INFORMATION ARCHITECTURE OF CITIES

Information Architecture and Future Cities

Understanding a city is fundamental for the meaningful design and management of a city. "Information Architecture and Future Cities" opens a holistic view on existing and new cities, with focus on Asia. The goal is to better understand the city by going beyond the physical appearance and by focusing on different representations, properties and impact factors of the urban system. We explore the city as the most complex human-made organism with a metabolism that can be modelled in terms of stocks and flows. We investigate data-driven approaches for the development of the future city, based on crowd sourcing and sensing. You will learn to see the consequences of citizen science and the merging of Architecture and information space. The course describes origins, state-of-the-art, and applications of information architecture and simulation. Both rapidly gain importance in the design of buildings, cities and territories. As course requirement, there will be three short exercises.

Where

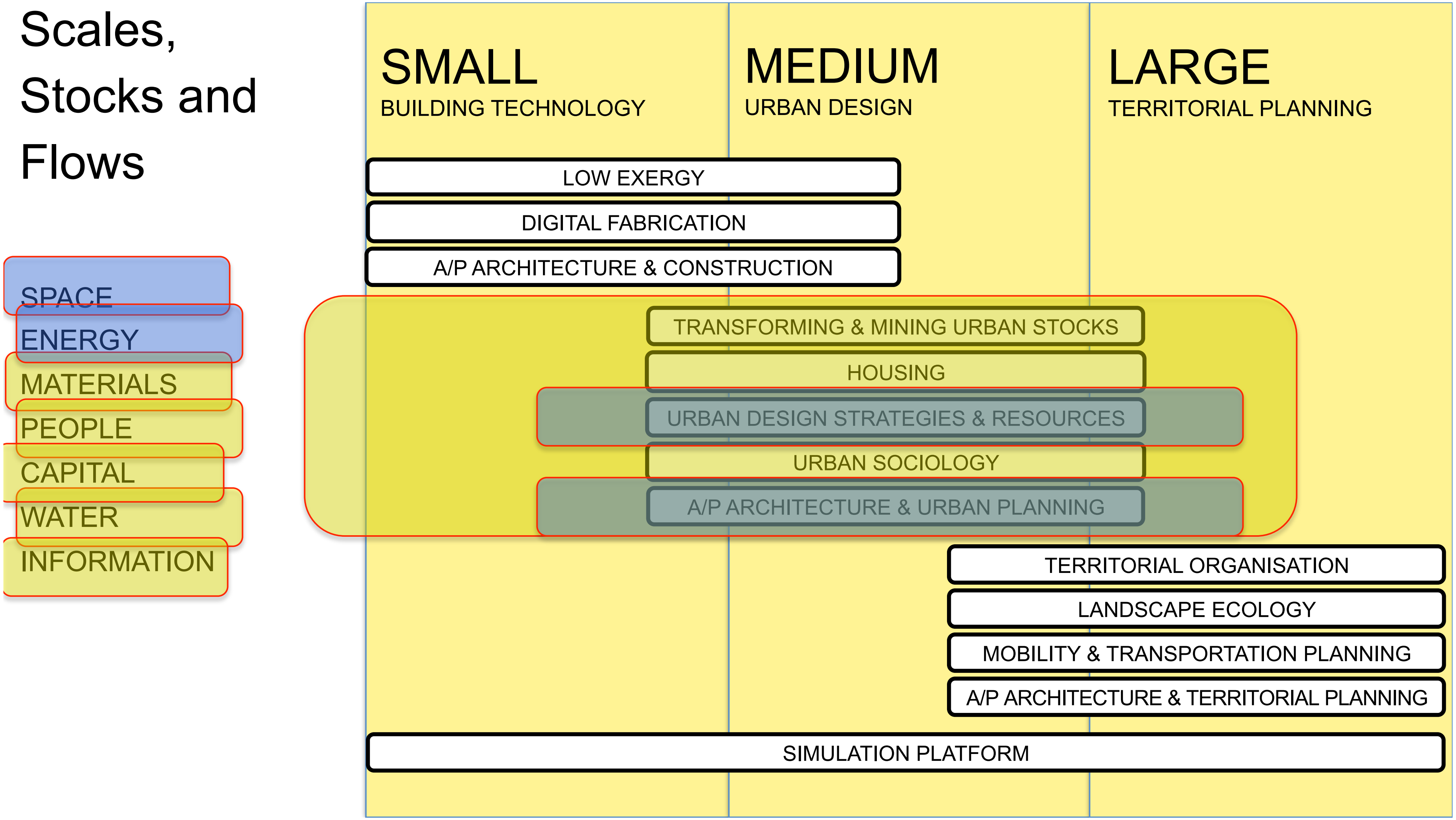
HIT F 22 (Value Lab)

