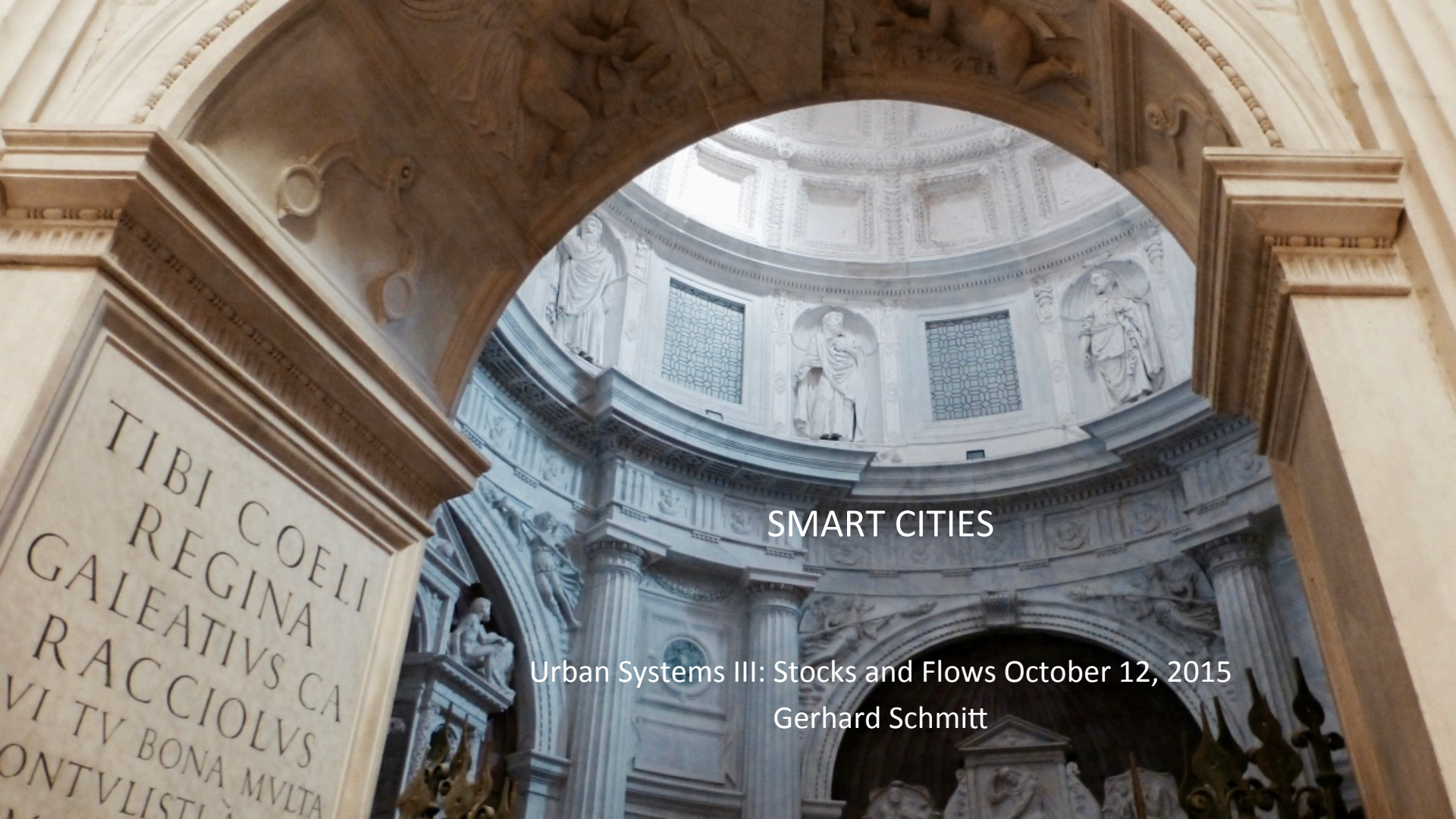

SMART CITIES

Urban Systems III: Stocks and Flows October 12, 2015

Gerhard Schmitt

Smart Cities

1 GS: Introduction	2 GS: Urban Systems I	3 PJ: Urban Systems II	4 GS: Urban Systems III	5 GS: Urban Research	6 GS: Urban Science	7 GS: Complexity Science	8 GS: Urban Governance	9 GS: Responsive Cities	10 GS: Final Critique
Principles of Information Architecture and Urban Simulation	Smart Cities	Methods and Tools for Urban Design	Stocks and Flows in Urban Systems	A Conversation: Measurements in the City	A Conversation: Citizen Design Science	Cities as Complex Systems	Participatory Design and Management	Cognitive Design Computing	Presentation of Results from 3 Courses
Exercise 1: Examples of Smart Cities			Exercise 2: Data Collection and Specification			Exercise 3: Energy and Mobility Data			Certificates

The story so far:

