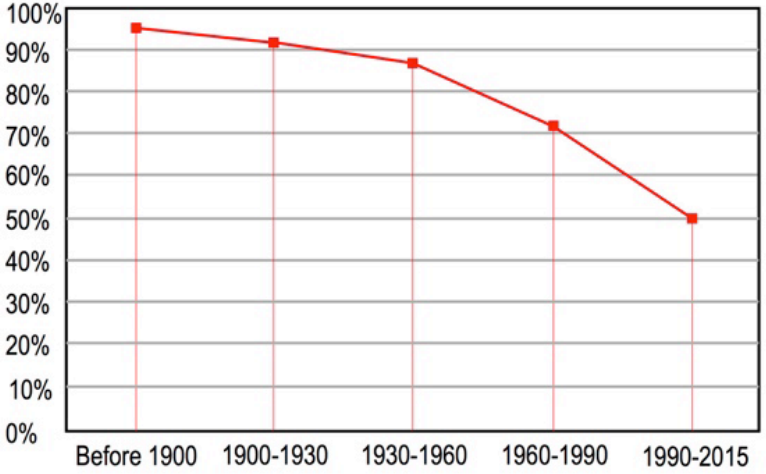
1. National Urban Policies (NUPs)
2. Rules and Regulations
3. Urban Planning and Design
4. Financing Urbanization
5. Local Implementation

Source:
UNHabitat

United Nations Global Goals – state of the art

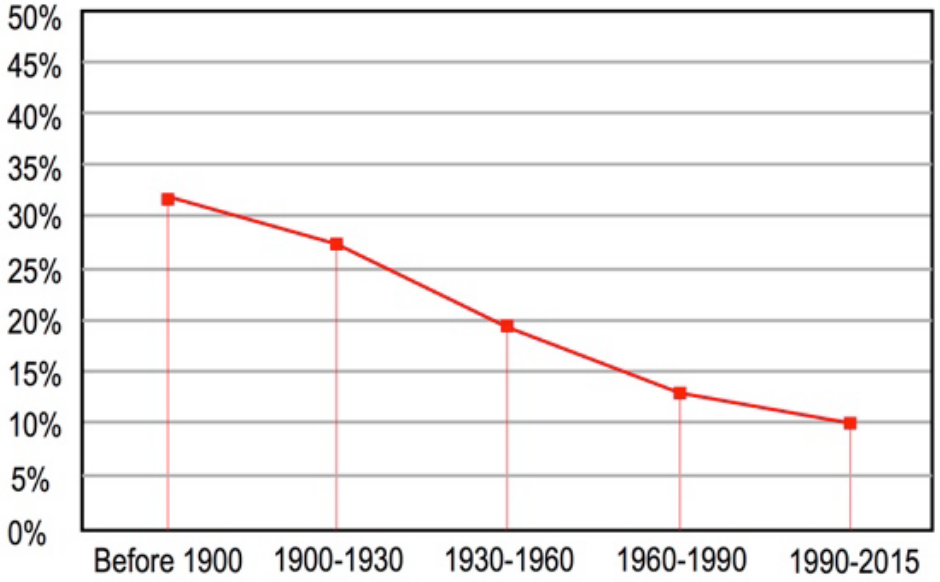


Urban Planning has dramatically… decreased
(Source: UNHabitat, 2017)



Areas of the city within a walking distance to an Arterial Road

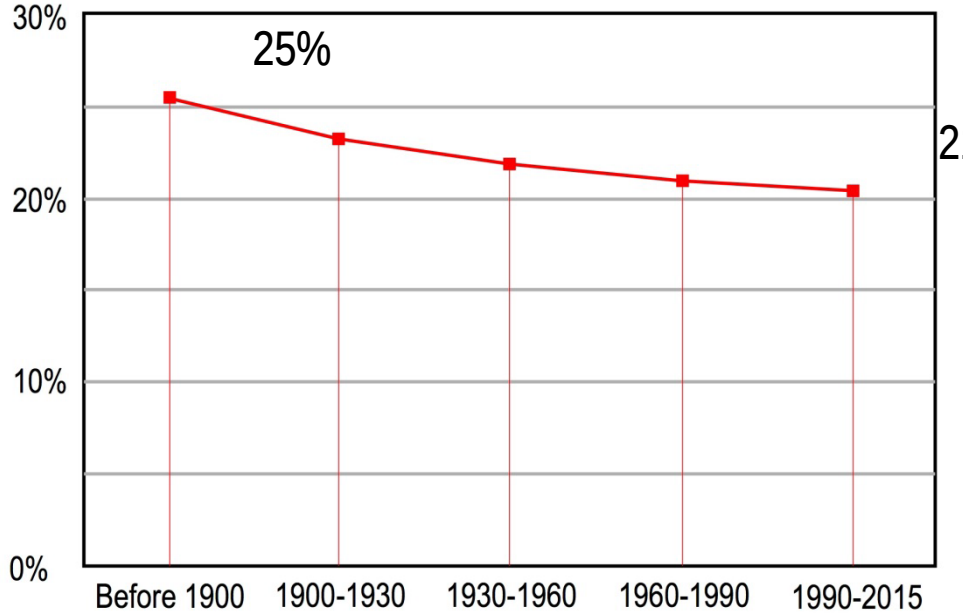
United Nations Global Goals – state of the art



Share of 4-way intersections

The share of 4-ways intersections has fallen over time
(Source: UNHabitat, 2017)

A higher share of 4-ways intersections indicates a high degree of orderly development
(Source: UNHabitat, 2017)



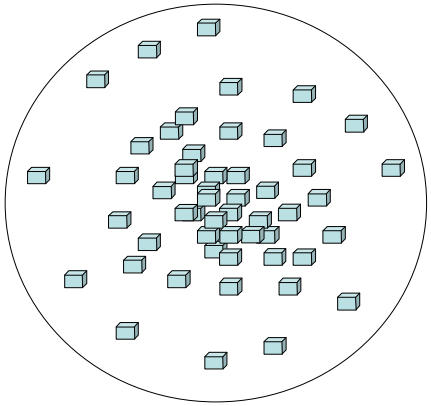
21%

Share of urban land allocated to streets has constituted 20.8%
(Source: UNHabitat, 2015)

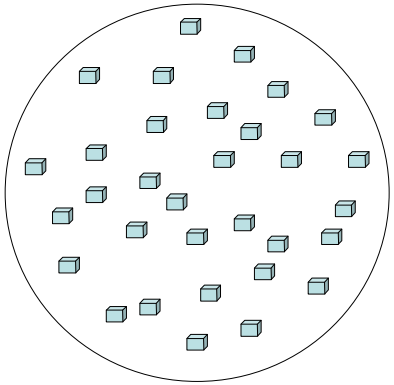
But 48% of cities have less than 20% of land allocated to streets
(Source: UNHabitat, 2017)