Supervision

Prof. Dr. Gerhard Schmitt gerhard.schmitt@sl.ethz.ch
Denise Weber denise.weber@arch.ethz.ch
Dongyoun Shin shin@arch.ethz.ch

22.09.2014	**Einführung und Überblick.** Introduction and Overview
29.09.2014	**Das System Gebäude – Klima.** Building as a System - Climate (Guest Lecture by Estefania Tapias)
06.10.2014	**Das System Gebäude - Konstruktion.** Building as a System - Habitat (Guest Lecture by Prof. Dirk Hebel)
13.10.2014	**Das System Gebäude – Energie & Habitat.** Building as a System - Energy & Habitat
20.10.2014	Seminar week (No lecture)
27.10.2014	**Das System Stadt - Soziologie.** City as a System - Social Science (Guest Lecture)
03.11.2014	**Stocks & Flows - Wasser & Material.** Stocks & Flows - Water & Material
10.11.2014	**Das System Stadt - Entwurf.** City as a System - Design
17.11.2014	**Stocks & Flows - Menschen & Informationen.** Stocks & Flows - People & Information (Guest Lecture by Matthias Standfest)
24.11.2014	**Das System Territorium - Mobilität.** Territory as a System - Mobility
01.12.2014	**Das System Territorium - Organisation.** Territory as a System - Organization (Guest lecture by Prof. Dirk Hebel)
01.12.2014	Final iA critique Combined critique with the other iA courses (14:00 - 18:00)

Scales, Stocks and Flows



Cooler Calmer Singapore

Prof Dr Gerhard Schmitt, ETH Zürich, Director
Dr Matthias Berger, Simulation Platform

Singapore-ETH Centre
for Global Environmental Sustainability, SEC

Cooler Calmer Singapore

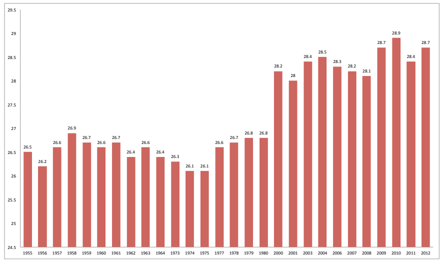
Dr. sc. Matthias Berger

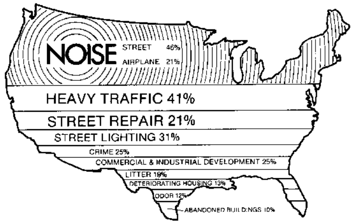
Mod. IX

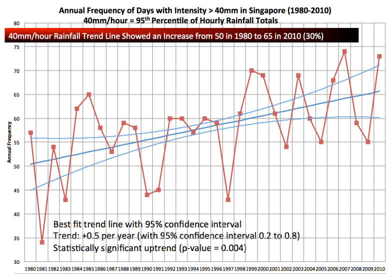
ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