- 12.10.2015 Stocks and Flows
- 5.10.2015 Methods and Tools for Urban Design
- 28.9.2015 From smart houses to smart cities – emerging criteria for smart cities as urban systems
- 21.9.2015 Cities are complex systems. Ideally, they are sustainable, resilient, livable, smart, and finally responsive – from production machines to human habitat

Content

- Exercise 1: Presentation and discussion
- Stocks and Flows
- Exercise 2: Outlook

Content

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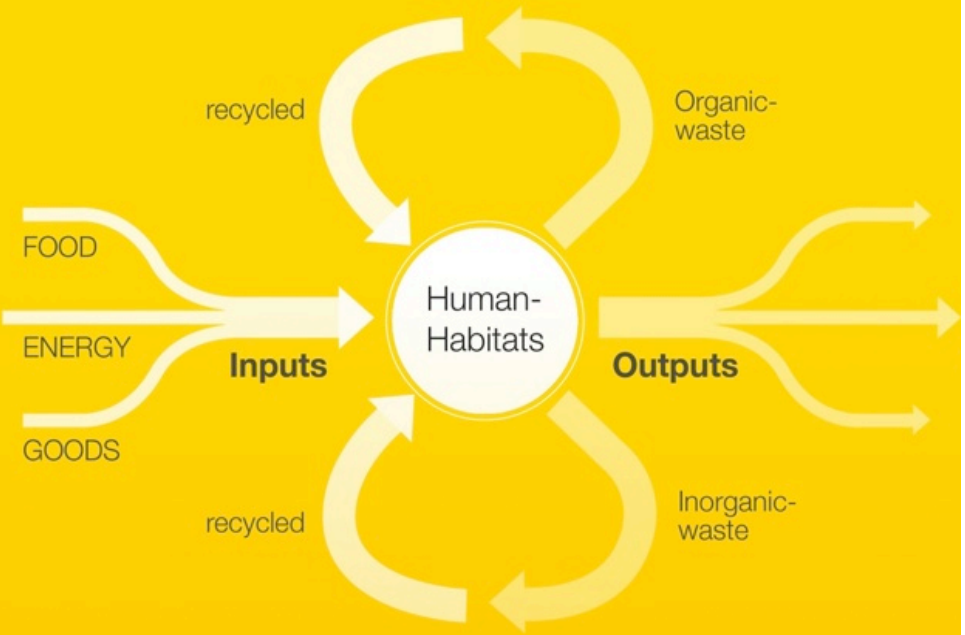
Motivation

In the next 30 years, urban living and working space for 2 Billion people is needed, mostly in tropical and sub-tropical areas. The present way to build cities does not scale. Needed: A massive change of perception and behaviour.



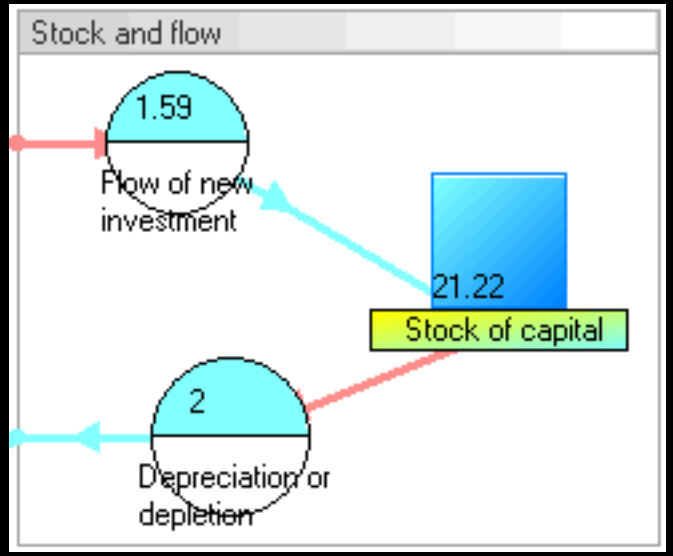
Urban Metabolism

Understand the city to behave as a dynamic and complex system

Read and model this system in terms of Stocks and Flows

Recognise Urban Stocks as basic elements of the urban metabolism and as locally available resources