Density: people, built stock, GDP, green areas, amenities, land cover

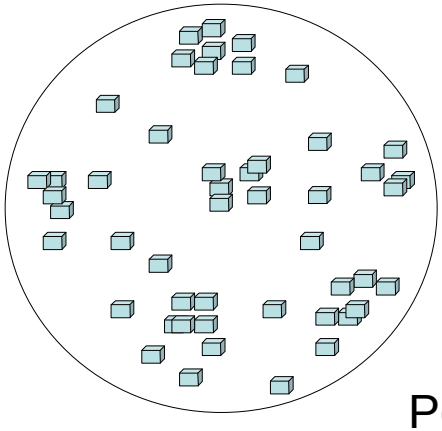
City Spatial Structure –
Policy, Management, Land & Energy Consumption



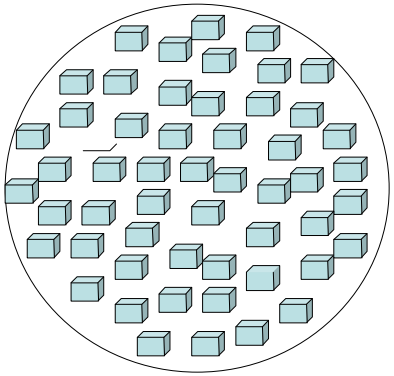
Monocentric



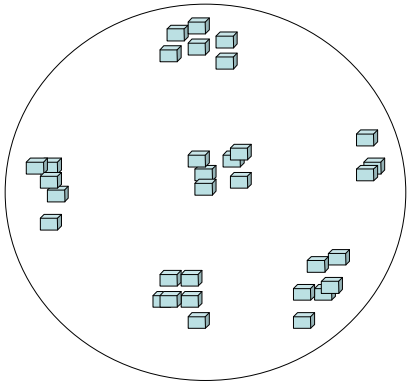
Sprawling



Polycentric



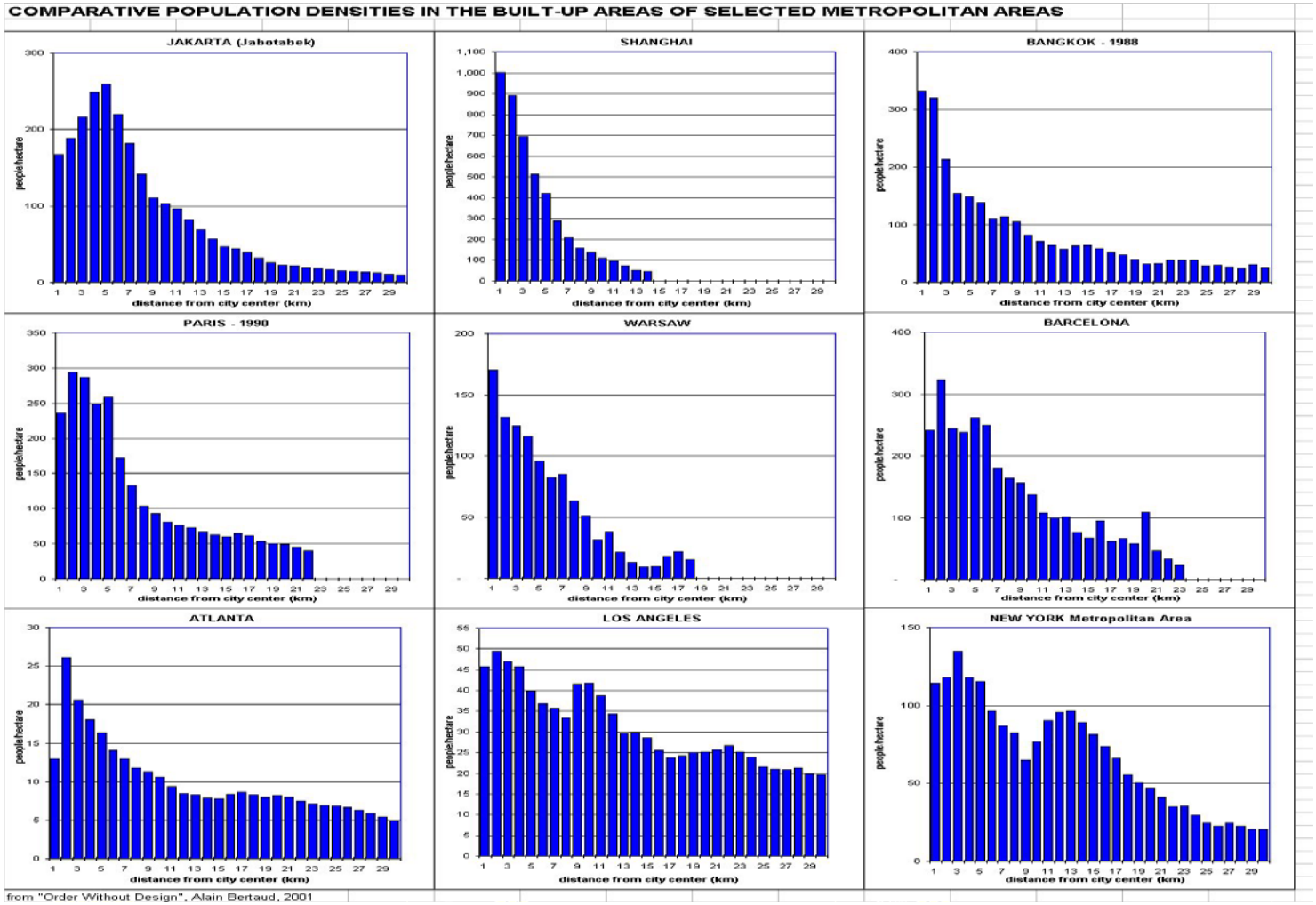
Compact



Combination of activity centers

Bobylev, 2014

Density: people, built stock, GDP, green areas, amenities, land cover



Source: Alain Bertaud, The development of Russian cities: Impact of reforms on spatial development. Draft Report #2. March 13, 2010

Key urban pressures (urban densification, environment, modernization of infrastructure)