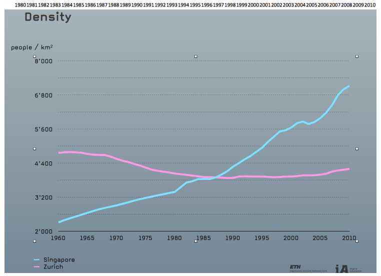
(SEC) SINGAPORE-ETH CENTRE 新加坡－ETH 研究中心

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





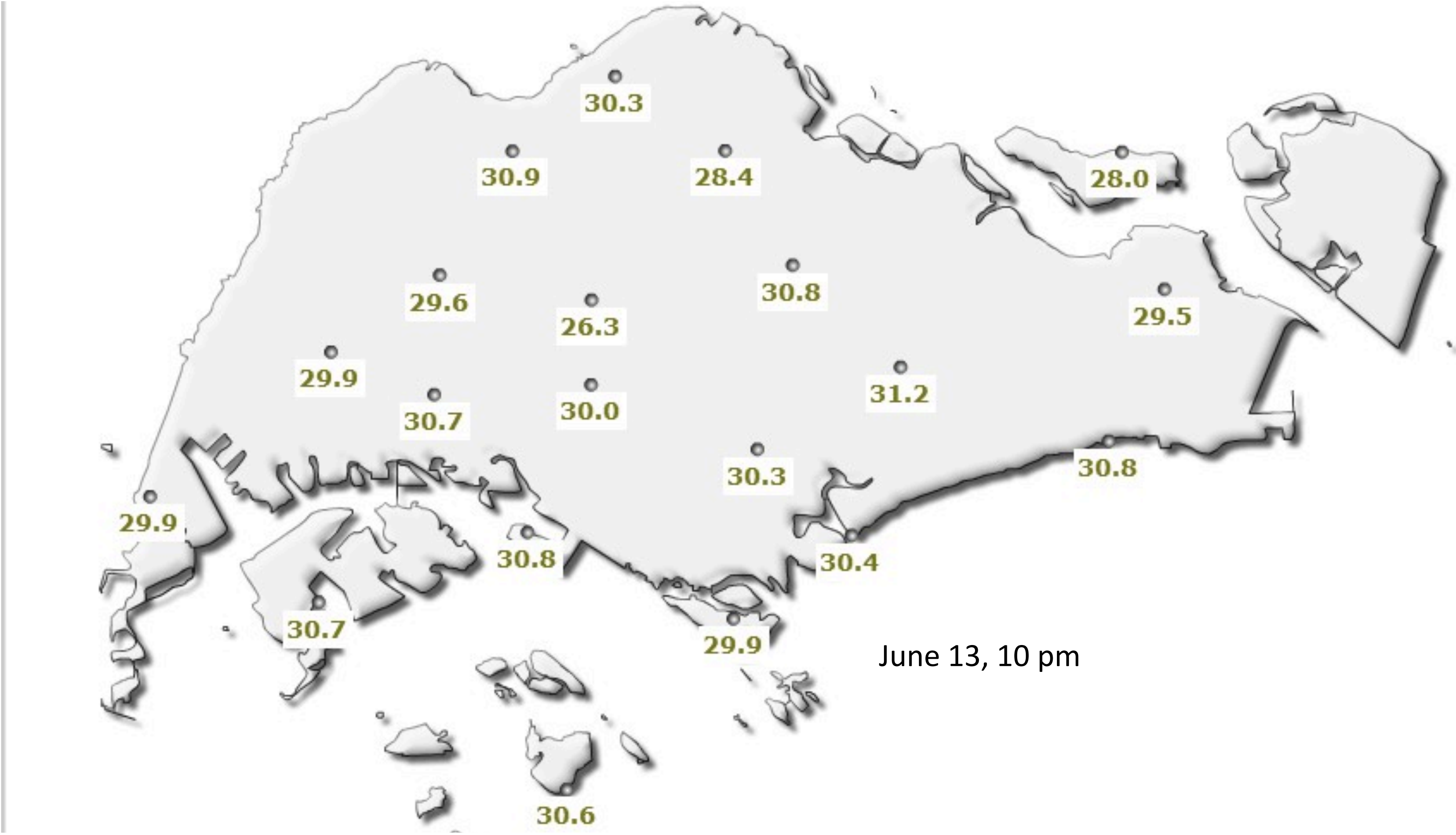




Cooler Calmer Singapore CCS - Facts

Over the last 35 years

- Rising temperature