Stocks and Flows - Origins



https://upload.wikimedia.org/wikipedia/commons/c/ca/StockFlow.gif

Stocks and Flows: People and Health

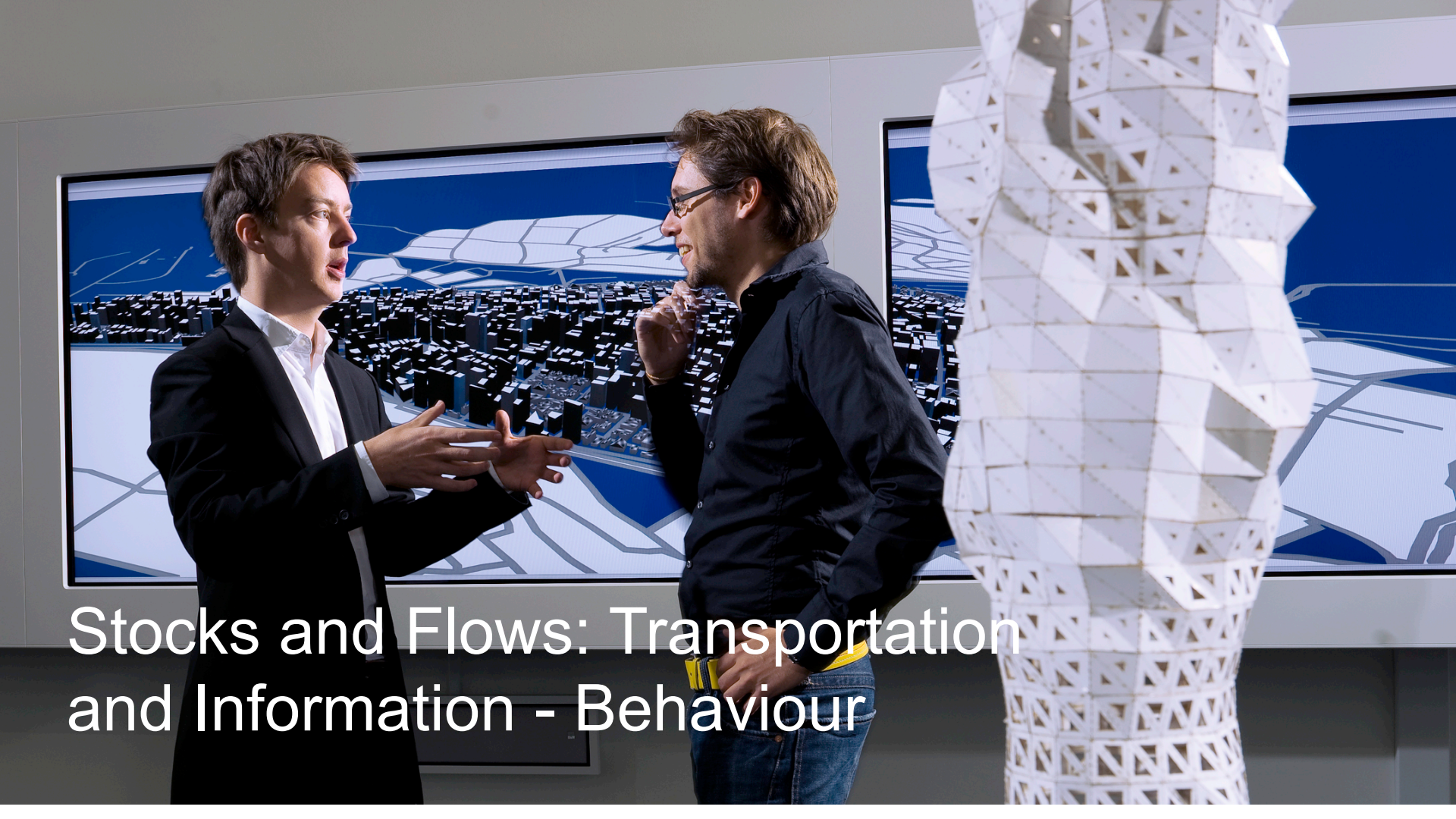
Stocks and Flows: Water and Capital - Behaviour