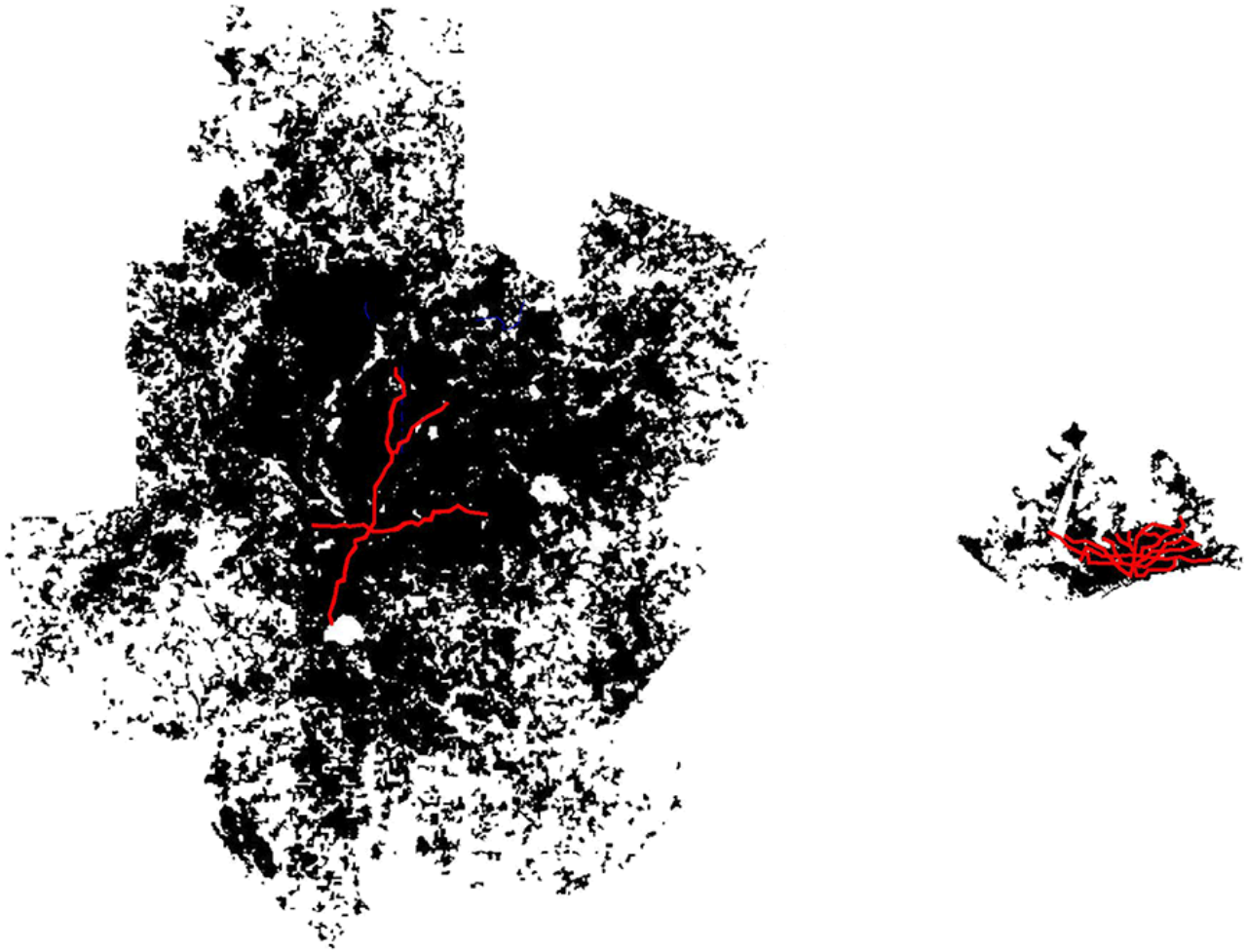
UN Habitat Density recommendation: at least 150 persons/ha (typical for European inner city areas)

- **10-20 persons/ha**
- **Public transport is NOT viable**

- **360 persons/ha**
- **Public transport is viable**

Source: UNHabitat

Key urban pressures (urban densification, environment, modernization of infrastructure)



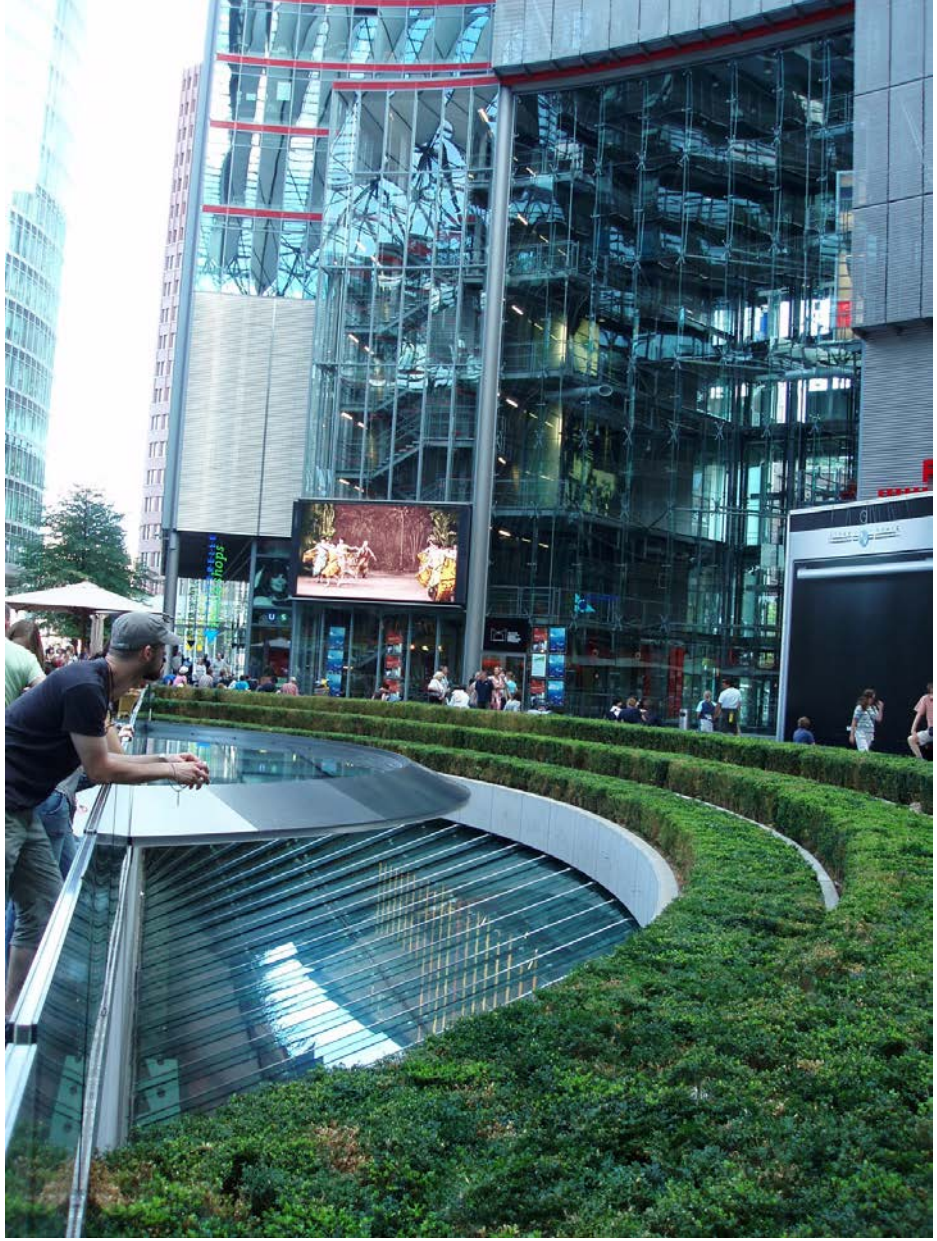
Atlanta **Barcelona**

Similar population size; Similar length of metro system

Share of population within 600m of metro station:

Atlanta: 4 % **Barcelona: 60 %**

Source: UNHabitat

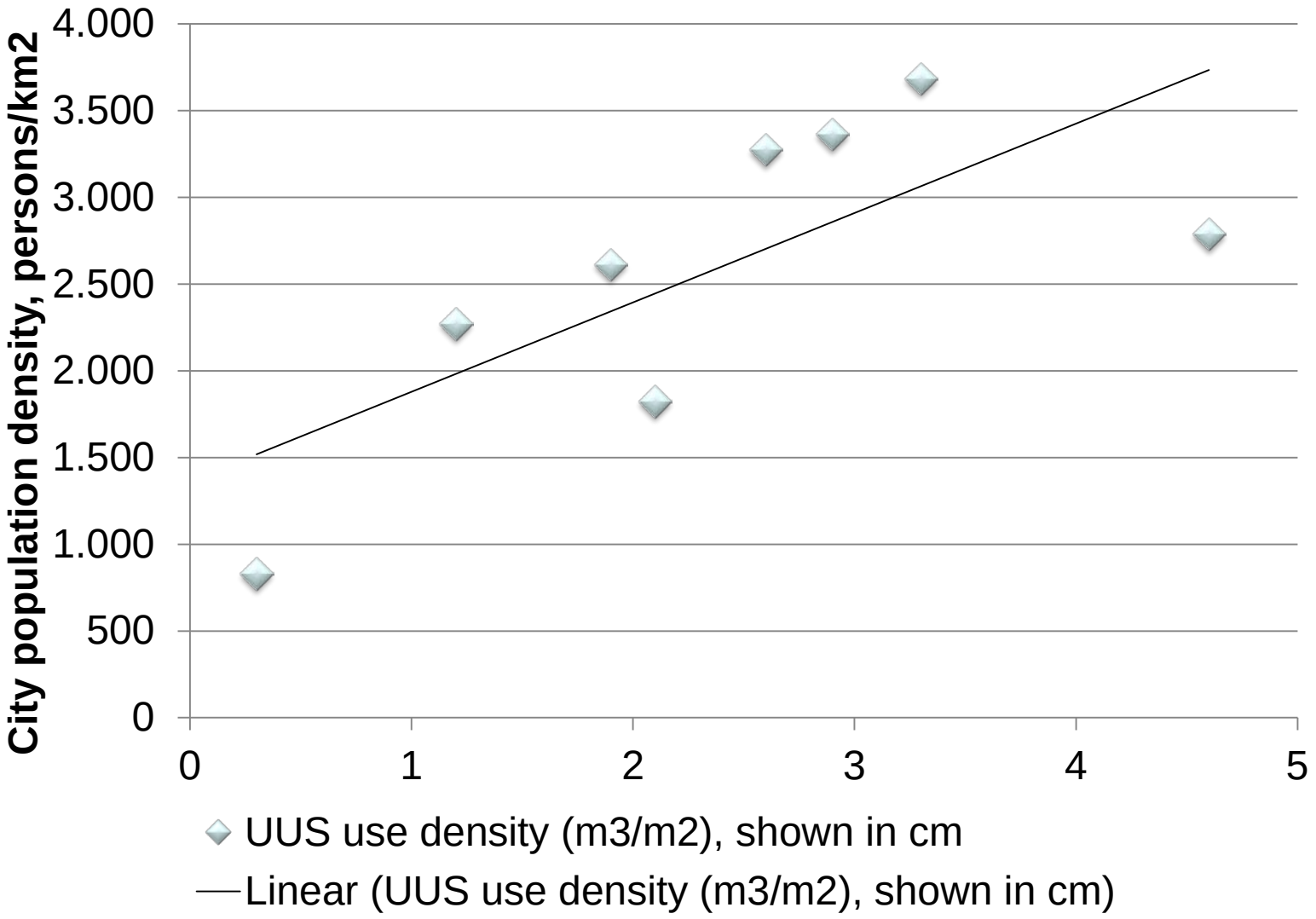


Berlin, Potzdamer Platz & Sony Centre;
Tokyo, Shiodome

Photo: Nikolai Bobylev

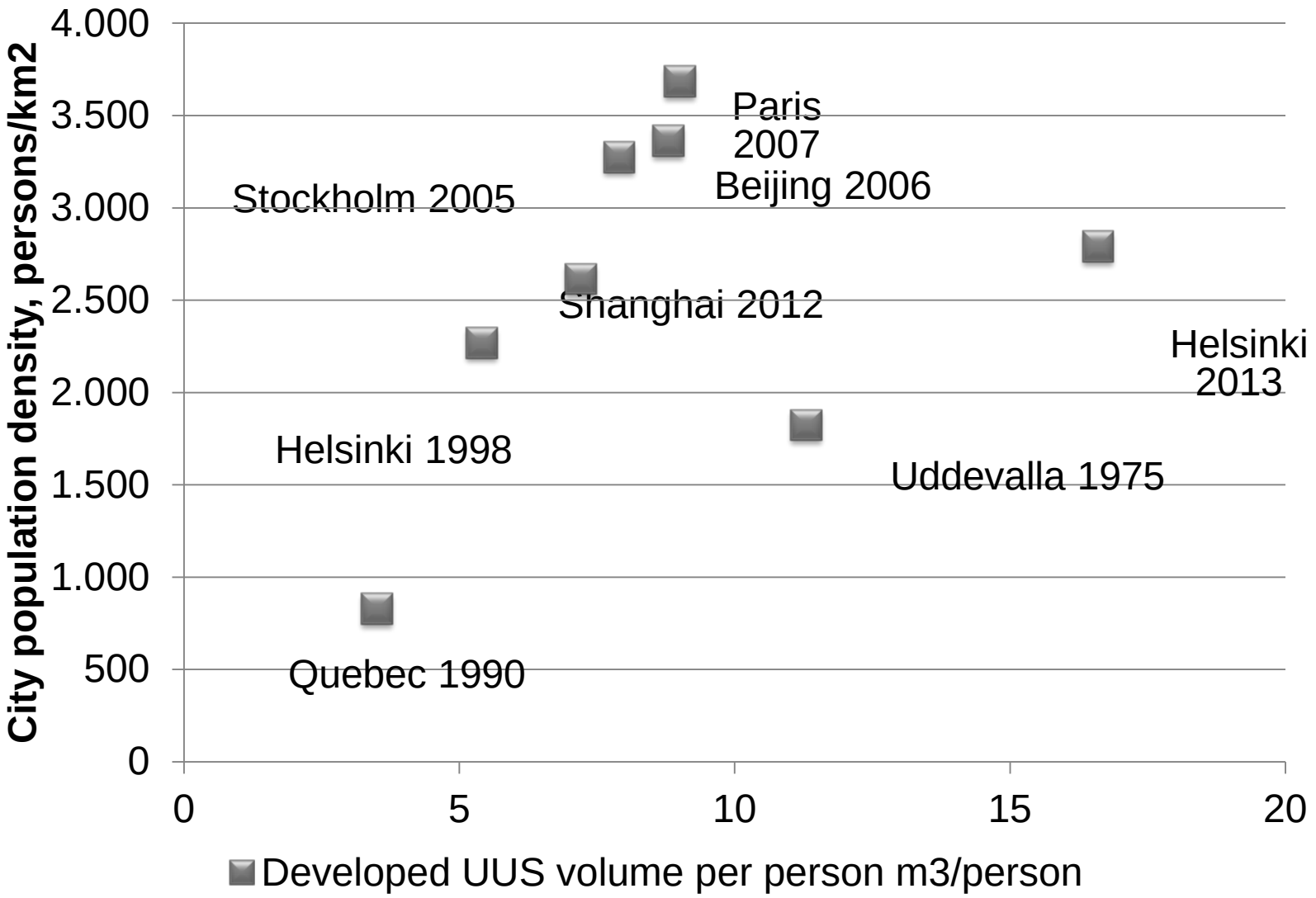
Cities in UUS research

UUS statistics



Source: Bobylev, N (2016) Underground Space as an Urban Indicator: Measuring Use of Subsurface. Tunnelling and Underground Space Technology, Elsevier. Volume 55

