



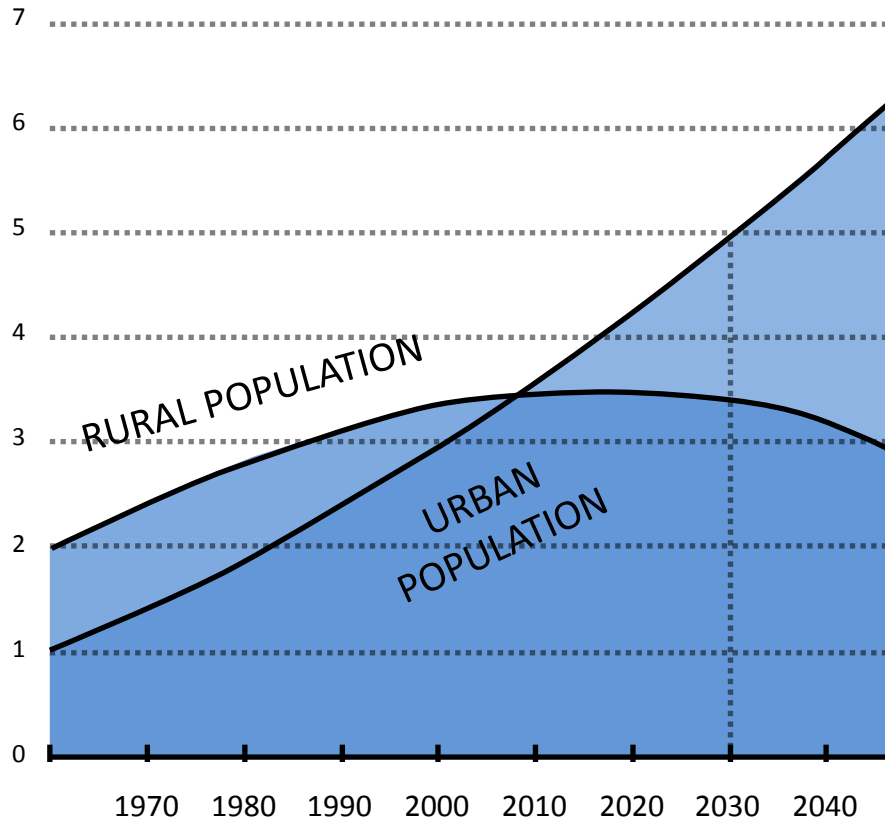
The Big Integration

Simulation Platforms for Low Carbon Decision Making

Dr. Matthias Berger

- Role of Information & BigData
- Interactive Tools for Decision Making
- Urban Planning @ FCL
- Beyond Smart Cities

Population (Billions)



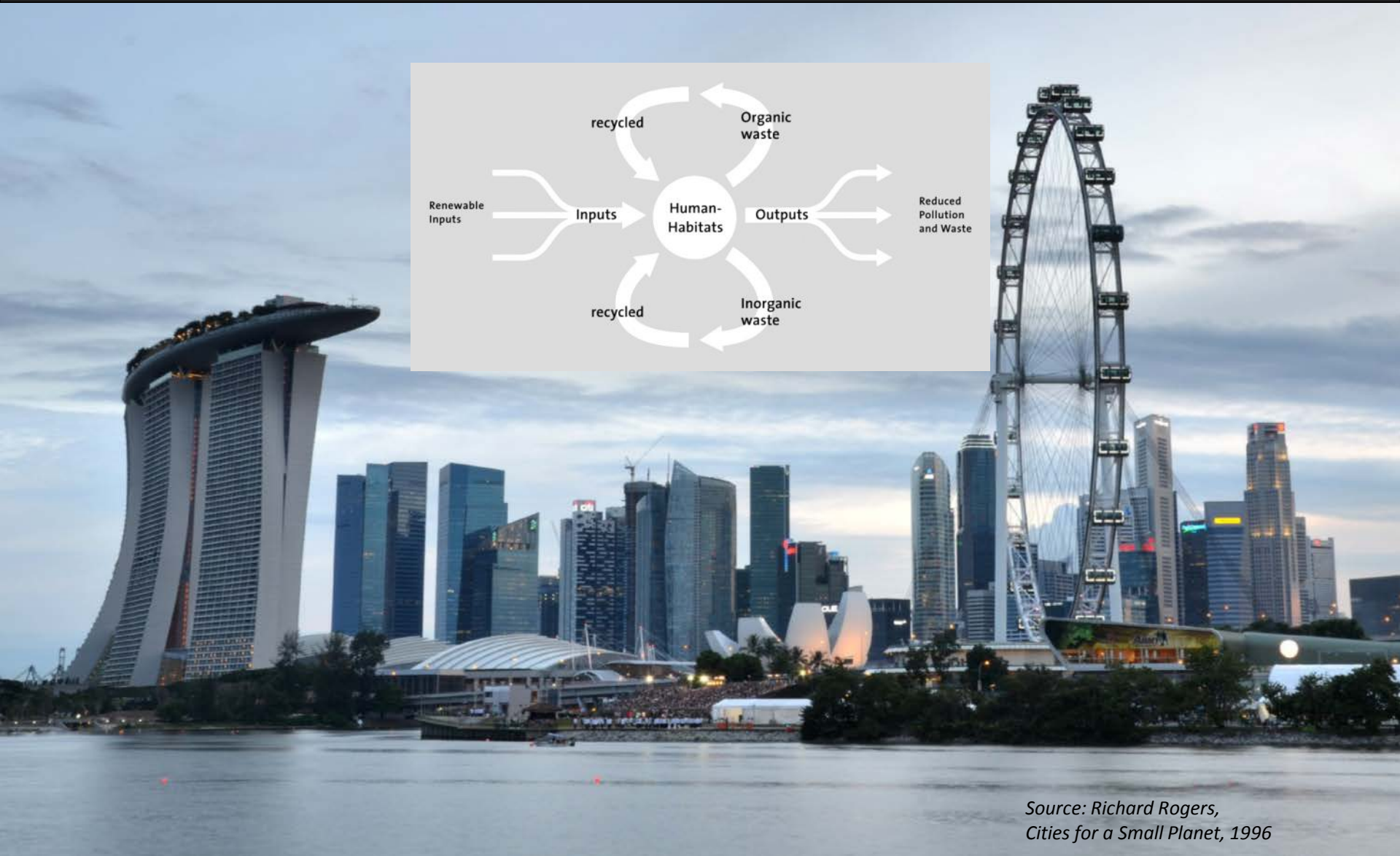
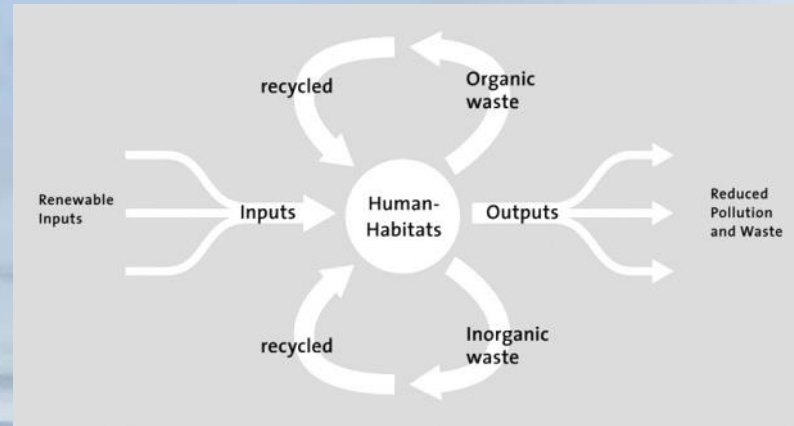
Expected urban and rural population growth

Source: GeoHive

Urbanization is continuing, but coming to an end.

We need to better understand how large cities are functioning in order to be able to design and plan more sustainable urban environments.