Stocks and Flows: Energy and Materials

Stocks and Flows: Energy and Materials - Behaviour

Stocks and Flows: Energy and Materials

Stocks and Flows: Space and Density -

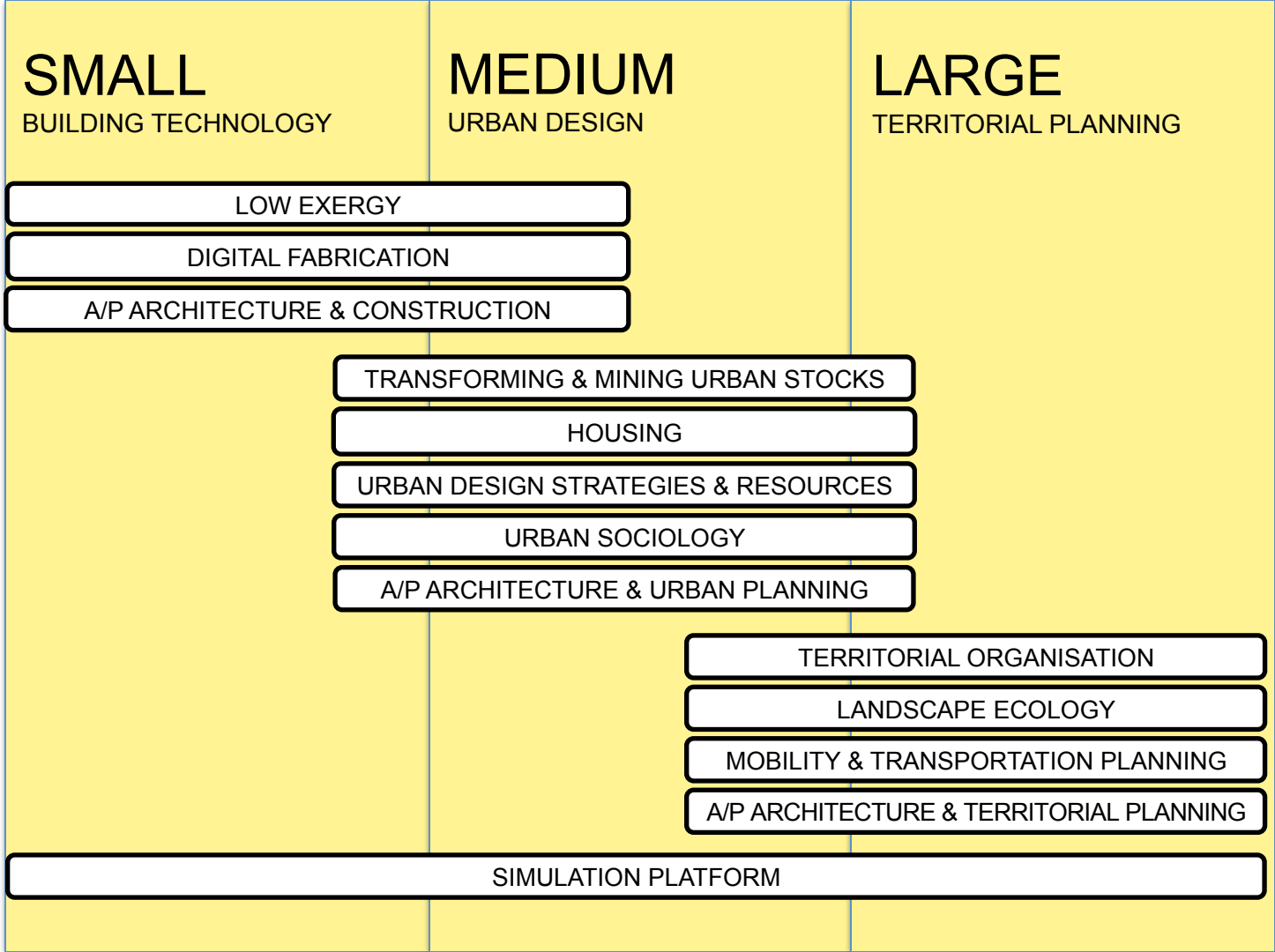


Stocks and Flows: Transportation and Information - Behaviour


The ETH Future Cities Laboratory in Singapore

Scales, Stocks and Flows

SPACE
ENERGY
MATERIALS
PEOPLE
CAPITAL
WATER
INFORMATION

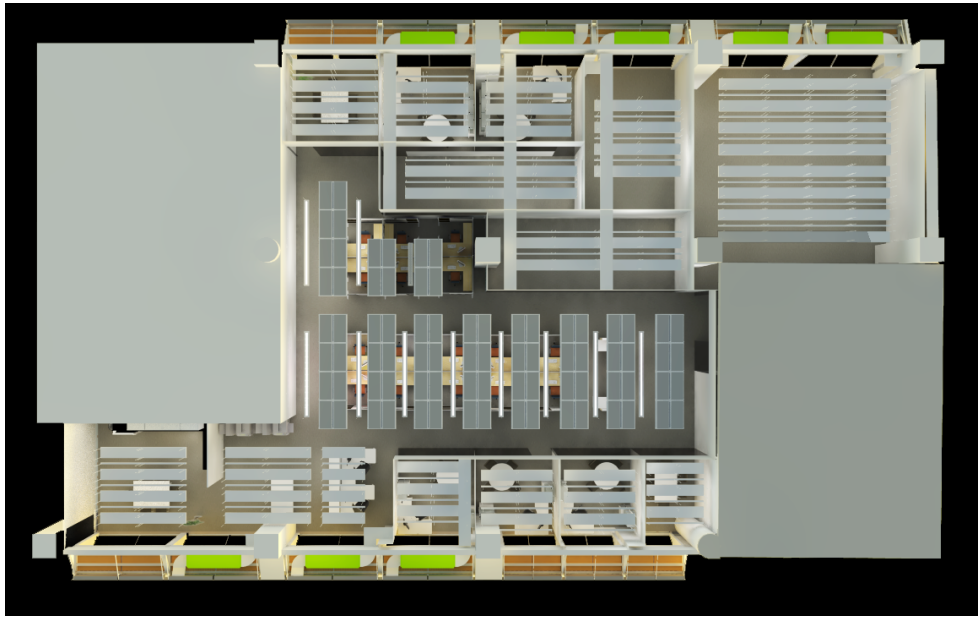


Reclaiming Backlanes – Boat Quay

3-for-2 @ UWC

From research to first application: 3-for-2 concept as a 600 m2 living lab at new UWC megablock