UUS statistics



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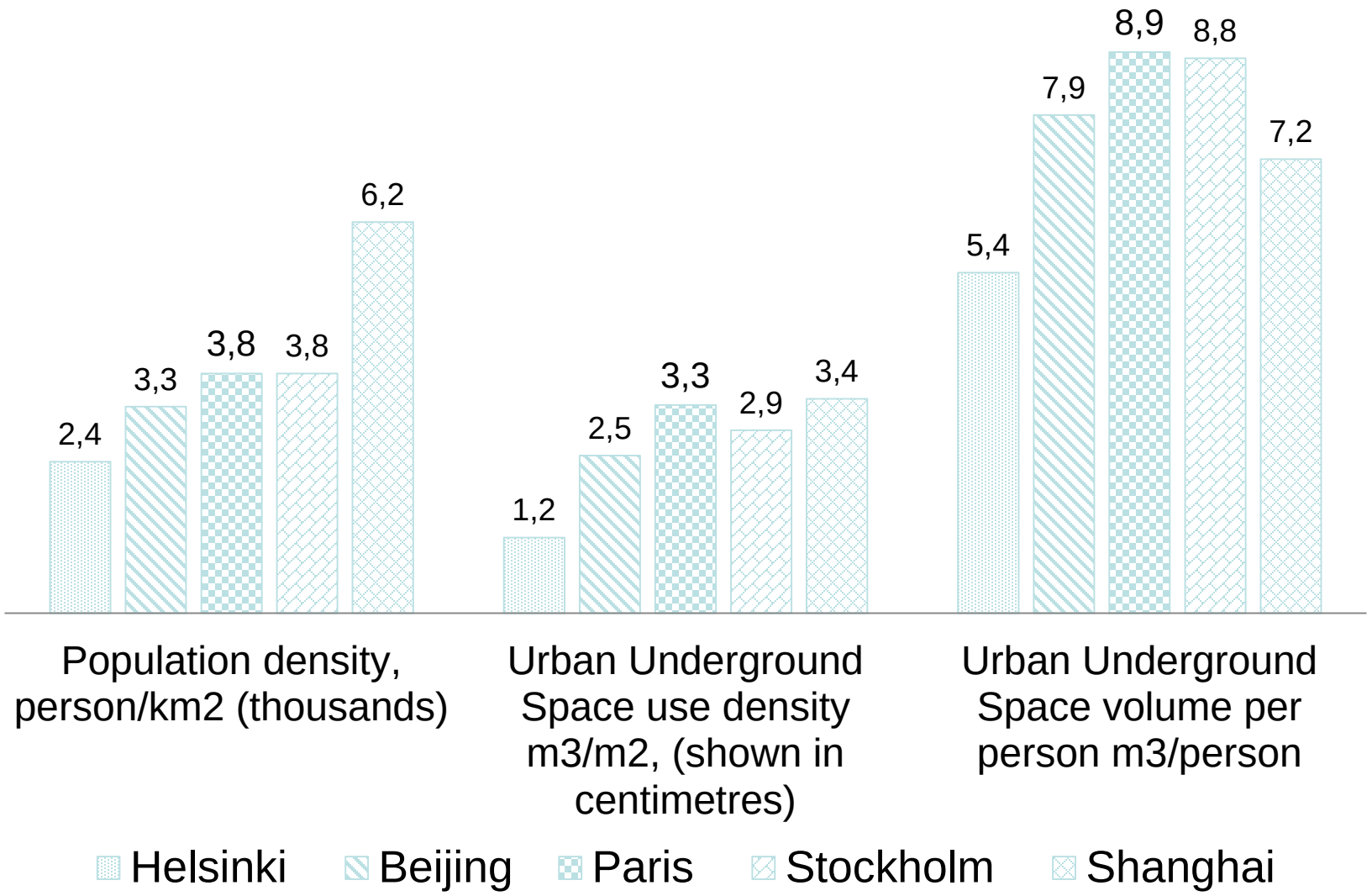
UUS statistics



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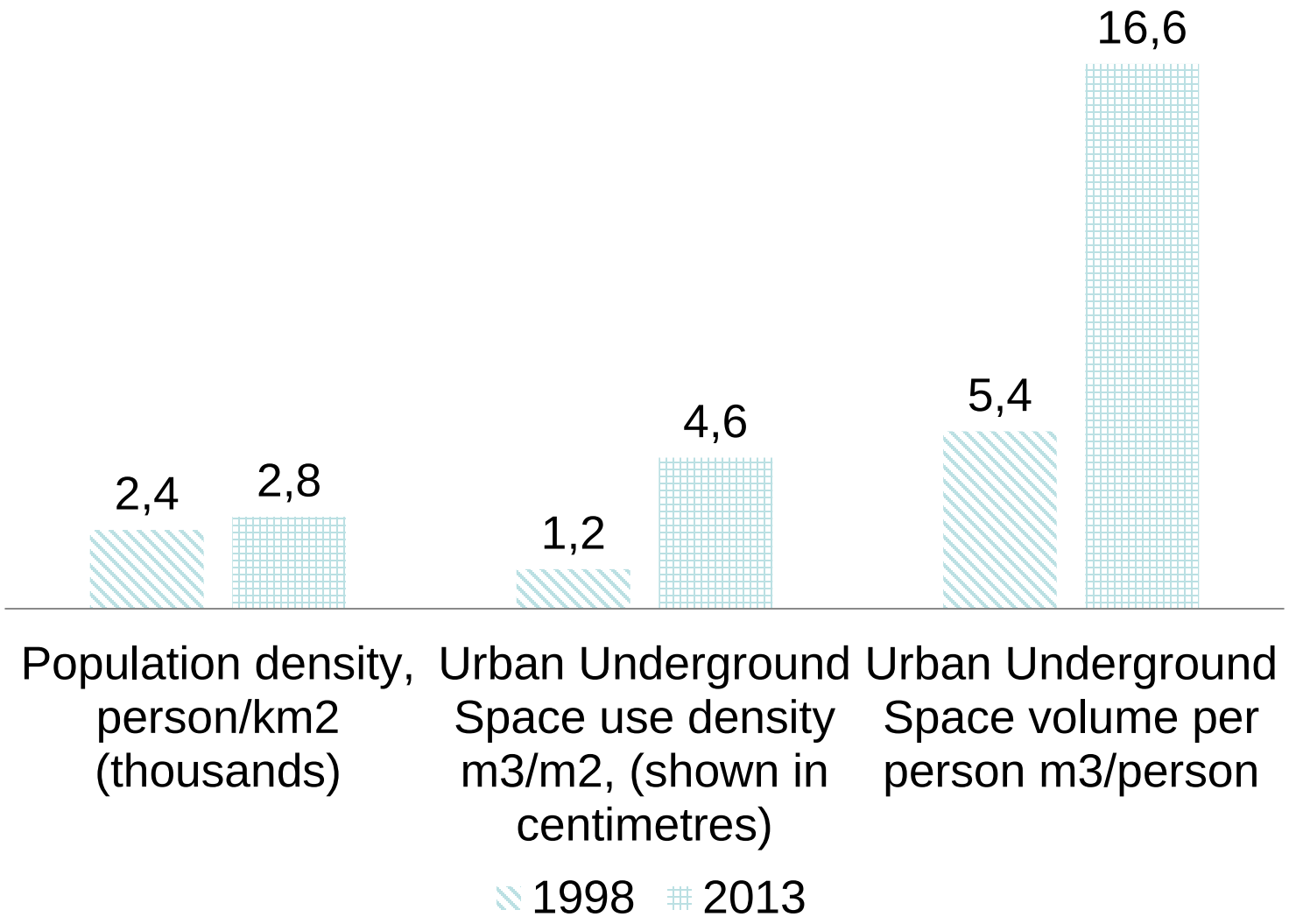