Source: Richard Rogers,
Cities for a Small Planet, 1996

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SMALL

BUILDING TECHNOLOGY

LOW EXERGY

DIGITAL FABRICATION

A/P ARCHITECTURE & CONSTRUCTION

MEDIUM

URBAN DESIGN

TRANSFORMING & MINING URBAN STOCKS

HOUSING

URBAN DESIGN STRATEGIES & RESOURCES

URBAN SOCIOLOGY

A/P ARCHITECTURE & URBAN PLANNING

LARGE

TERRITORIAL PLANNING

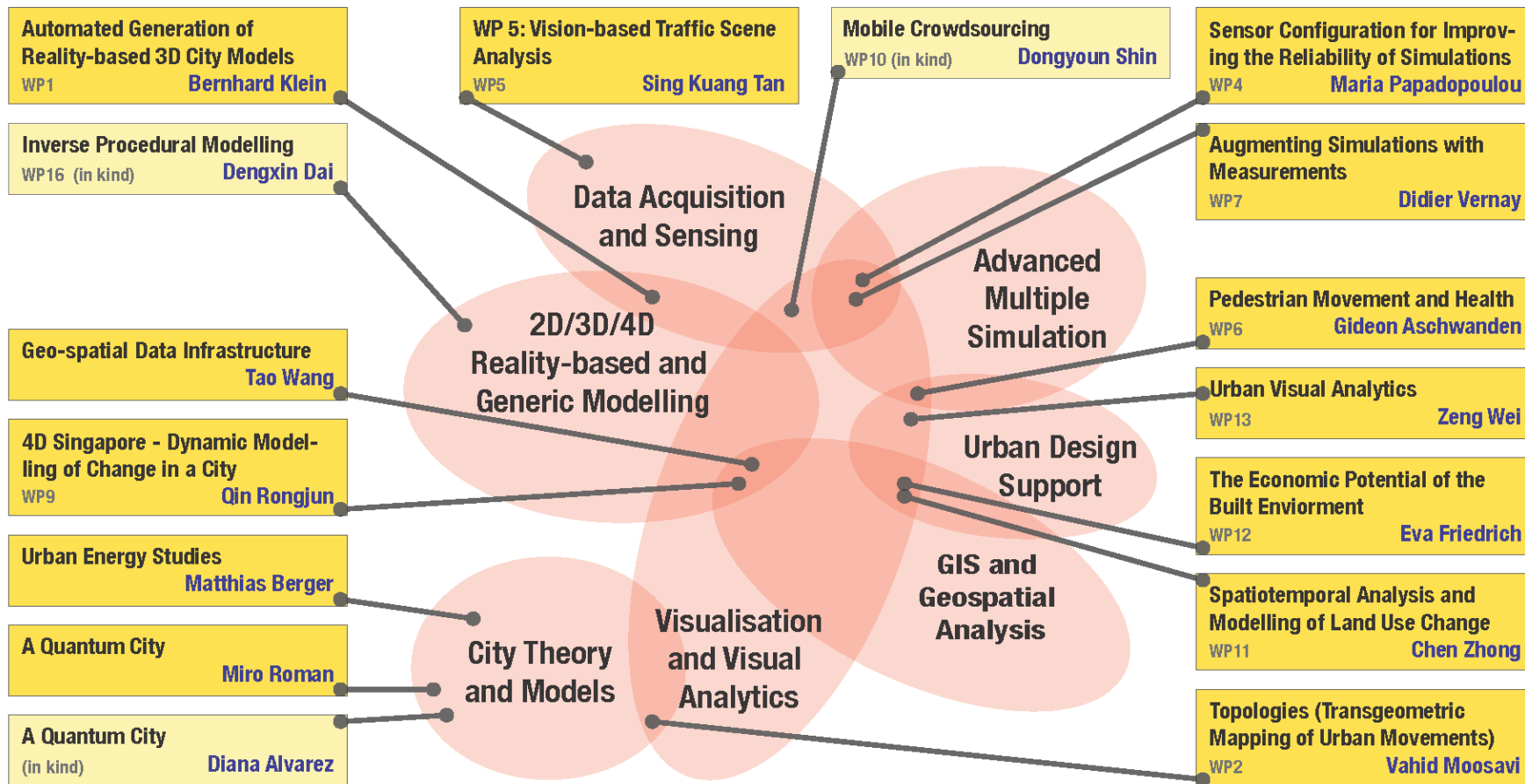
TERRITORIAL ORGANISATION

LANDSCAPE ECOLOGY

MOBILITY & TRANSPORTATION PLANNING

A/P ARCHITECTURE & TERRITORIAL PLANNING

SIMULATION PLATFORM



Module Leader: Prof. Dr. Gerhard Schmitt

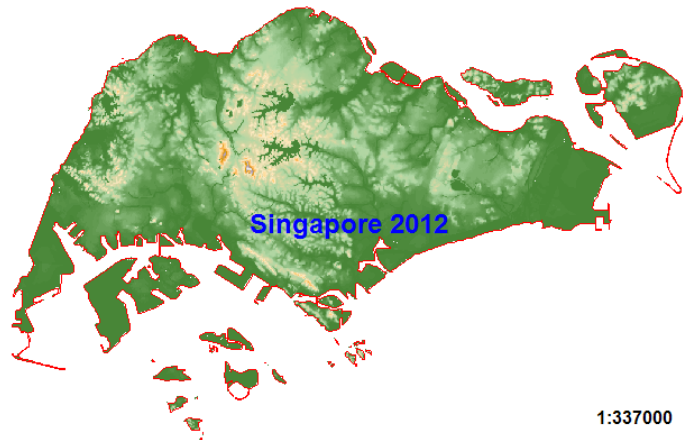
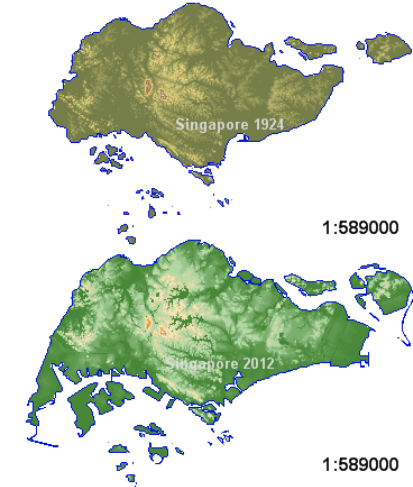
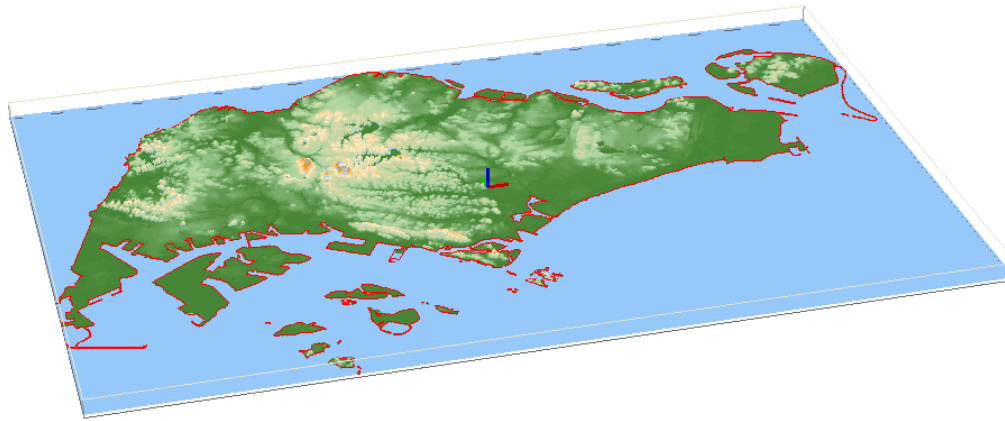
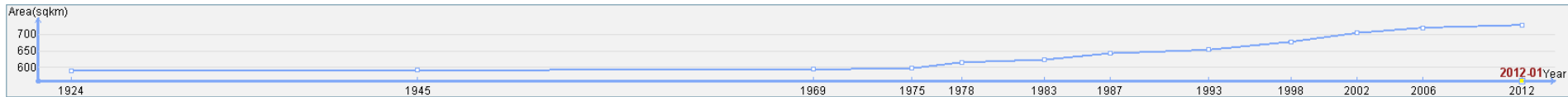
Principal Investigators: Prof. em. Dr. Armin Grün - Prof. Dr. Ludger Hovestadt - Prof. Dr. Ian Smith - Prof. Dr. Stefan Müller Arisona

Affiliated Faculty: Prof. Dr. Luc van Gool (ETH Zurich) - Prof. Dr. Tat Jen Cham (NTU) - Prof. Dr. Chi-Wing Fu (NTU) - Prof. Dr. Benny Raphael (NUS)

Postdoctoral Fellows: Dr. Matthias Berger - Dr. Tao Wang - Dr. Bernhard Klein

System Specialists: Daniel Sin - Rewell Dangoy

Dynamics and Transformation of Singapore's Topography from 1924 to 2012



Simulation of the transformation of topographic surface from 1924 to 2012 based on digital elevation models of two years and coast lines of 12 separate years reconstructed from topographic maps. The simulation is based on a modified geo-morphing algorithm.

The digital elevation data has been used in the synergy project "Transforming Topographies", together with Module III Professor Uta Hassler and assistant Professor Milica Topalovic. The National Archives of Singapore and the Mapping Unit of the Ministry of Defence are gratefully acknowledged as data sources.

Urban Monitoring with Unmanned Aerial Vehicles (UAVs)

3D campus map of the National University of Singapore.

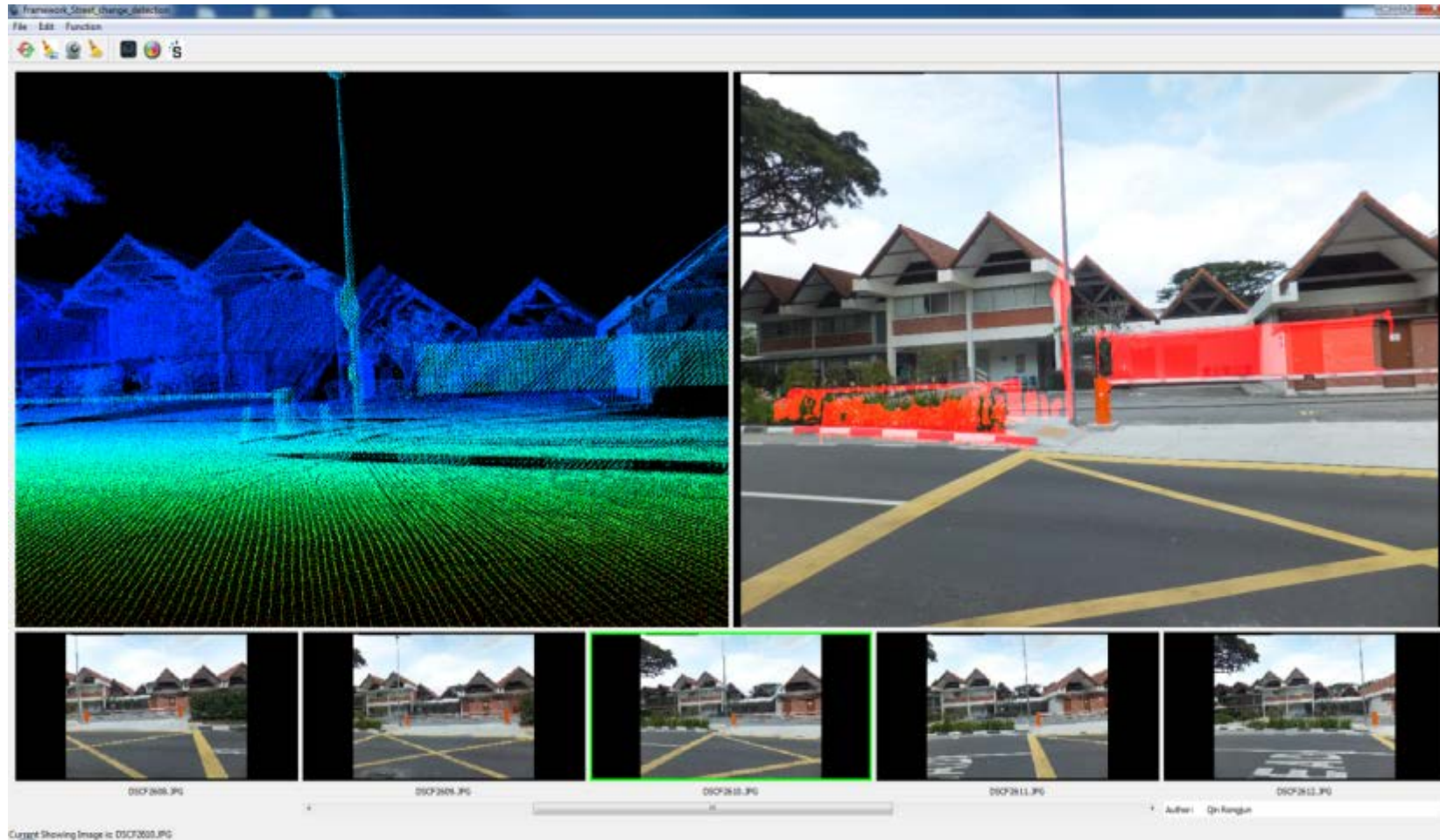


Urban Monitoring with Unmanned Aerial Vehicles (UAVs)

UAVs are a flexible platform to acquire high resolution information for small scale urban applications. We develop techniques to monitor small-scale changes in urban environments or to identify Dengue hotspots.



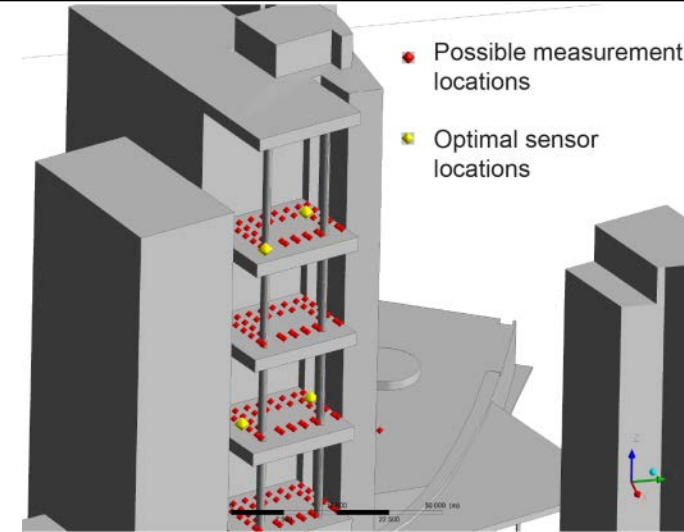
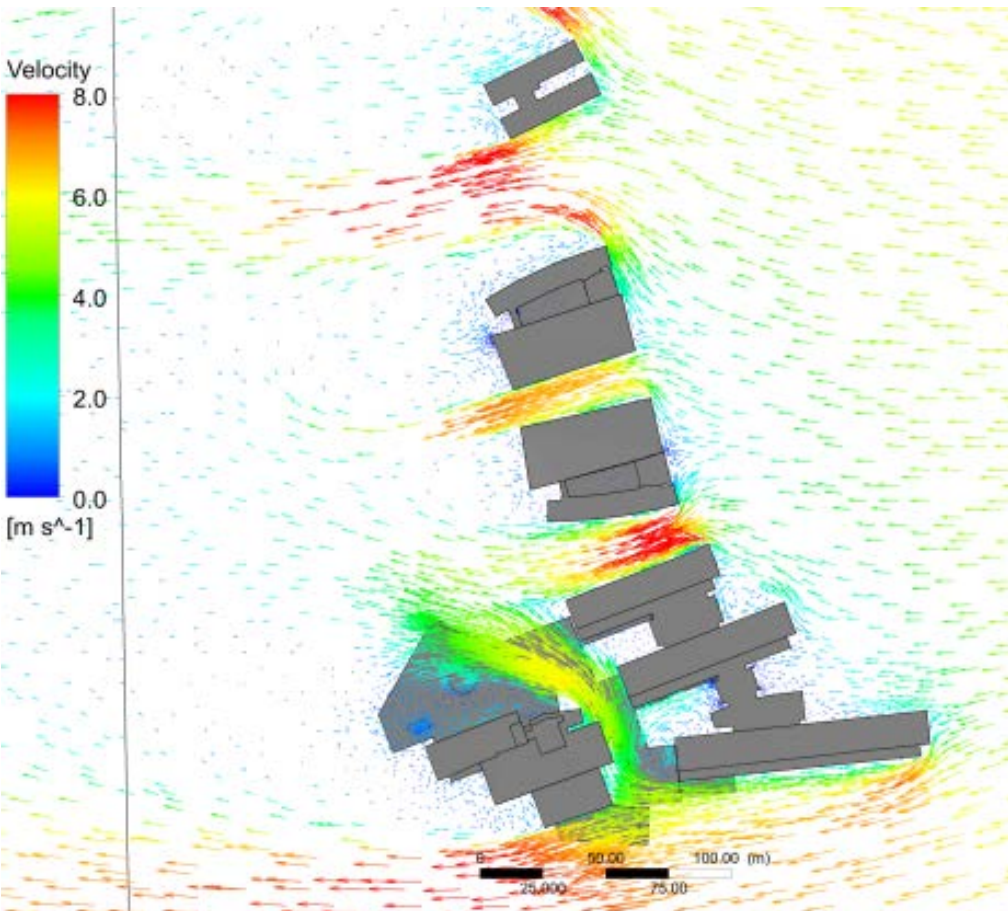
Change Detection at Street Level for Urban Facility Management



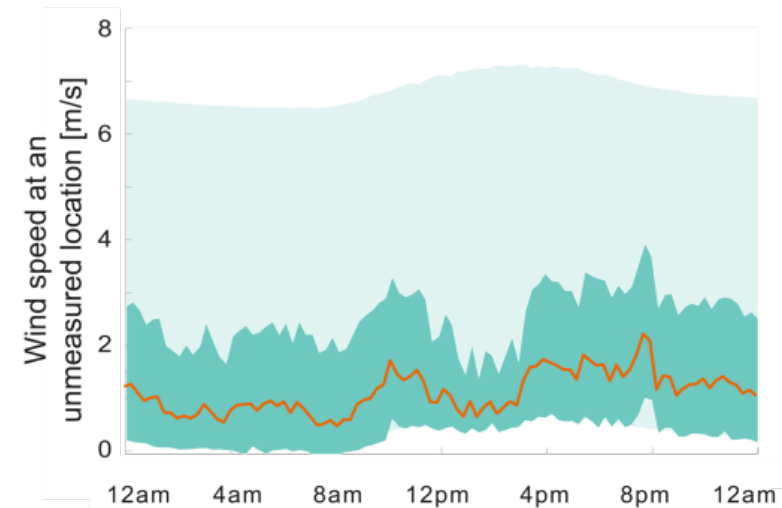
Using geospatial technologies, changes happen at the street side can be efficiently detected. It has the potential to release the labor effort to visit on site for checking facility damages, illegal dumping. Mobile Mapping Systems (Vehicles equipped with laser scanner and mass image acquisition system) could help to rapidly acquire 3D information. We develop algorithms to detect the differences of the 3D data captured from different period, which could serve as a tool to locate the changes with minimal effort.