UWC megablock



3-for-2 project space

Research Modules

Digital Fabrication

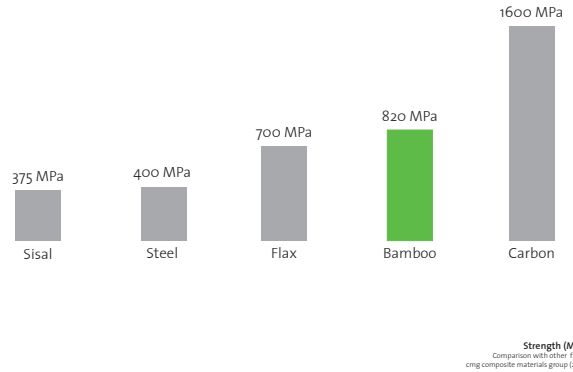
Prof. Fabio Gramazio
Prof. Matthias Kohler

Using robotic technology to design models of high-rise buildings.

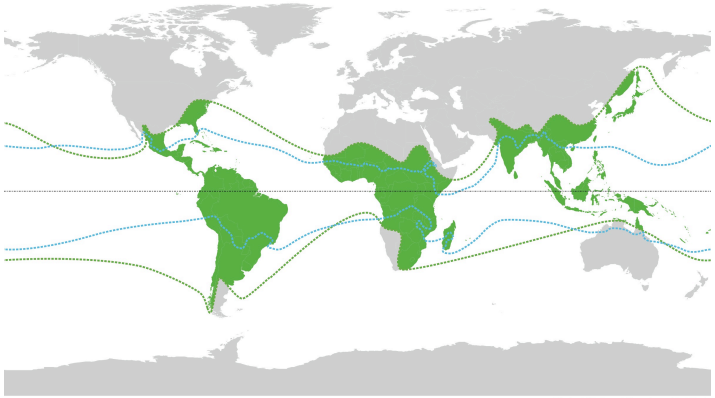
Image source: Bas Princen

Back to Stocks & Flows

Bamboo Concrete



Strength (MPa)
Comparison with other fibres
cmg composite materials group (2012)



Global Natural Bamboo Habitat
National Geographic (1980)

Research question: Can bamboo fibers be used to replace steel as a reinforcement material in concrete?

SMART Innovation Grant awarded in March 2013

Benefits of Bamboo as a construction material:

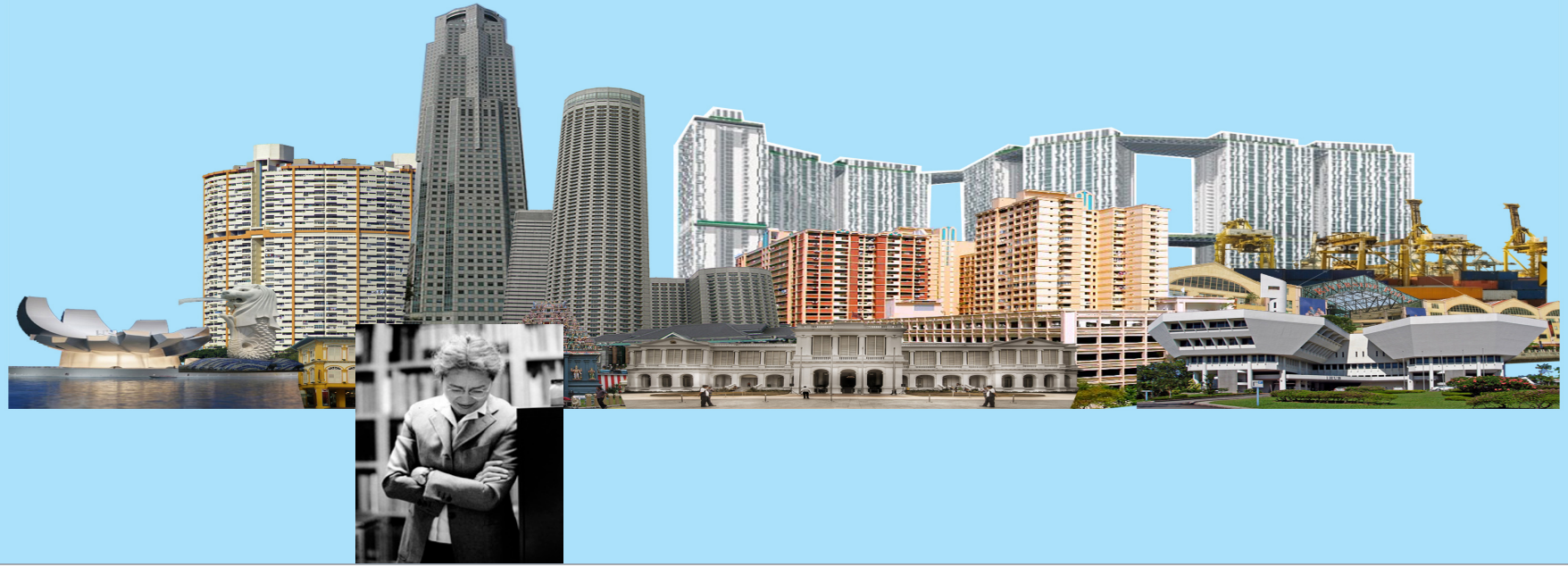
- Grows in most developing countries
- Tensile strength is double that of construction steel
- Produced as a composite material, it could be used as reinforcement in concrete structures
- It is a renewable resource, cheap, light and strong