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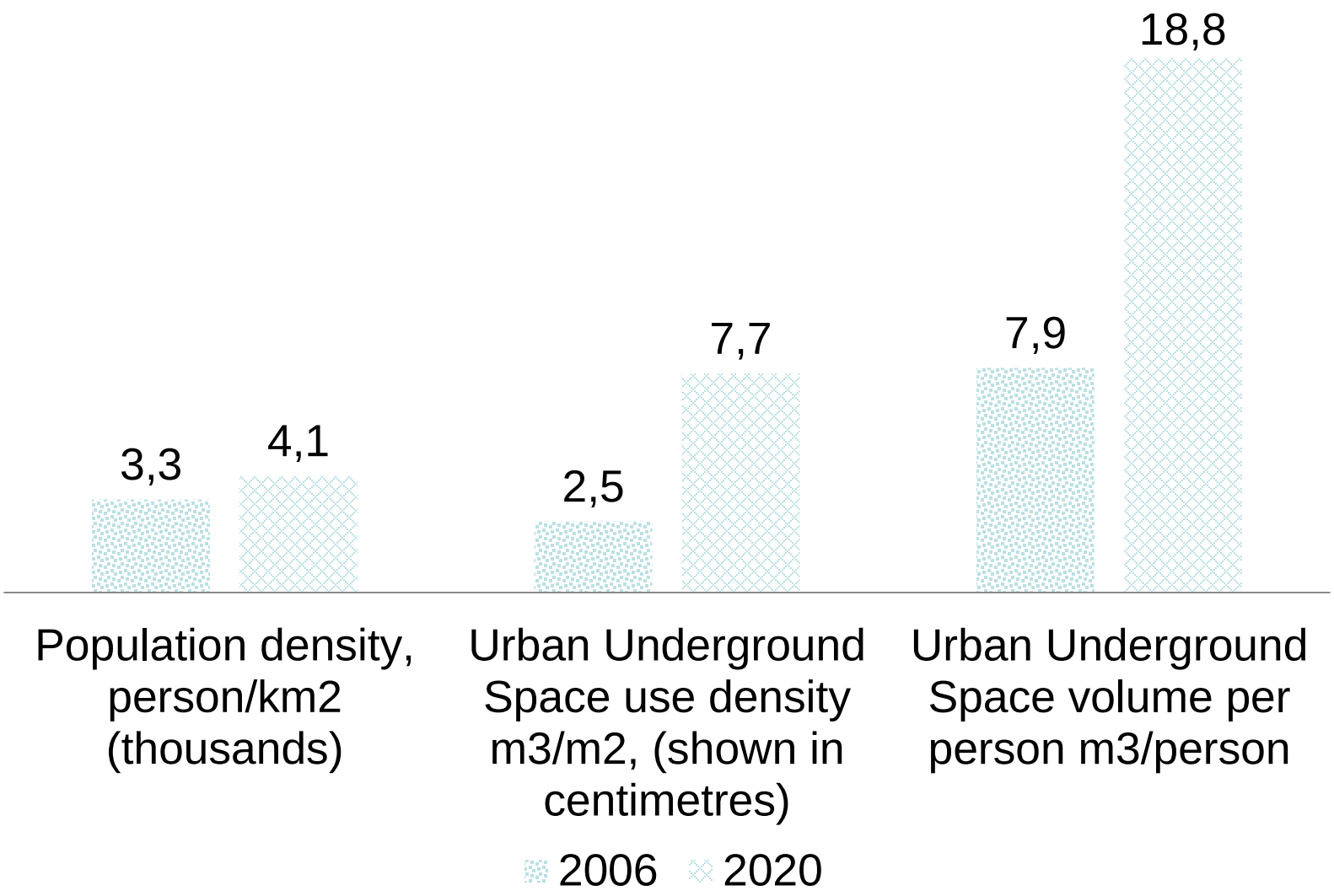