Prediction of Airflow around High-rise Buildings

Measurement data are employed to improve Computational-Fluid Dynamics predictions optimal sensor locations are locations with the highest information content (entropy-measure).



- Prediction ranges **before** measurements
- Prediction ranges **after** measurements
- Mean values **after** measurements



An aerial photograph of a city, likely Singapore, showing a mix of high-rise apartment blocks and older, lower-rise buildings with red-tiled roofs. A central road with traffic is visible, and the sky is clear and blue.

Key Message:

Information is needed as basic input in models and simulations based on bottom-up engineering.

Contrary, BigData is strong in black-box models.

- Role of Information & BigData
- Interactive Tools for Decision Making
- Urban Planning @ FCL
- Beyond Smart Cities

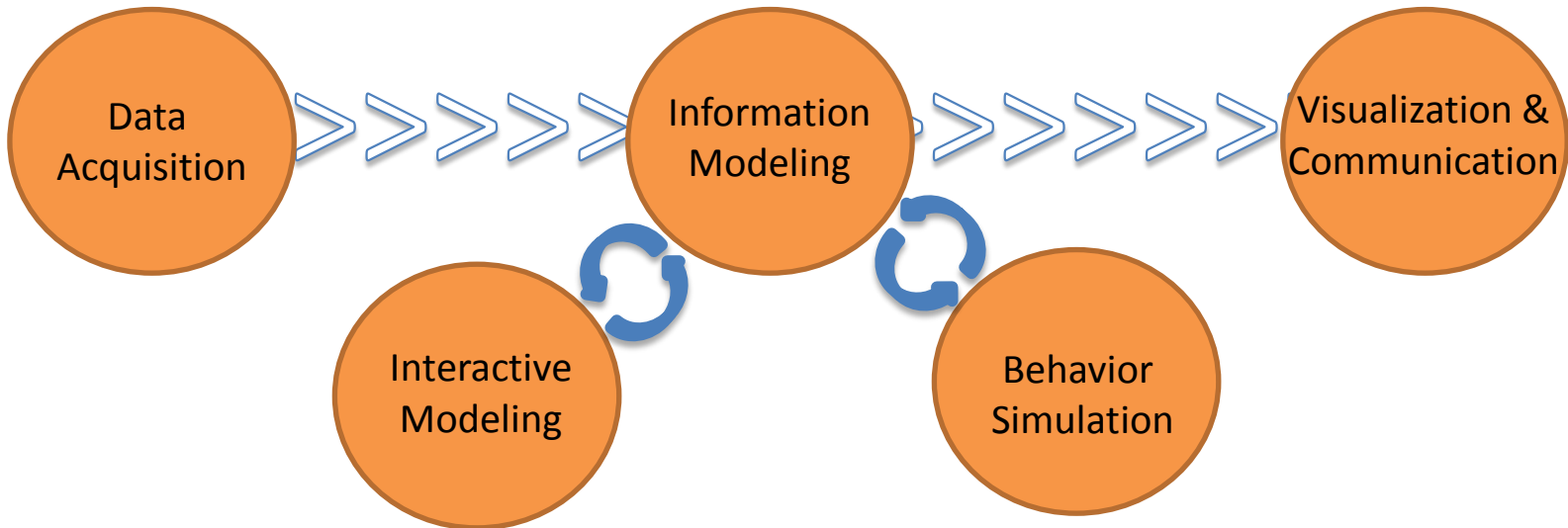
The Big Integration

(SEC) SINGAPORE-ETH 新加坡-ETH
CENTRE 研究中心

(FCL) FUTURE CITIES LABORATORY 未来城市实验室



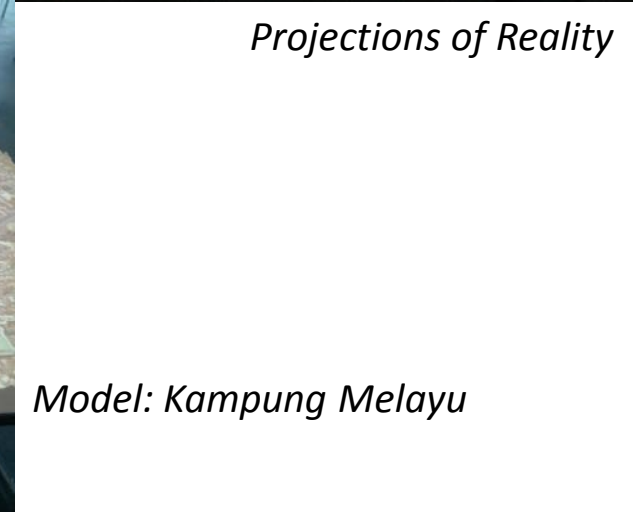
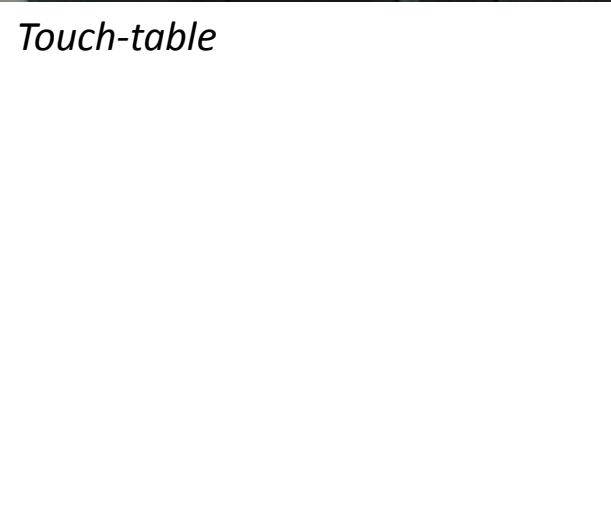
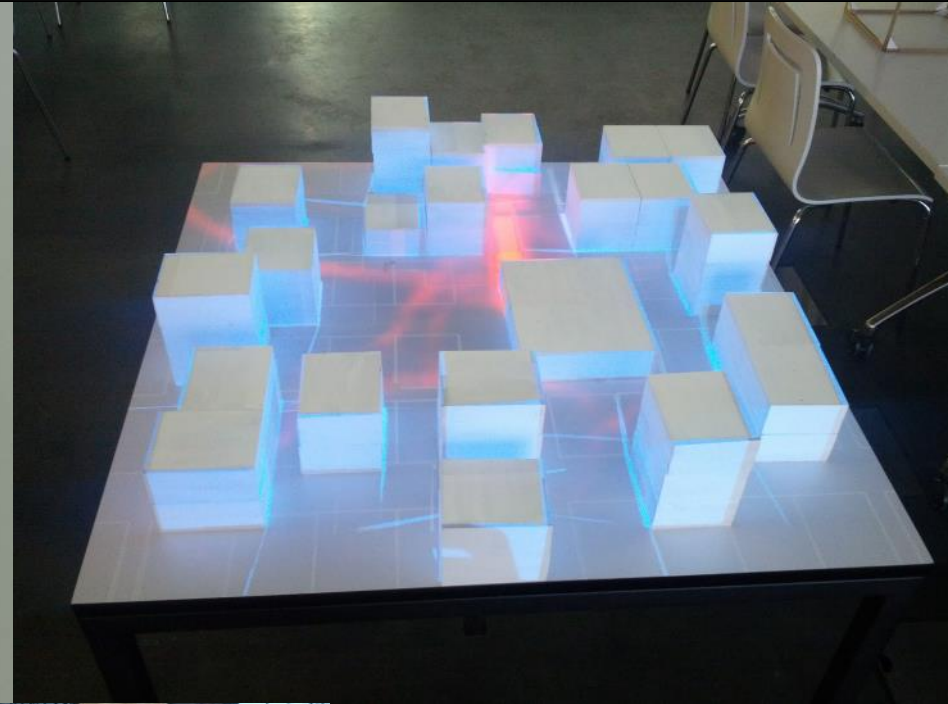
Drawing: Lukas Treyer, ETH Zürich, 2005



The Big Integration

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城市
实验室



Touch-table

Projections of Reality

Model: Kampung Melayu



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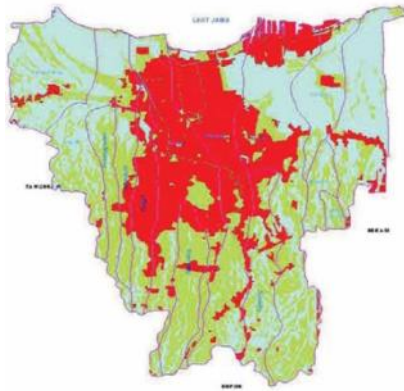


Key Message:

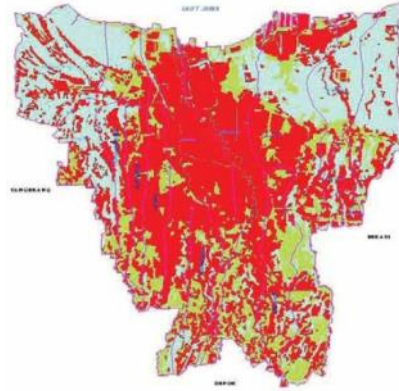
Transforming data and information into knowledge can be enhanced by interactive visualizations and workspaces.

- Role of Information & BigData
- Interactive Tools for Decision Making
- **Urban Planning @ FCL**
- Beyond Smart Cities

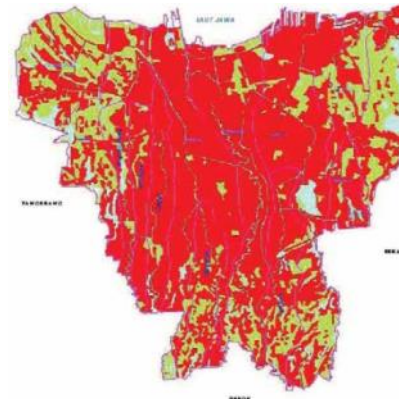
Population Growth



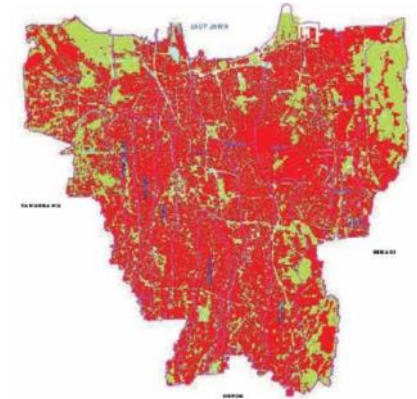
1970



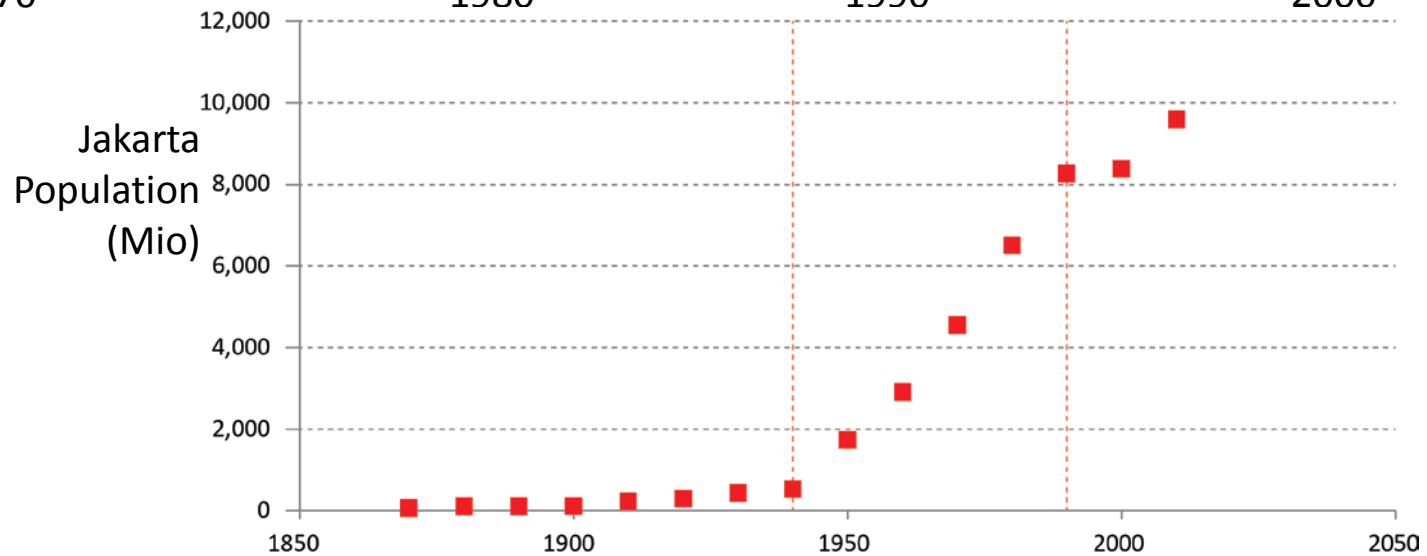
1980



1990



2000



Urban Analysis: Stocks and Flows of Finance



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TEMPAT TINGGAL	Milik	<input type="text"/>	Sewa	<input type="text"/>	