Housing

Prof. Sacha Menz

An Interdisciplinary Case Study on the Development of Singapore Public Housing Typologies (1960-Present).

Image source: Module X



Research Modules

Transforming & Mining Urban Stocks

Prof. Dr Uta Hassler

Exploring the preservation and conservation of heritage buildings.

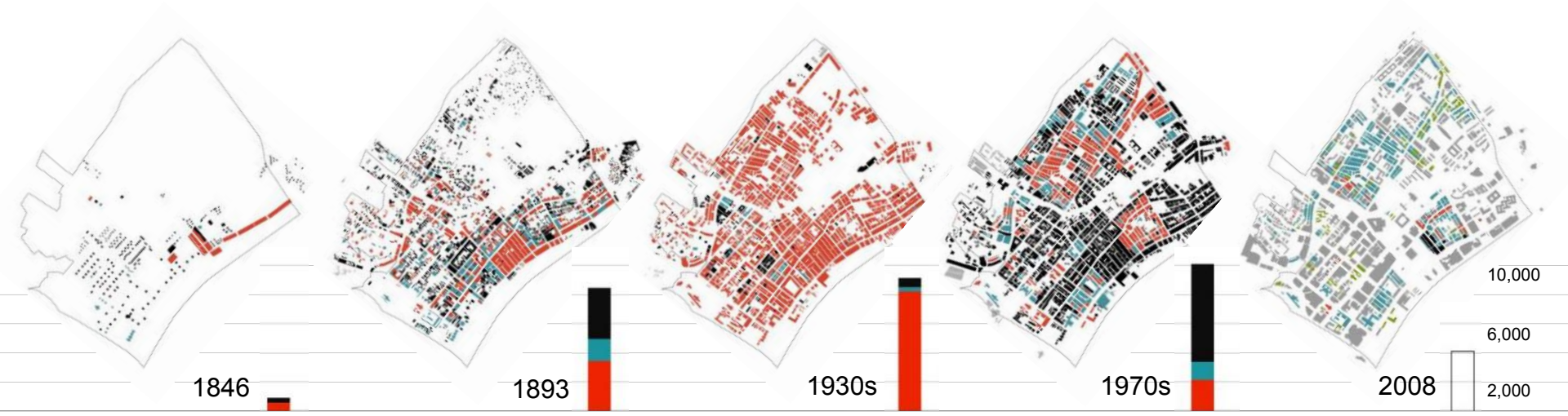
Image source: Module III

Back to Stocks & Flows

District scale

Rochor+ survival rate

Iris Belle, Uta Hassler, Ankur Choudhury, *in preparation*



Rochor+ building footprints map regression

Research Modules

Urban Design Strategies & Resources

Prof. Kees Christiaanse

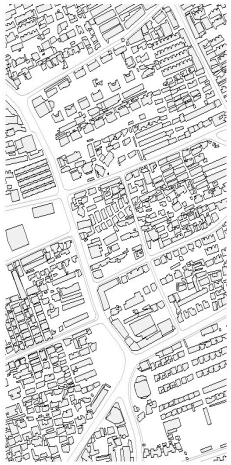
Investigating the notion of centralities in the city, and the role of the airport with respect to mobility, migration and infrastructure.