- Increasing noise
- More flooding
- Increasing density


30.3
30.9
28.4
28.0
29.6
26.3
30.8
29.5
29.9
30.7
30.0
31.2
30.3
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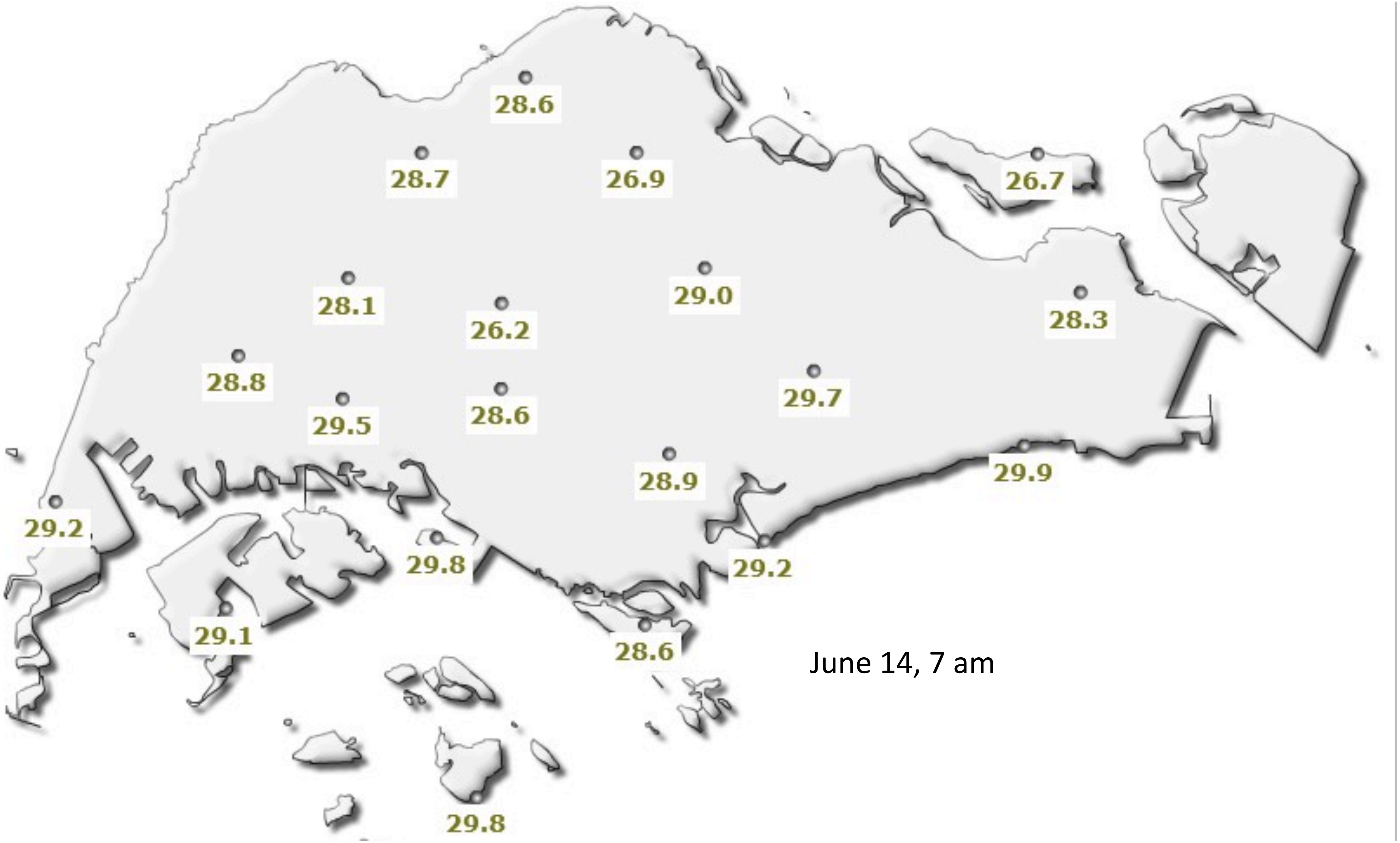
29.9
30.8
30.4
30.7
29.9
30.6