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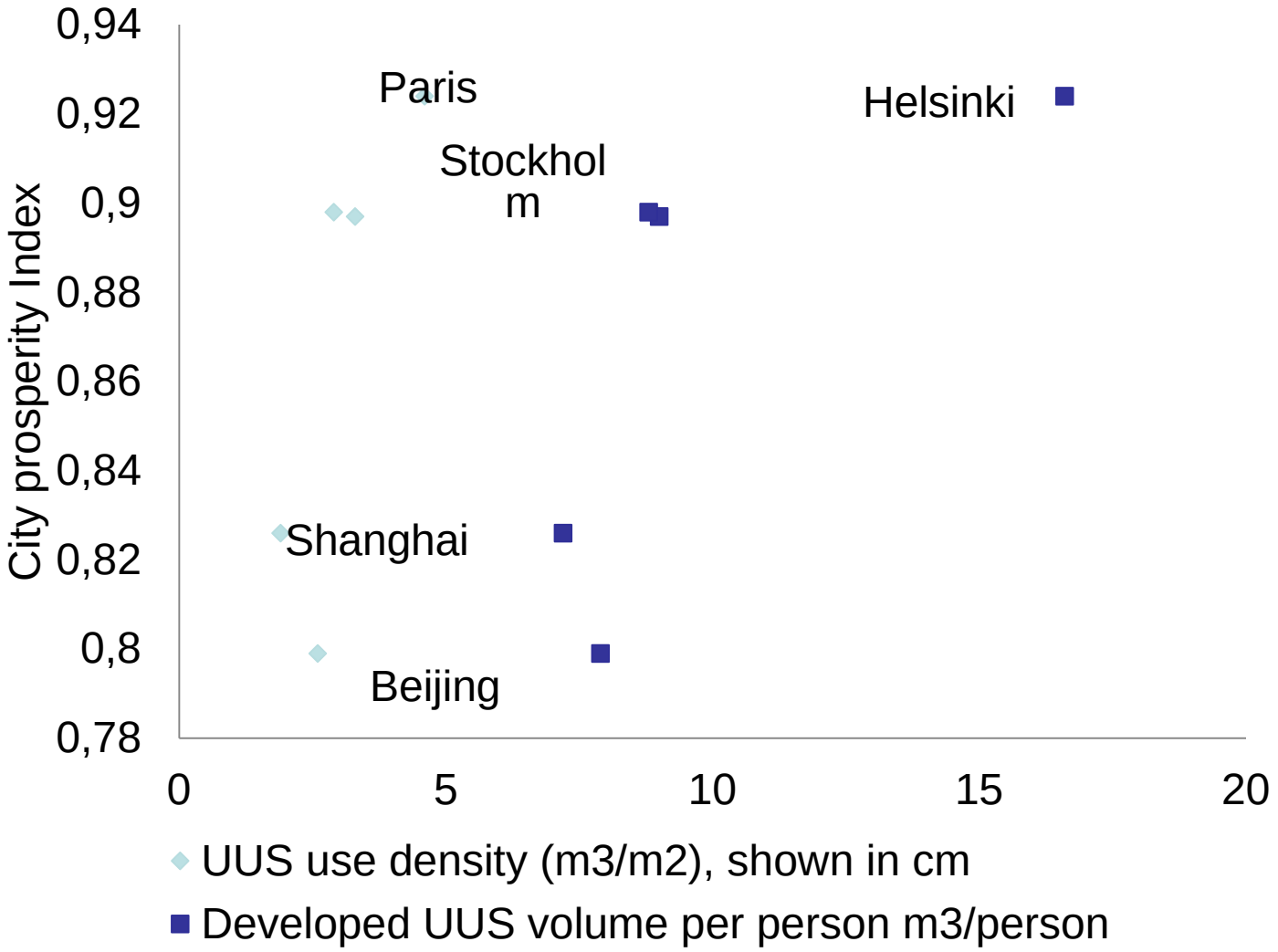
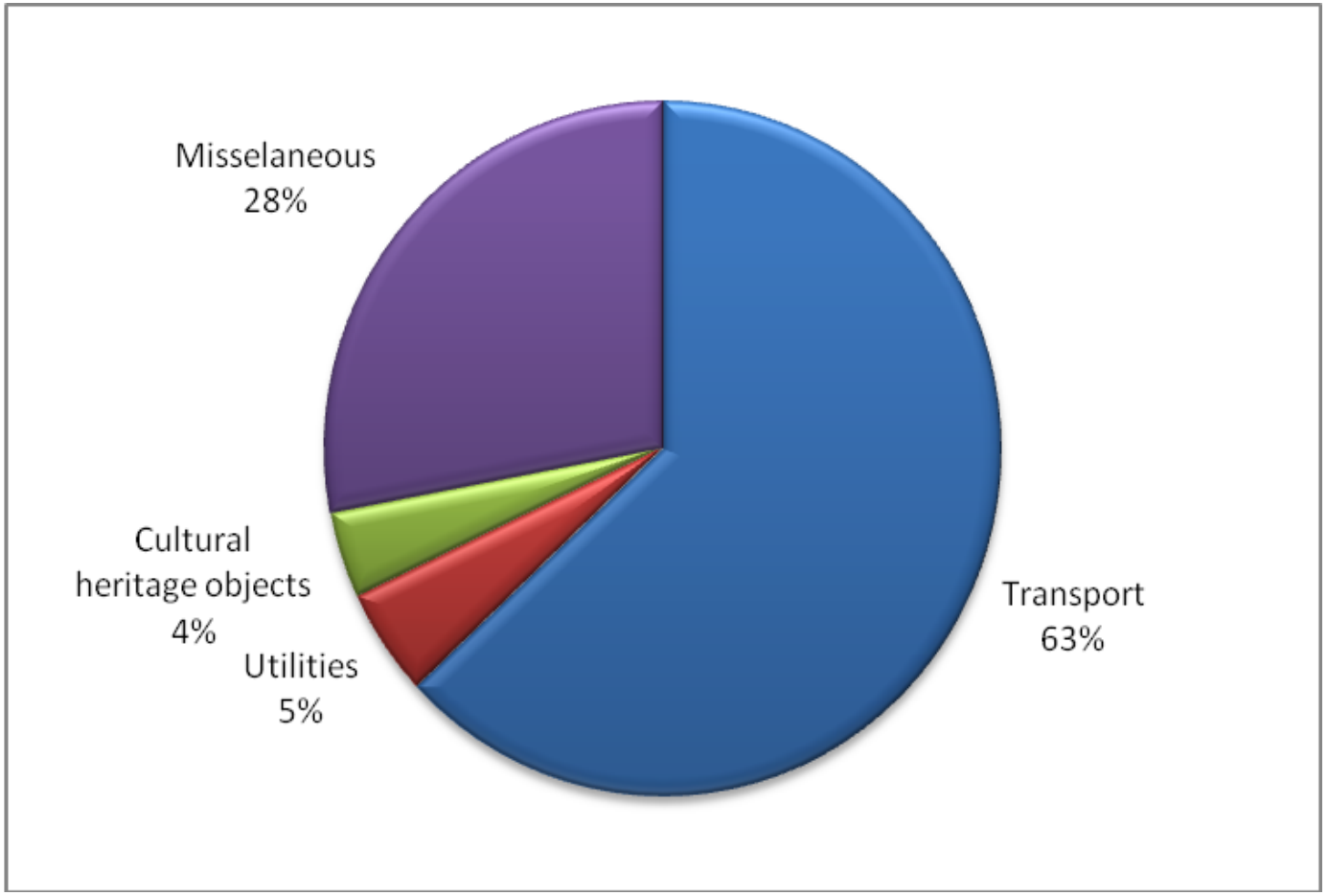


Source: Bobylev, N (2016) Underground Space as an Urban Indicator: Measuring Use of Subsurface. Tunnelling and Underground Space Technology, Elsevier. Volume 55