Image source: Max Hirsh

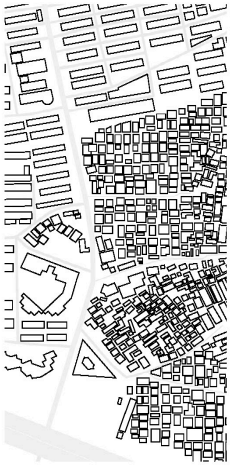
Back to Stocks & Flows

SINGAPORE

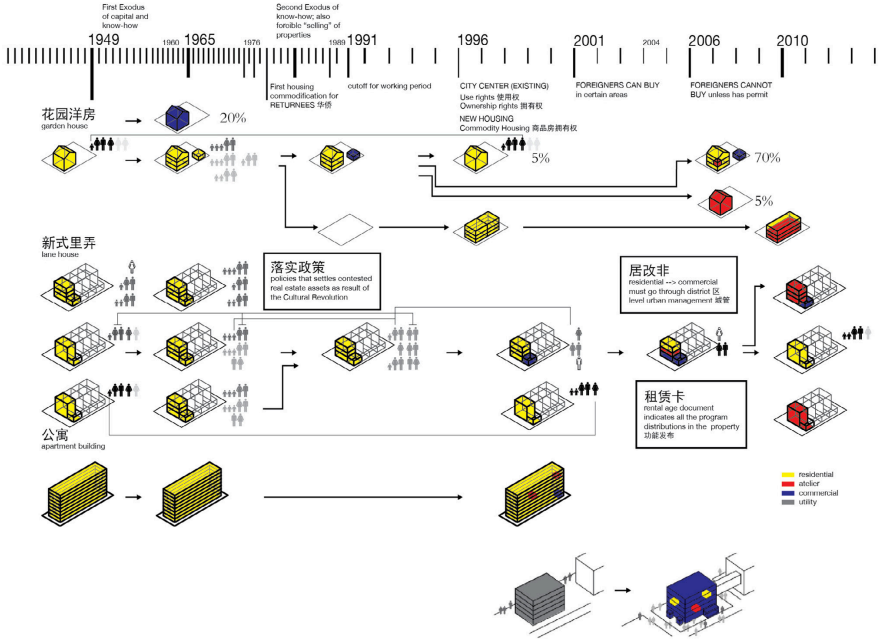
SHANGHAI

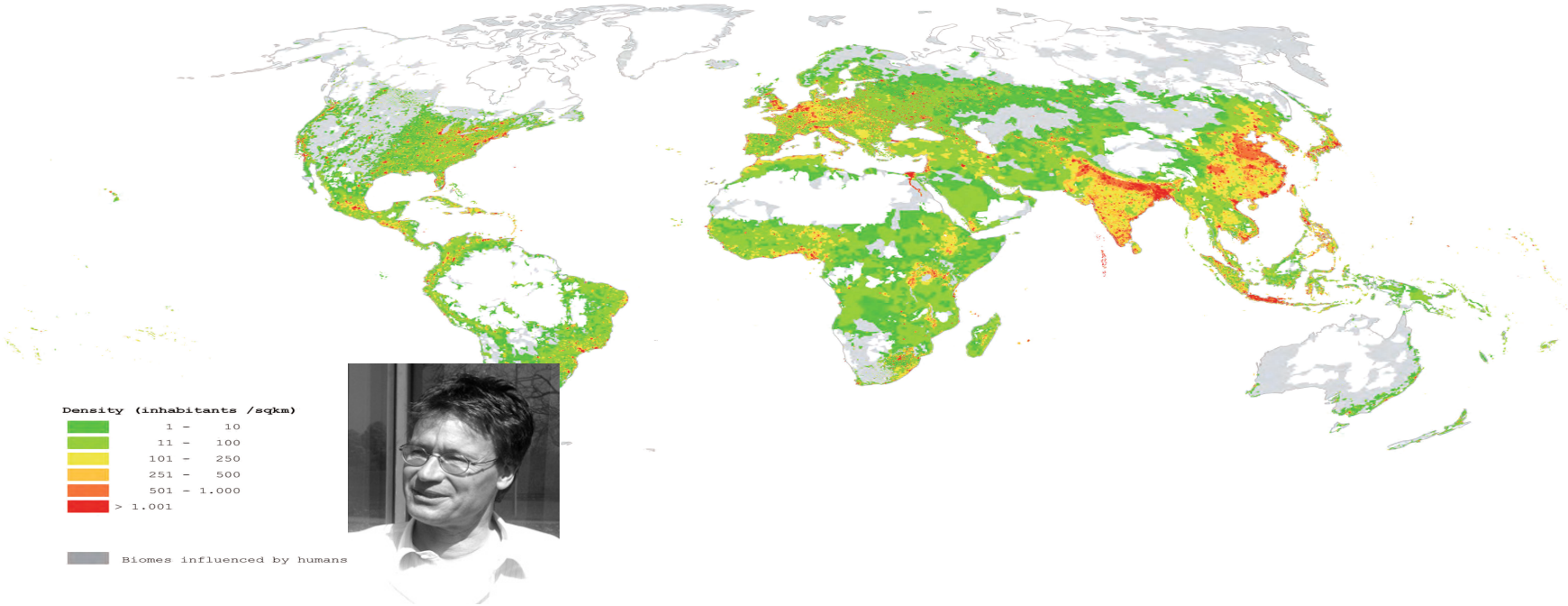


SHENZHEN



BANGKOK





Research Modules

Urban Sociology

Prof. Dr Christian Schmid

Comparative studies of cities.

Image source: Module V

Back to Stocks & Flows

Research Modules

Territorial Organisation

Prof. Dr Marc Angélil

Mitigating poverty through building sustainable towns.