DATA RUMAH TANGGA

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Anak (berapa)	<input type="text"/>	Keluarga Lainnya (Paman, sepupu dll)	<input type="text"/>	Jelaskan	<input type="text"/>
Lainya (Kos dll) (berapa)	<input type="text"/>		<input type="text"/>	Jelaskan	<input type="text"/>
JUMLAH ORANG	<input type="text"/>				

EKONOMI DOMESTIK

ANGGOTA KELUARGA 1	Usia	Pendidikan Terakhir						Jenis Kelamin		Suku Bangsa							
Deskripsi Pekerjaan	IRT, Buruh Pabrik, Supir Ojek, Mahasiswa, Pekerja Toko, UKM, Professional, dll						Jauh Tempat Kerja Km		-0.5	0.5	1	2	3	5	10	+20	
Gaji (Rupiah/Bulan)	<300rb	300-500rb	500rb-1jt	1-1,5jt	1,5-2jt	2jt-3jt	3jt-5jt	5jt-10jt	10jt+	Lokasi Tempat Kerja							
Jumlah Hari Kerja (Bulan)	<3	5	10	15	20	25	30	Lama Berkerja Bulan/tahun		<3 bul	3 bul	6 bul	12 bul	1 tah	2 tah	5 tah	+10 tah
Lama Tinggal disini?	3 bulan	6 bulan	1 tahun	2 tahun	3 tahun	4 tahun	5 tahun	6 tahun	10+	Lahir							
Asal Kelurahan/Kota																	
Frekwensi Pulang Kampung?	3 bulan	6 bulan	1 tahun	2 tahun	3 tahun	4 tahun	5 tahun	6 tahun	10+	Tak pernah							

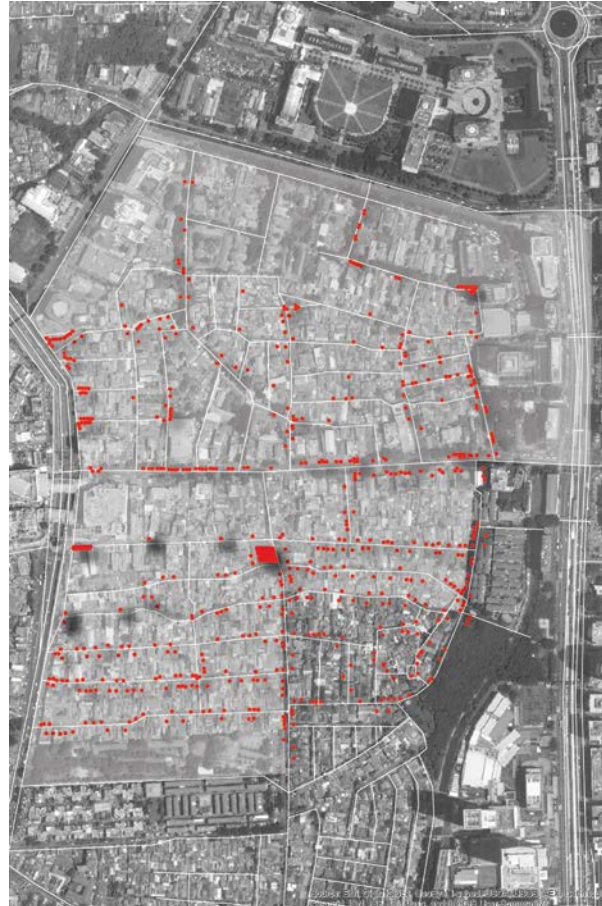
ANGGOTA KELUARGA 2	Usia	Pendidikan Terakhir						Jenis Kelamin		Suku Bangsa							
Deskripsi Pekerjaan	IRT, Buruh Pabrik, Supir Ojek, Mahasiswa, Pekerja Toko, UKM, Professional, dll						Jauh Tempat Kerja Km		-0.5	0.5	1	2	3	5	10	+20	
Gaji (Rupiah/Bulan)	<300rb	300-500rb	500rb-1jt	1-1,5jt	1,5-2jt	2jt-3jt	3jt-5jt	5jt-10jt	10jt+	Lokasi Tempat Kerja							
Jumlah Hari Kerja (Bulan)	<3	5	10	15	20	25	30	Lama Berkerja Bulan/tahun		<3 bul	3 bul	6 bul	12 bul	1 tah	2 tah	5 tah	+10 tah
Lama Tinggal di Pluit/Marda?	3 bulan	6 bulan	1 tahun	2 tahun	3 tahun	4 tahun	5 tahun	6 tahun	10+	Lahir							
Asal Kelurahan/Kota																	
Frekwensi Pulang Kampung?	3 bulan	6 bulan	1 tahun	2 tahun	3 tahun	4 tahun	5 tahun	6 tahun	10+	Tak pernah							

ANGGOTA KELUARGA 3	Usia	Pendidikan Terakhir						Jenis Kelamin		Suku Bangsa							
Deskripsi Pekerjaan	IRT, Buruh Pabrik, Supir Ojek, Mahasiswa, Pekerja Toko, UKM, Professional, dll						Jauh Tempat Kerja Km		-0.5	0.5	1	2	3	5	10	+20	
Gaji (Rupiah/Bulan)	<300rb	300-500rb	500rb-1jt	1-1,5jt	1,5-2jt	2jt-3jt	3jt-5jt	5jt-10jt	10jt+	Lokasi Tempat Kerja							
Jumlah Hari Kerja (Bulan)	<3	5	10	15	20	25	30	Lama Berkerja Bulan/tahun		<3 bul	3 bul	6 bu	12 bul	1 tah	2 tah	5 tah	+10 tah
Lama Tinggal di Marunda?	3 bulan	6 bulan	1 tahun	2 tahun	3 tahun	4 tahun	5 tahun	6 tahun	10+	Lahir							
Asal Kelurahan/Kota																	

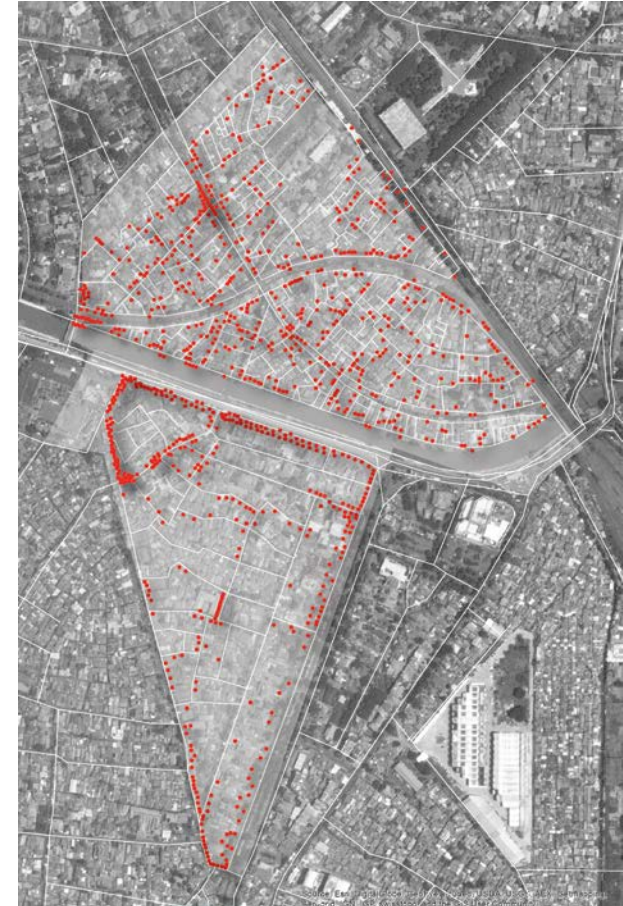
Business Survey in three Kampung in Jakarta



Sawah Besar



Kampung Bali



Menteng

Business Activities in Different Urban Settings

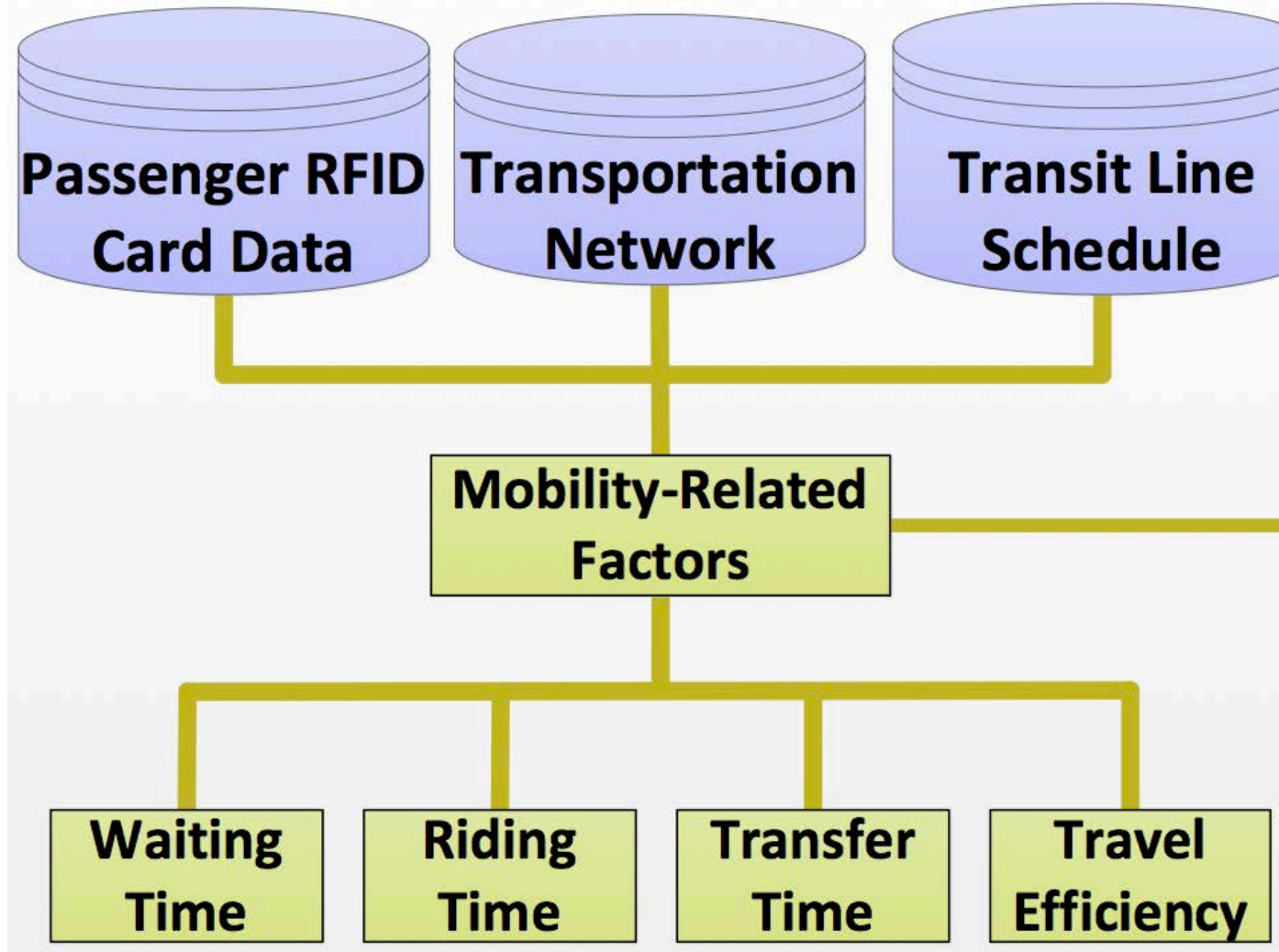


Visual Analytics: How People Move...