UUI state-of-the-art: Berlin

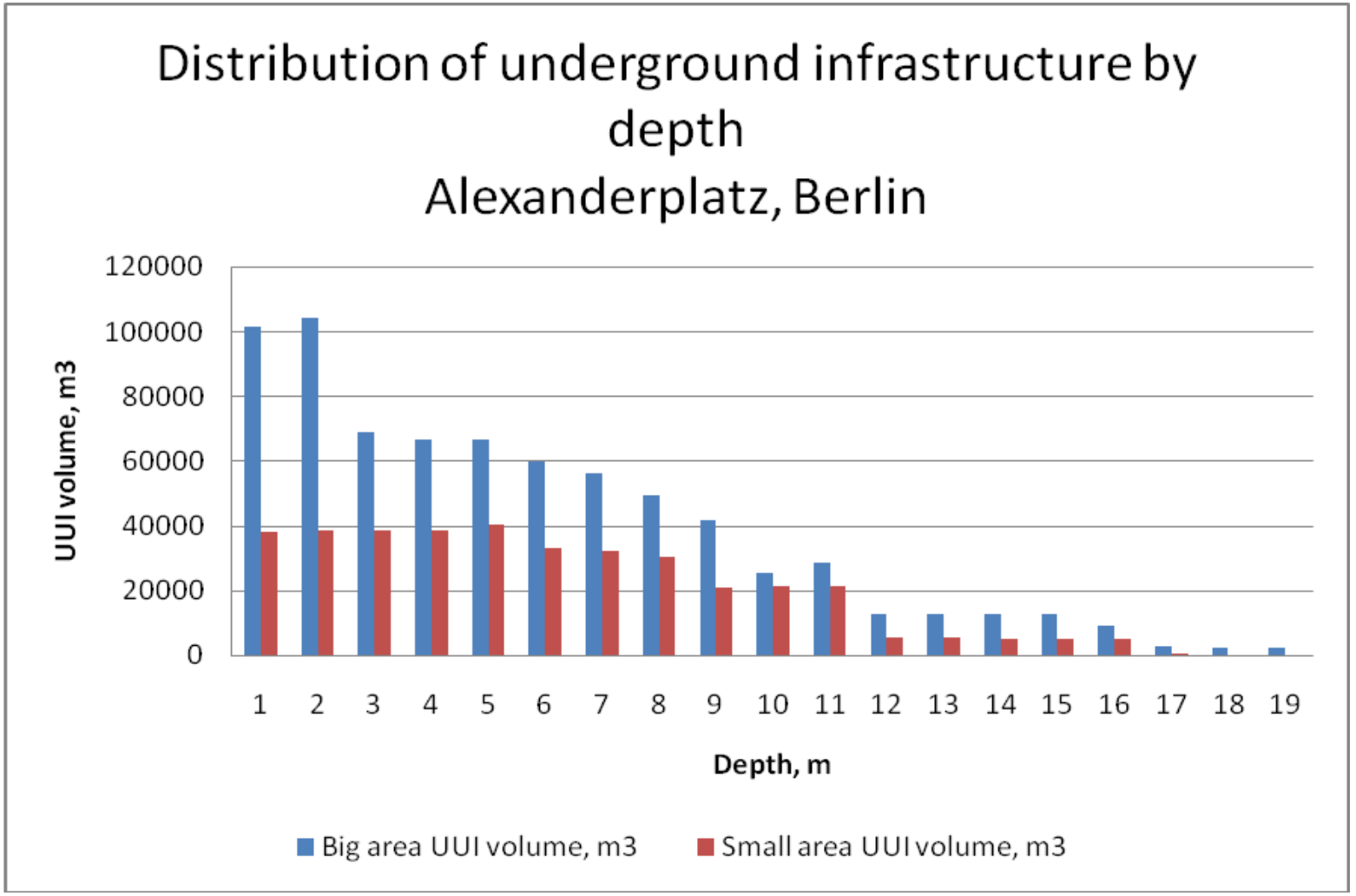
Analytical estimation of urban underground space use by function (Berlin, Alexanderplatz)



Source: Bobylev, Nikolai (2010) Underground Space Use in the Alexanderplatz Area, Berlin: research into the quantification of Urban Underground Space use. Tunnelling and Underground Space Technology, Elsevier, 31p

UUI state-of-the-art: Berlin

Quantification & statistics on UUI



Source: Bobylev, Nikolai (2010) Underground Space Use in the Alexanderplatz Area, Berlin: research into the quantification of Urban Underground Space use. Tunnelling and Underground Space Technology, Elsevier, 31p

Policy summary for a sustainable and resilient Urban Underground Space

Cities: addressing Sustainability, Resilience, Quality of Life

Cities: green, *sustainable, liveable, smart, climate-neutral, resilient*

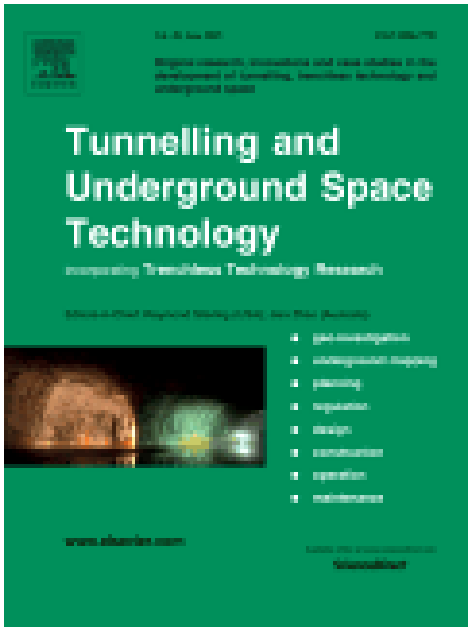
Key UUS policies:

- -master planning, 3D planning, urban density and efficiency
- -carbon capture and storage;
- -geothermal;
- -gas (compressed air storage);
- -groundwater

1. Create a vision on underground space use
2. Plan the use of underground space
3. Manage the use of underground space

Tunnelling and Underground Space Technology, Elsevier
Special Issues 2015-2016

Tunnelling and Underground Space Technology incorporating Trenchless Technology Research
Editor-in-Chief: Jian Zhao
5-Year Impact Factor: 1.833



http://www.journals.elsevier.com/
tunnelling-and-underground-space-technology/

Special Issues

The Emergence of Underground Space Use Planning and Design
Virtual Special Issue from Underground Space (1976—1985)

Improvements in Underground Space Utilization and Planning
Virtual Special Issue (1986 – 2014)

Urban Underground Space: A Growing Imperative
Perspectives and Current Research in Planning and Design for Underground Space Use (2016)

Main themes 2016

Urban Underground Space: A Growing Imperative. Perspectives and Current Research in Planning and Design for Underground Space Use

Sustainability, Resilience, Livability, Urbanization, Futures, Urban development concepts

Resources use, energy, land use, user competition, conflicts of interest

City planning, master plans, zoning, functional use, city case studies

Social sciences perspective: governance, administration, management, institutions, stakeholders, professionals, education, disciplines, policy and legal

Data, analysis, and tools: statistics, quantification, valuation, 3-dimentional mapping, GIS, decision analysis, economics

Human perspective: Architecture, interior design, health, ergonomics, psychology

Special and distinct issues: civil defense, disaster reduction, renewal, rehabilitation, redevelopment, environmental protection

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PEOPLE

ITA global perspective
URBAN UNDERGROUND SPACE IN A CHANGING WORLD

UN HABITAT
FOR A BETTER URBAN FUTURE

UEA
University of East Anglia

Thank you for your attention!

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