Image source: Module VI

Back to Stocks & Flows

Research Modules

Landscape Ecology

Prof. Christophe Girot

Understanding and improving the future of urban rivers.

Image source: Derek Vollmer

Back to Stocks & Flows

Research Modules

Mobility & Transportation Planning

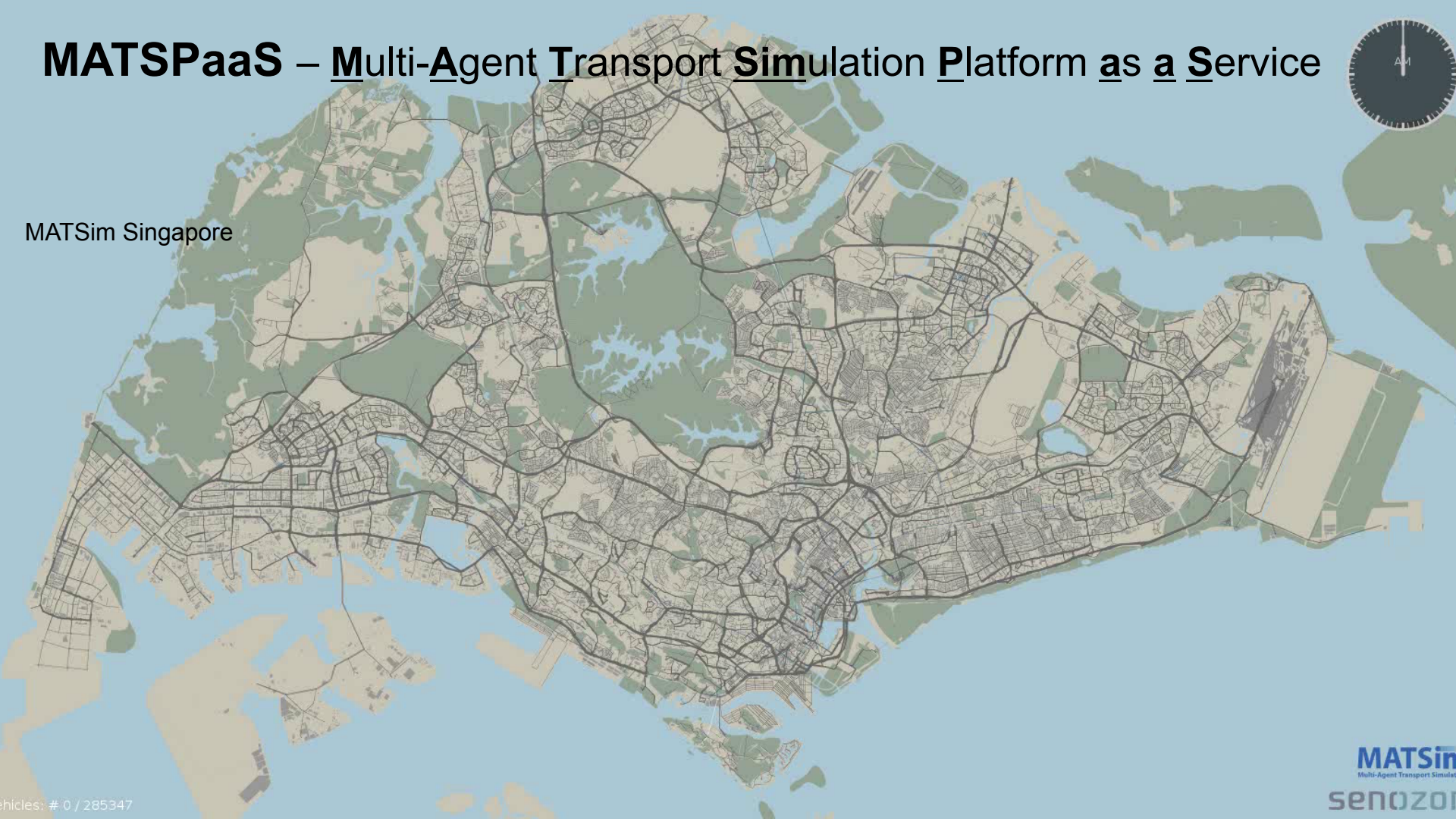
Prof. Dr Kay Axhausen

Studying urban transport systems to maximize efficiency.

Image source: Module VIII

Back to Stocks & Flows

MATSPaaS – **M**ulti-**A**gent **T**ransport **Sim**ulation **P**latform **a**s **a** **S**ervice



Content

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Summary

- The content of your exercises adds new dimensions to Smart Cities definition – congratulations!
- The topic is Smart Cities – but education or research do not appear in the criteria – meaning?
- Many of the cities selected are the same as in the Liveable Cities course – coincidence?
- Stocks and flows as a fundamental concept to understand cities
- The second exercise will focus on measurements supporting the definition of smartness and responsiveness