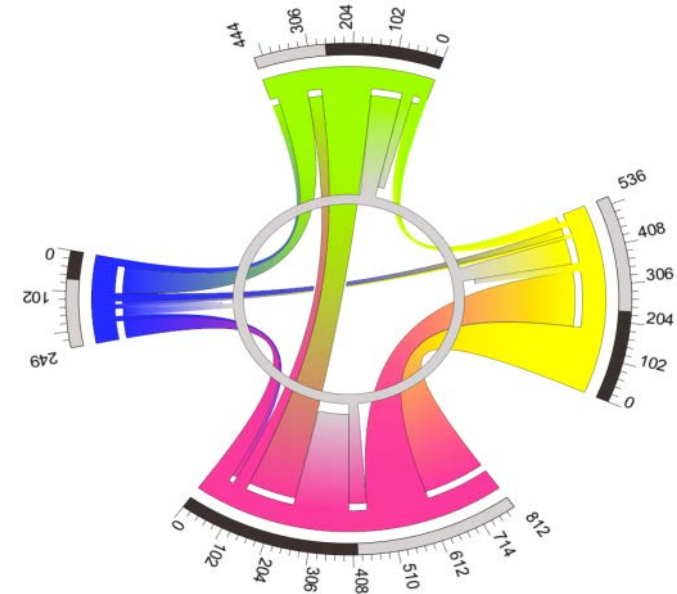
Photograph: Calvin Teo, 2005

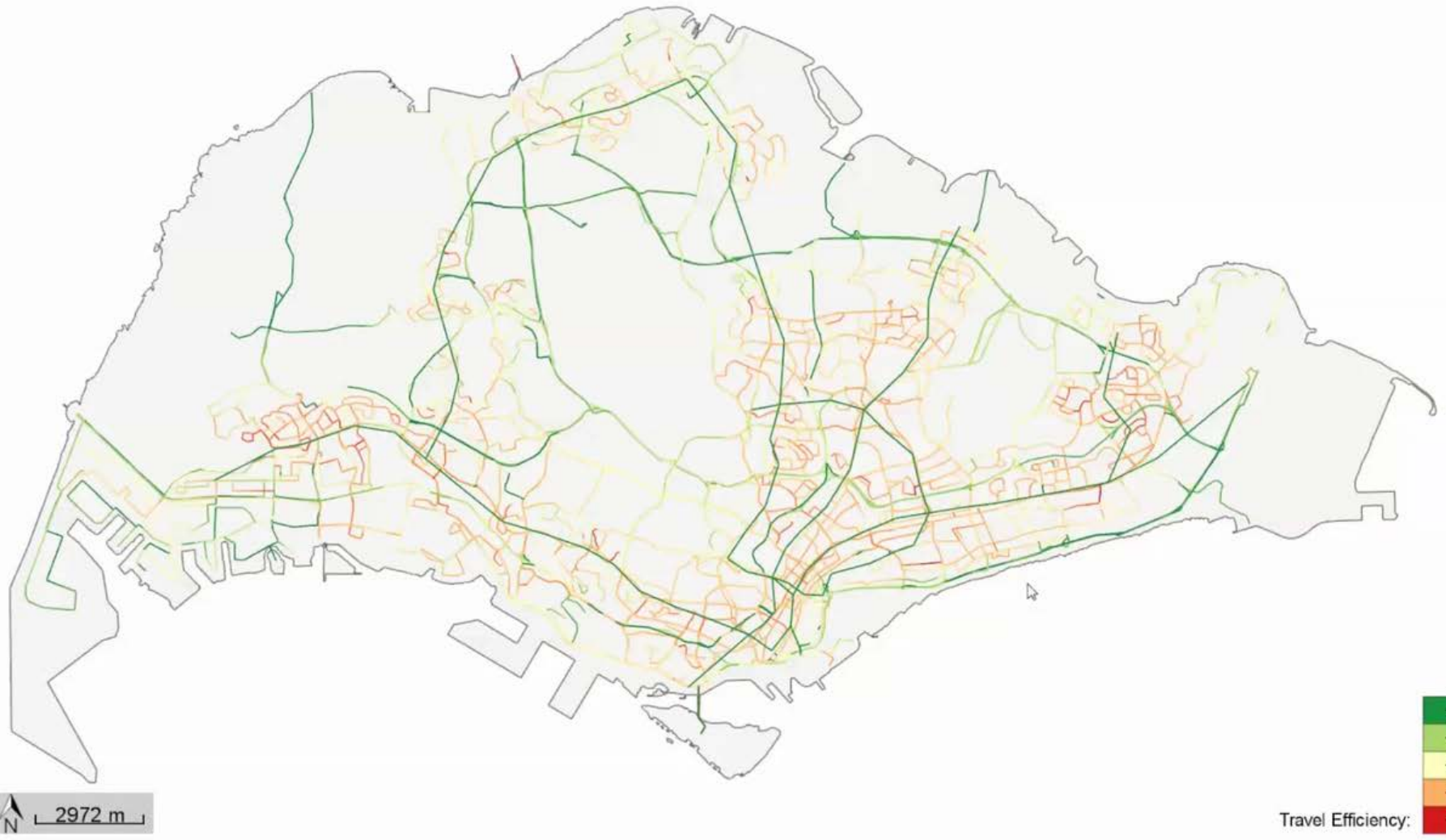


Visual Analytics: Interchange Patterns

To link

	0	1	2	3	4
From link 0	0	86	25	50	81
1	32	0	84	140	20
2	12	22	0	14	25
3	156	40	57	0	174
4	25	20	10	181	0





Video: Zeng Wei, Future Cities Laboratory, 2014



Key Message:

Urban planning requires a long-term vision and suitable tools for extrapolation of future trends.

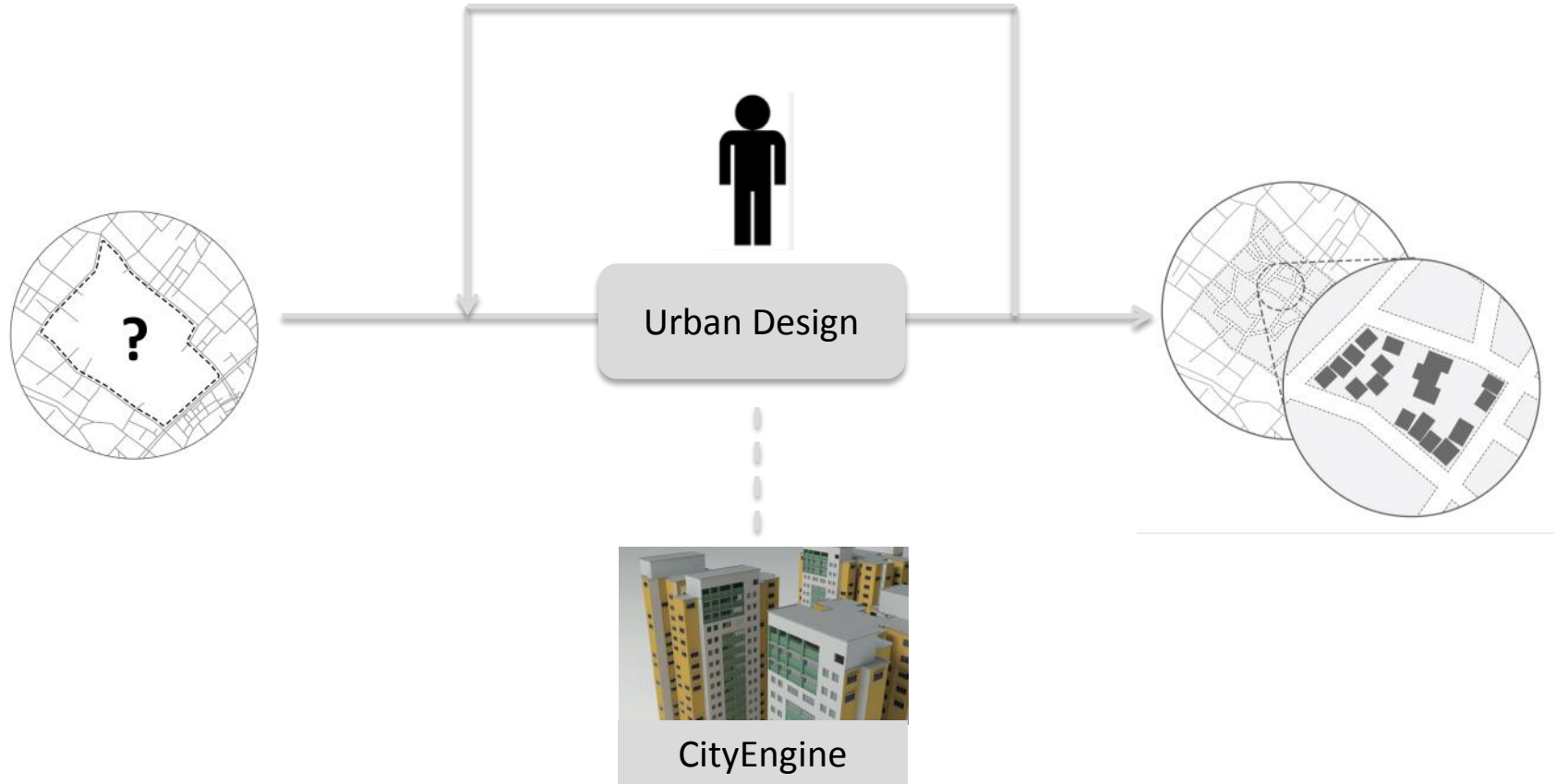


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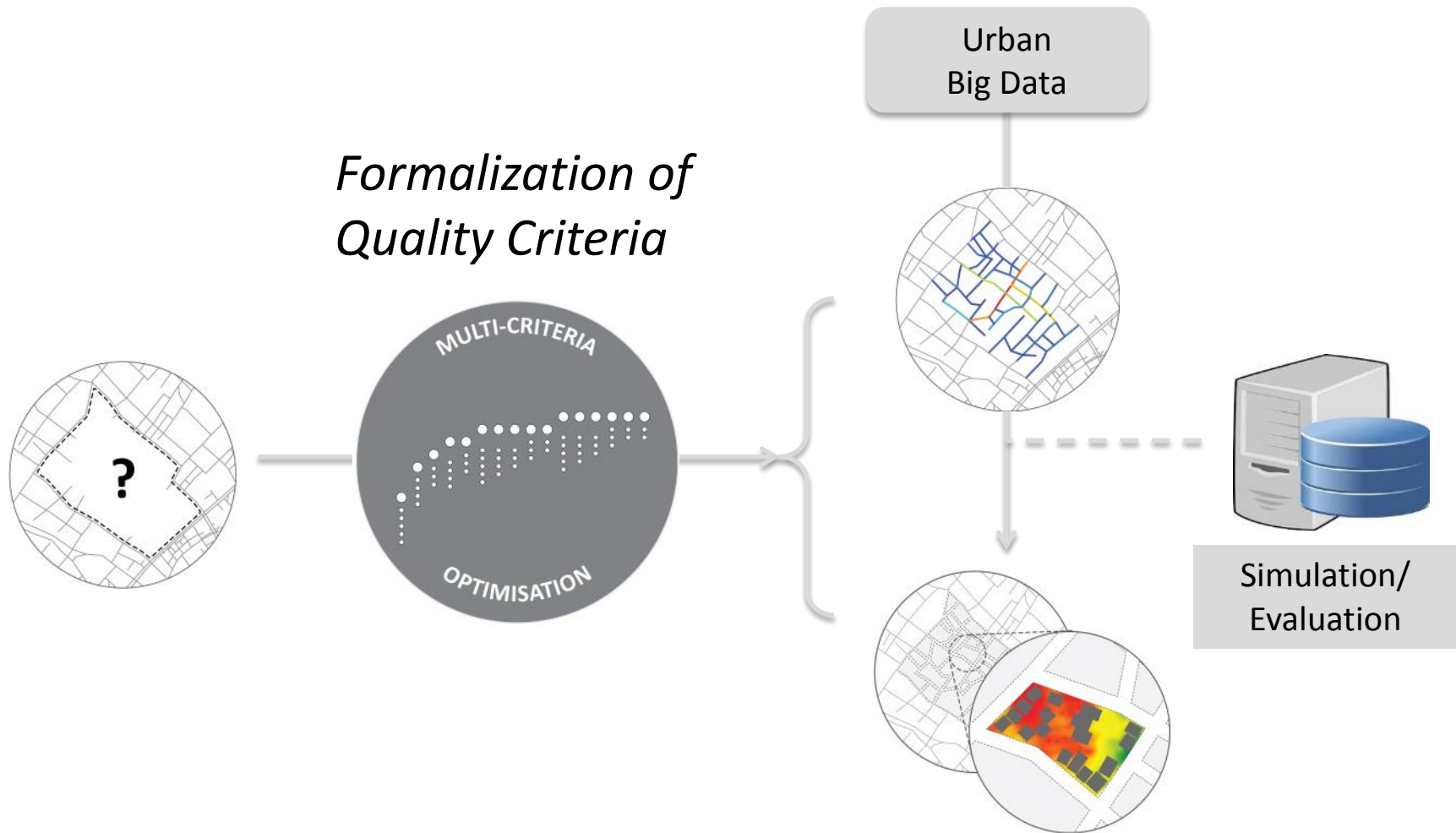
Design Space Exploration for Urban Compaction

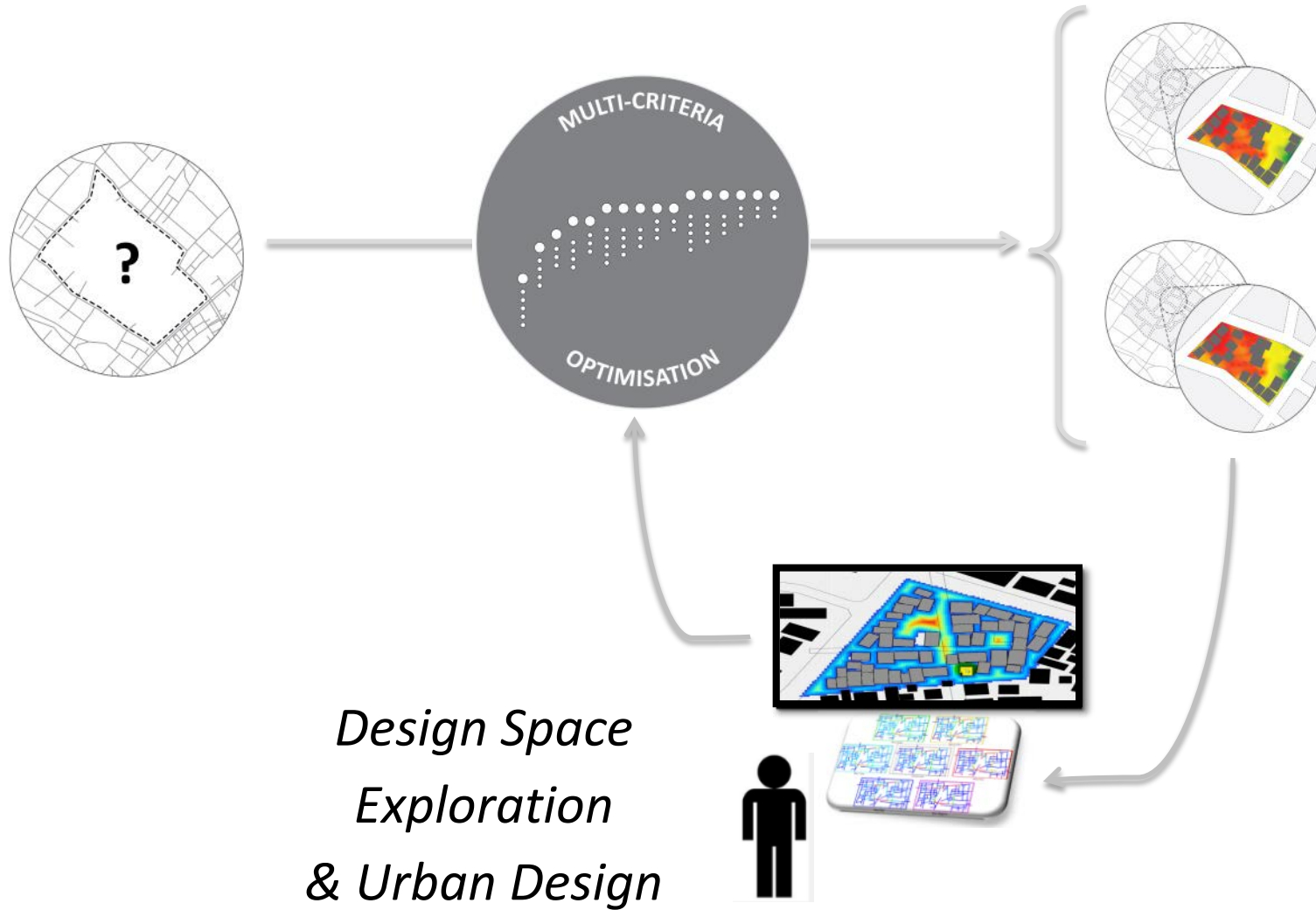
This project investigates new computational design methods based on urban big data to synthesise urban designs according to specified requirements.

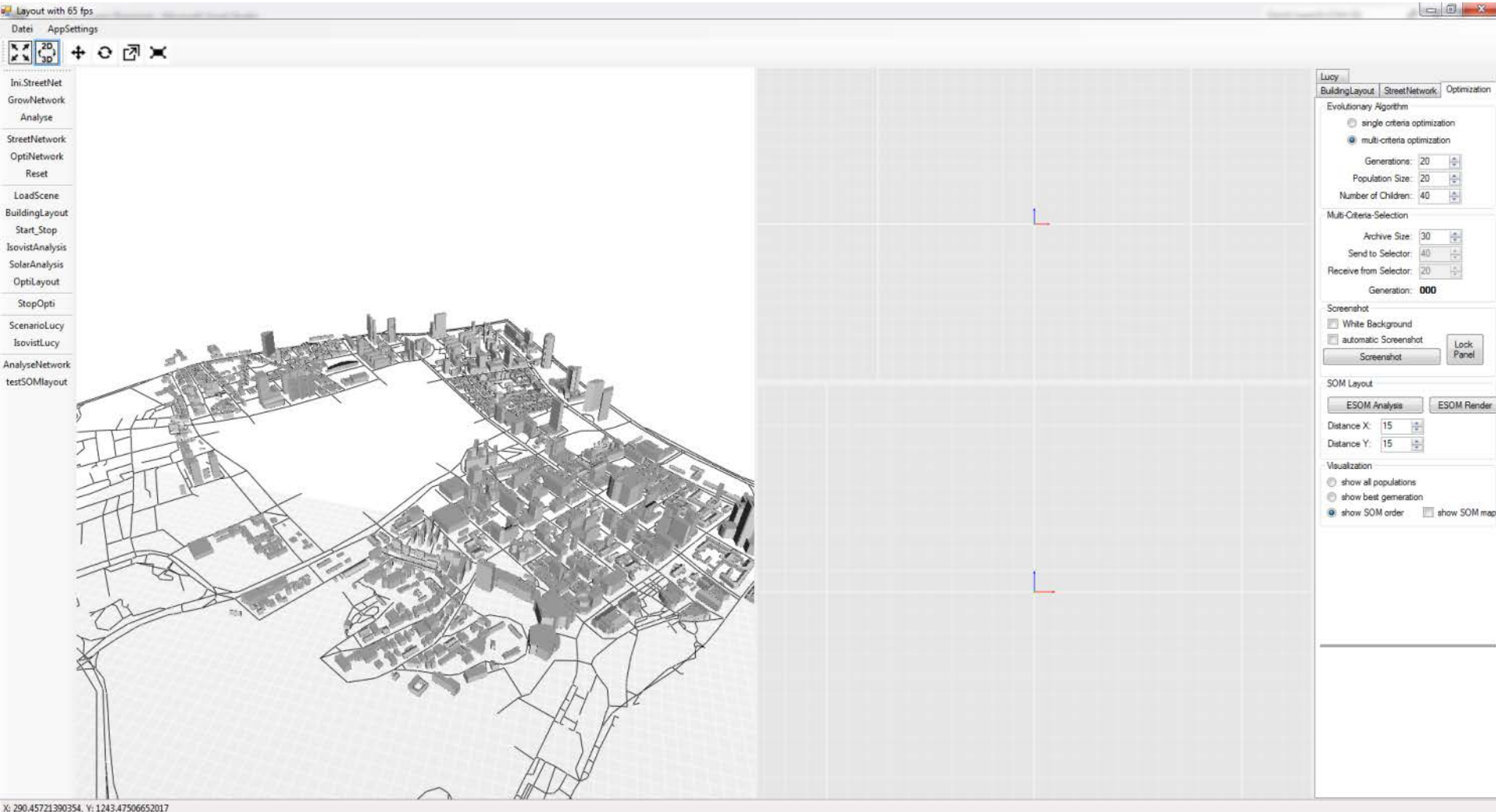




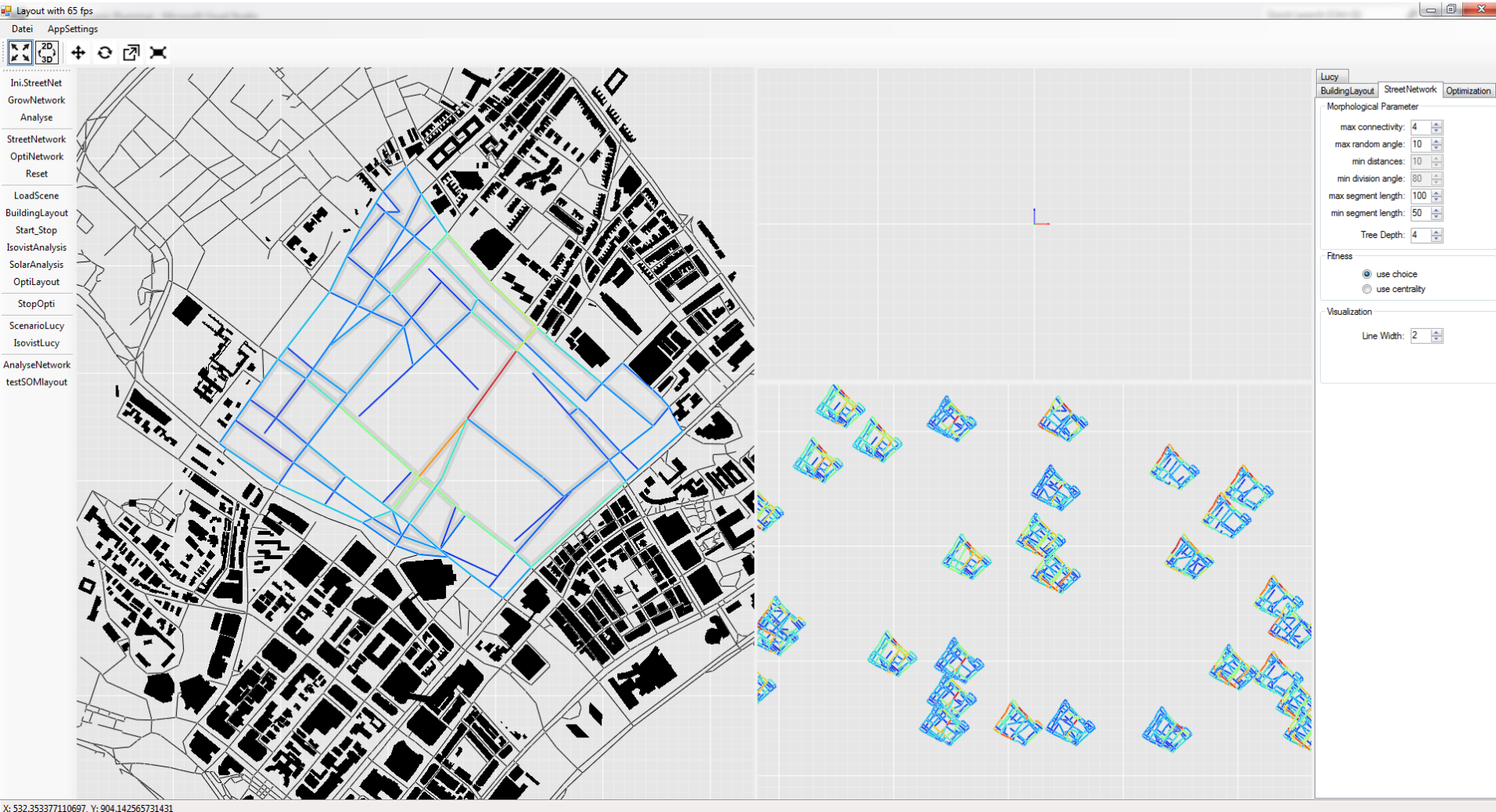
Formalization of Quality Criteria



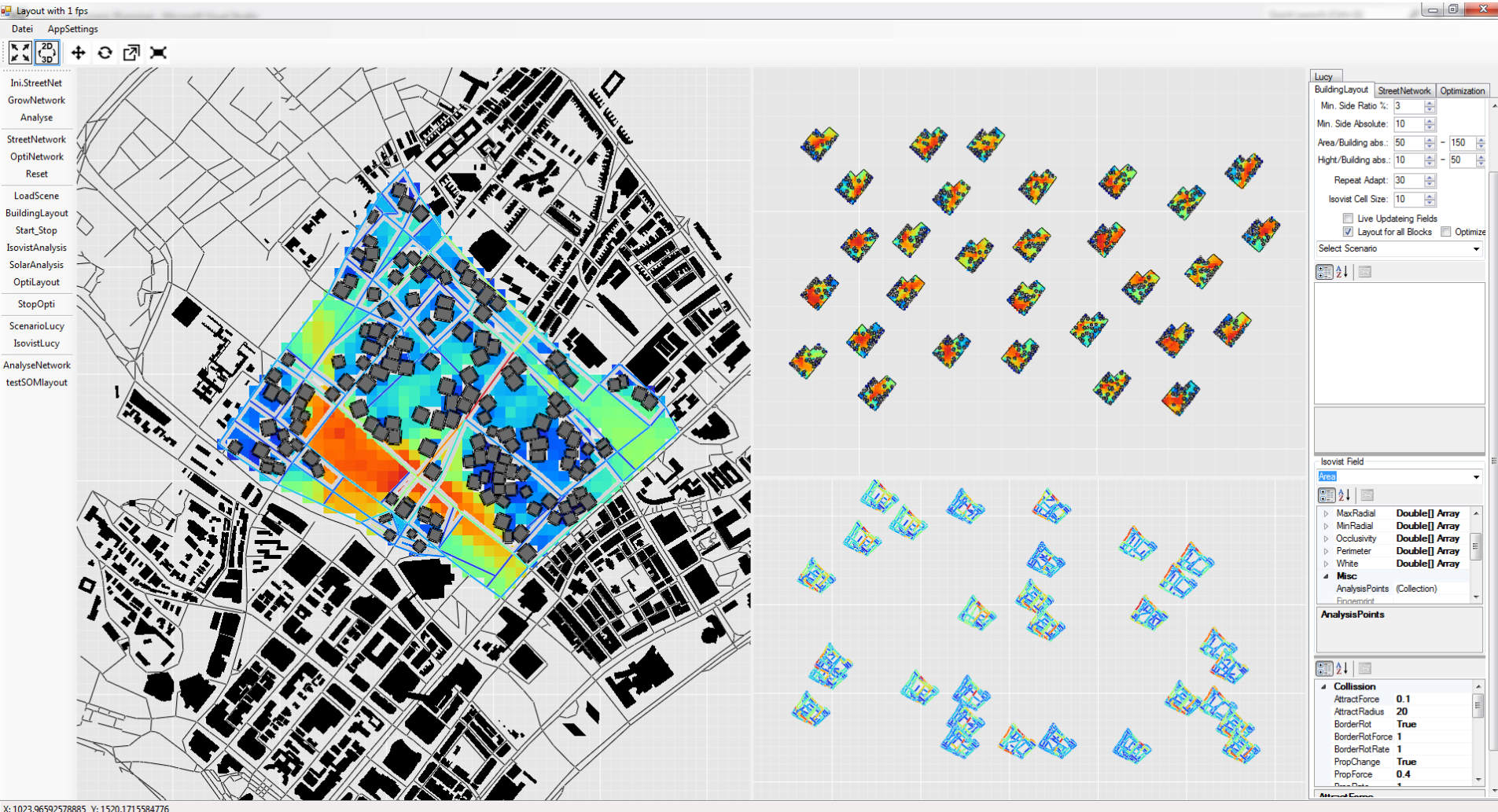




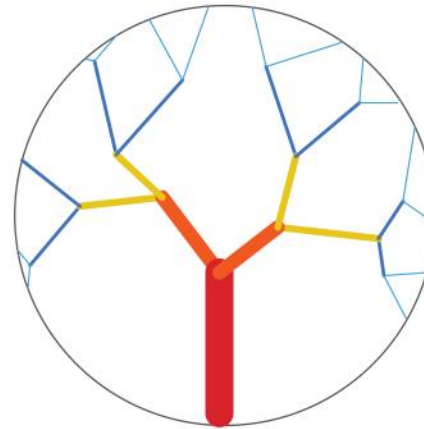
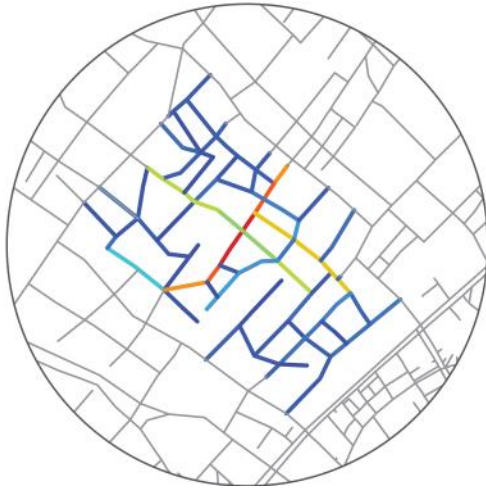
Photograph: Reinhard König, ETH Zürich, 2014



Photograph: Reinhard König, ETH Zürich, 2014



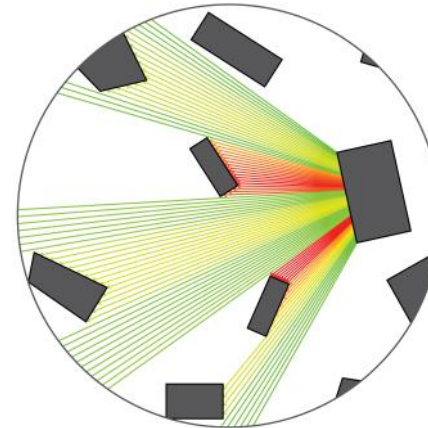
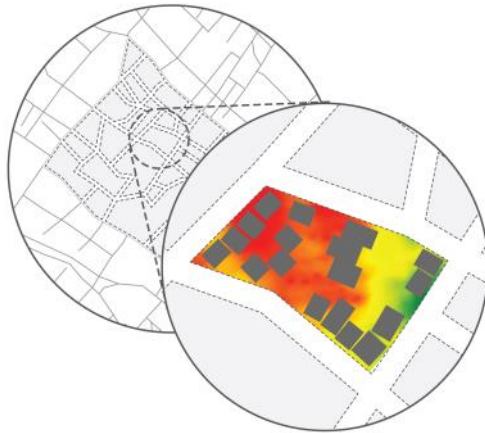
Photograph: Reinhard König, ETH Zürich, 2014



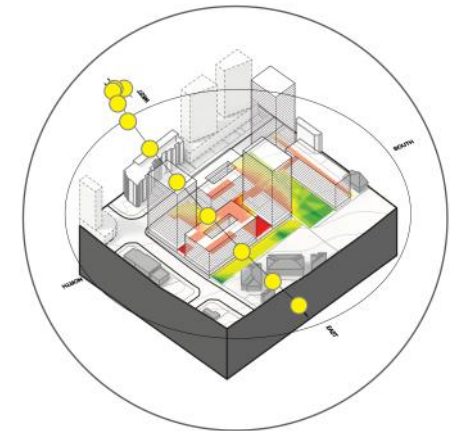
Traffic potential



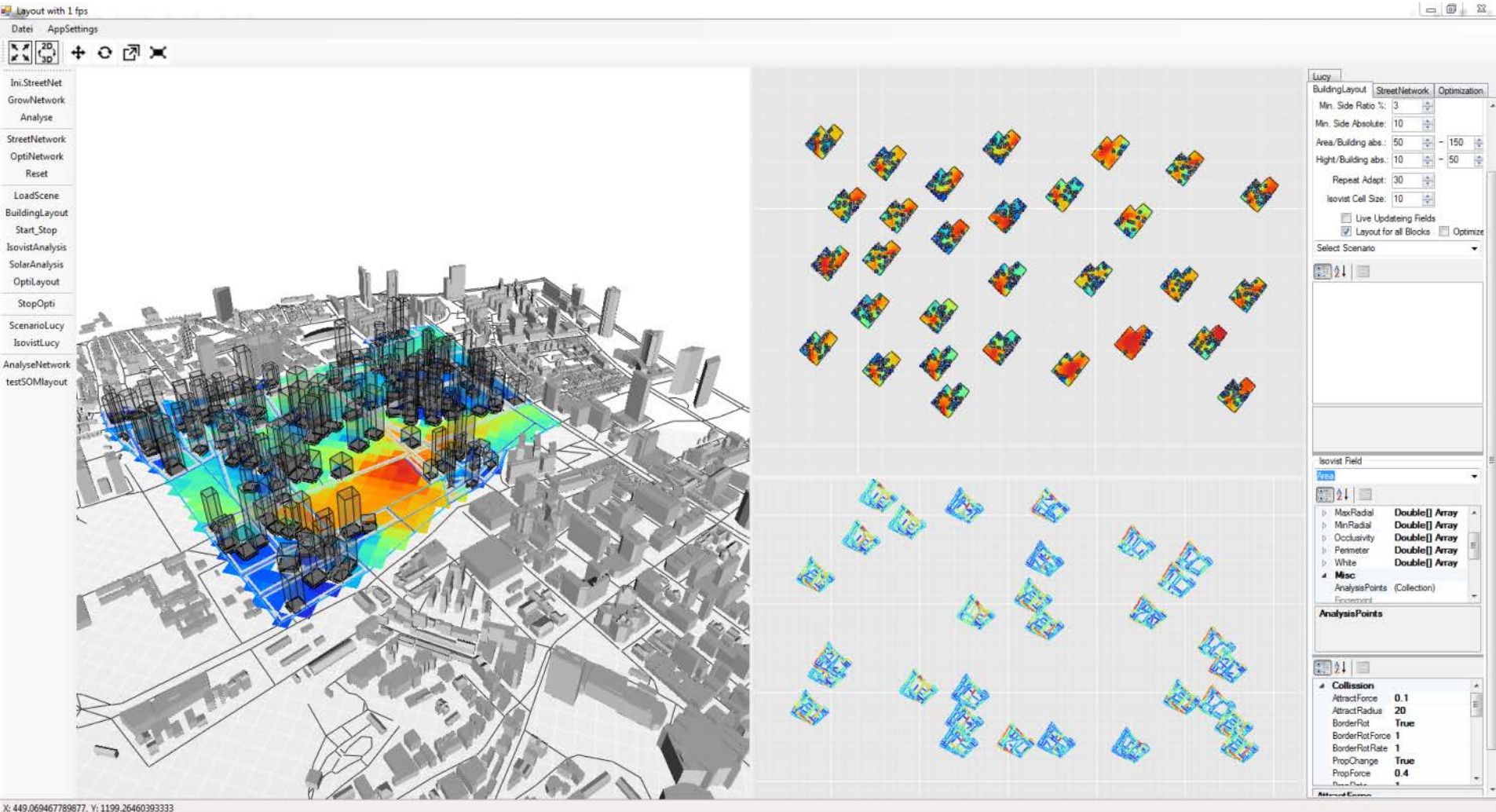
Parking availability



Privacy



Solar energy



Photograph: Reinhard König, ETH Zürich, 2014

comment analysis

Inclusive, cooler cities: A different take on liveability

WHAT MAKES A CITY ATTRACTIVE?

It is a discussion following the release of the Global Liveability Index that the Singaporean public may get a different view of what makes a city attractive. The report by the EY Group's Centre for Global Liveability Index 2012, which is published by the firm, says that Singapore has moved up from 17th to 15th place in the index.

The response by Mr. Khoo Joo Koh, Singapore's ambassador to the United Kingdom, says that Singapore has a reputation for being a safe and secure city. He also notes that Singapore's infrastructure is world-class, and that the country's government is committed to transparency and accountability.

Good Governance

Mr. Khoo Joo Koh, Singapore's ambassador to the United Kingdom, says that Singapore has a reputation for being a safe and secure city. He also notes that Singapore's infrastructure is world-class, and that the country's government is committed to transparency and accountability.

A Different Take On Liveability

HOME

B647 Forty things special about 5-pore Zen **B5 Tireless road safety warrior**



Researcher map out patterns of commuters who meet regularly by GENE COO



Nothing random about 'familiar strangers' by GENE COO

30 science

These 100 million such... 24 years old, of the water they...

terms are mature and are now entering the implementation phase within Singapore's smart and cultural context.

WORLD THE STRAITS TIMES WEDNESDAY, MARCH 29, 2012 A10 Ally's pullout ends a blow to India govt A16 'Massacre planner'

Saving Jakarta from flooding

Studies under way to clean up flood-prone Ciliwung river, but squatters won't budge

INDONESIA - When it rains in the capital, Jakarta, the Ciliwung river flows through the city, and the floodwaters can be a nuisance. The government has tried to build floodwalls, but the squatters who live along the river have resisted.

Now, a study by a team of researchers from the University of Indonesia and the University of California, Berkeley, says that the government should build floodwalls, but also provide a way for the squatters to move to other parts of the city.

The study says that the government should build floodwalls, but also provide a way for the squatters to move to other parts of the city.

Putting a price on travel

It's one of the most interesting... the cost of a trip can be as high as...



HELEN'S GOOD ALTERNATIVES

THE RISE OF ROBOTS

VIEW OF A GROWING URBAN POPULATION, CONTINUES THE SINGAPORE WHERE AND AREA IS LIMITED WILL SHOW USE TO VERTICAL LIVING. TO THIS END, THE FUTURE CITY LABORATORY (FCL) IS CURRENTLY CONDUCTING RESEARCH TO INVESTIGATE THE IMPLICATIONS OF ROBOTIC FABRICATION PROCESSES ON THE DESIGN AND CONSTRUCTION OF HIGH-RISE BUILDINGS. SOUTHEAST ASIA CONSTRUCTION TALKS TO PROFESSOR RANDO GRAMAZZO, PRINCIPAL INVESTIGATOR OF THE ARCHITECTURE AND DIGITAL FABRICATION RESEARCH MODULE AT FCL, ABOUT THIS FUTURE DEVELOPMENT.



Robot for high-rise work

It's one of the most interesting... the cost of a trip can be as high as...

WHAT'S THE RIGHT PRICE?

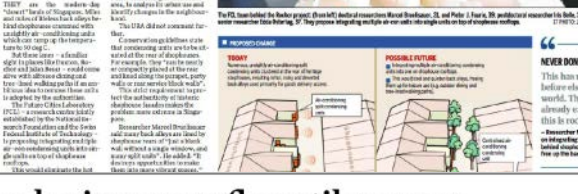
The other, and perhaps biggest, is large housing projects... the cost of a trip can be as high as...

Cool way to transform Rochor's hot back alleys



Proposal to shift shophouses' air-con units, introduce outdoor dining

It's one of the most interesting... the cost of a trip can be as high as...



APARTMENT FLOORS MAY SOON BE FILLED OUT BY HUMANS, BUT BY INTELLIGENT ROBOTS - FAST, PRECISE AND IN NO DANGER OF STRAINING THEIR BACKS.

THE ROBOT USES SENSORS THAT SHOW IT WHERE TO LAY THE TILE NEXT.



WATCH THE **robot could be laying your floor tiles soon**

THE STRAITS TIMES

President Tan looks for takeaways in Zurich

He tours Zurich lab showcasing work on flood management

By YASMINE YAHYA WISNEN

President Tony Tan Kang Yam kicked off his visit to Switzerland yesterday by looking at what Singapore and the European Union can learn from each other in areas ranging from environment to productivity.

President Tan taking to MES exchange clients (from left) Chng Guan, Leo Chen Tan, Li Hongping and Jo Anne at the Swiss Federal Institute of Technology Zurich, beside him is Second Minister for Trade and Industry S. Iswaran.

The ETN has a research centre in Singapore that studies ways to help cities grow sustainably. This includes research into energy-efficient buildings and ways to promote a green transport network.

WORLD A19

Bambo offers green building solution



S'pore Swiss lab hopes to harness material's strength and flexibility in reinforcing concrete

It is the world's first bamboo building. The Swiss Federal Institute of Technology Zurich (ETH) gave a first-hand look at the material's potential in a research project.

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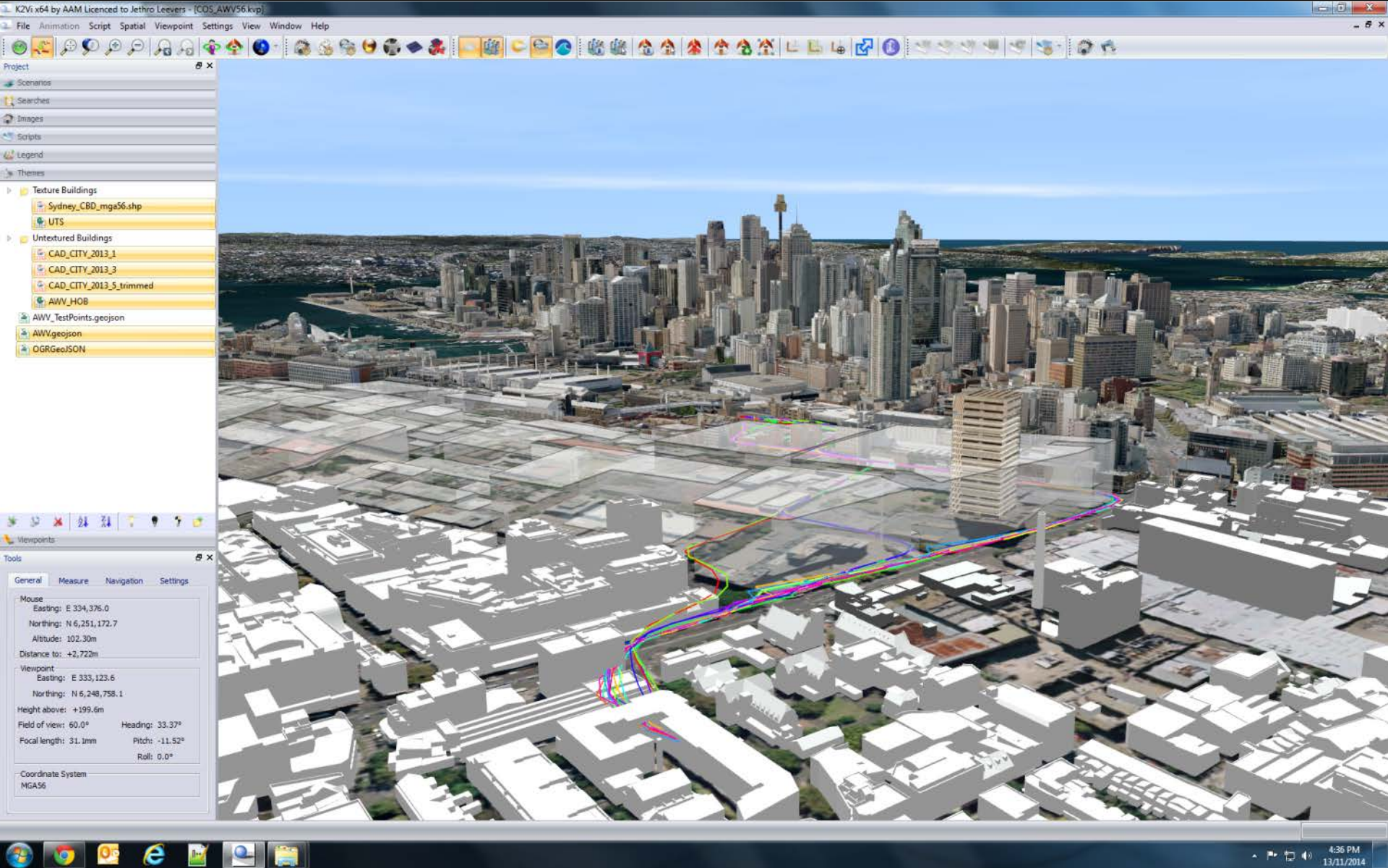
WATCH THE **robot could be laying your floor tiles soon**

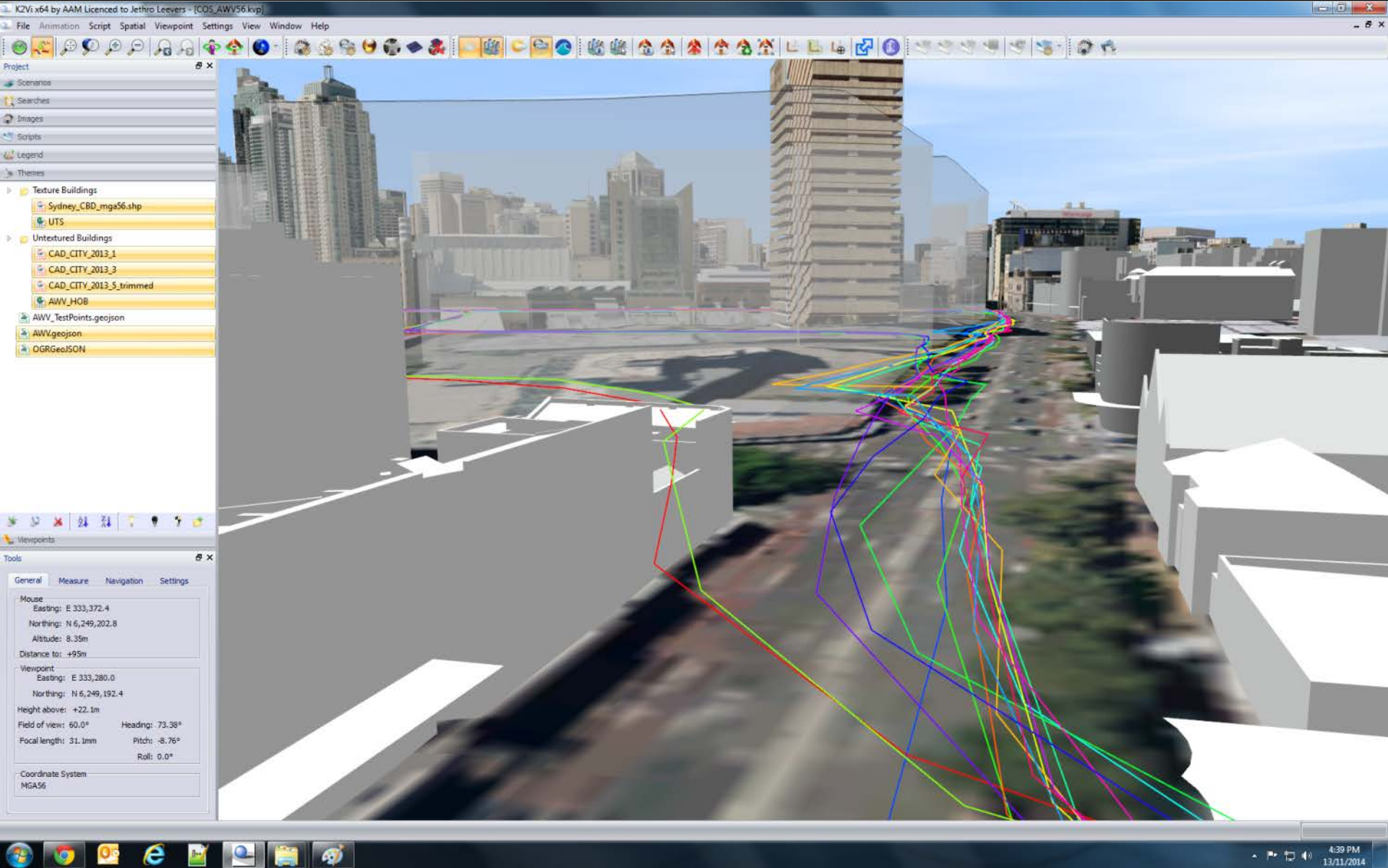
THE ROBOT USES SENSORS THAT SHOW IT WHERE TO LAY THE TILE NEXT.

Beyond Smart Cities

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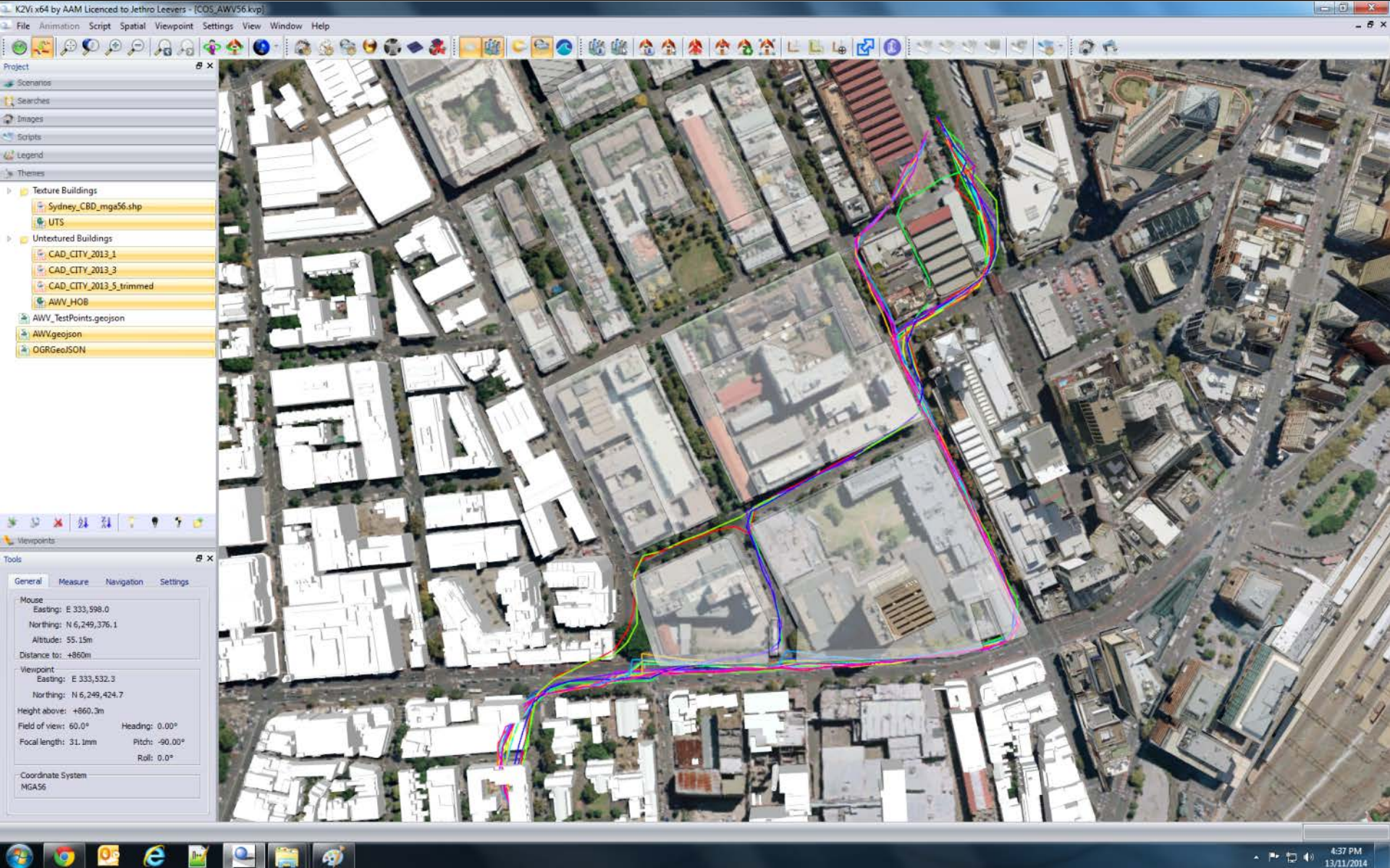
Beyond Smart Cities

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CENTRE

新加坡-ETH
研究中心

(FCL) FUTURE
CITIES
LABORATORY

未来
城市
实验室





Key Message:

Smart cities miss the human's or citizen's perspective.

Responsive and resilient cities are the new goal.

Take Away:

City labs are crucial to create sustainable cities, since they bring stakeholders together.

The background image shows a modern, multi-story building with a glass and metal facade. The word "INNOVATION" is prominently displayed in large, dark letters on the upper part of the building. The sky is overcast, and there are some green plants visible on the left side of the frame.

ETH Zurich's Future Cities Laboratory in Singapore

Contact:

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