June 13, 10 pm


28.6
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26.9
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26.2
29.0
28.3
28.8
29.5
28.6
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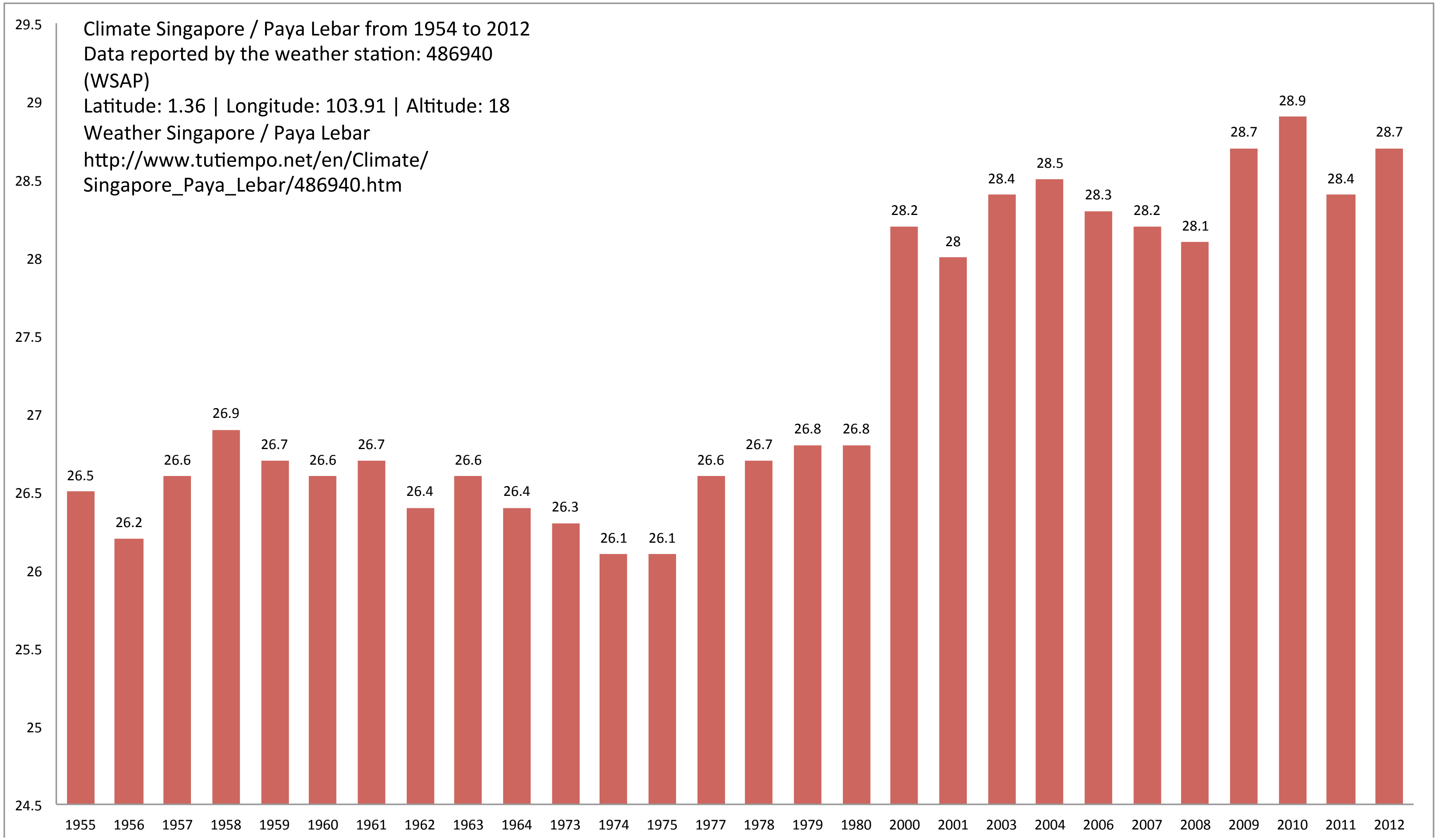
29.9
29.2
29.8
29.2
29.1
28.6
29.8

June 14, 7 am


Climate Singapore / Paya Lebar from 1954 to 2012
Data reported by the weather station: 486940
(WSAP)
Latitude: 1.36 | Longitude: 103.91 | Altitude: 18
Weather Singapore / Paya Lebar
http://www.tutiempo.net/en/Climate/
Singapore_Paya_Lebar/486940.htm
29.5
29
28.5
28
27.5
27
26.5
26
25.5
25
24.5
26.5
26.2
26.6
26.9
26.7
26.6
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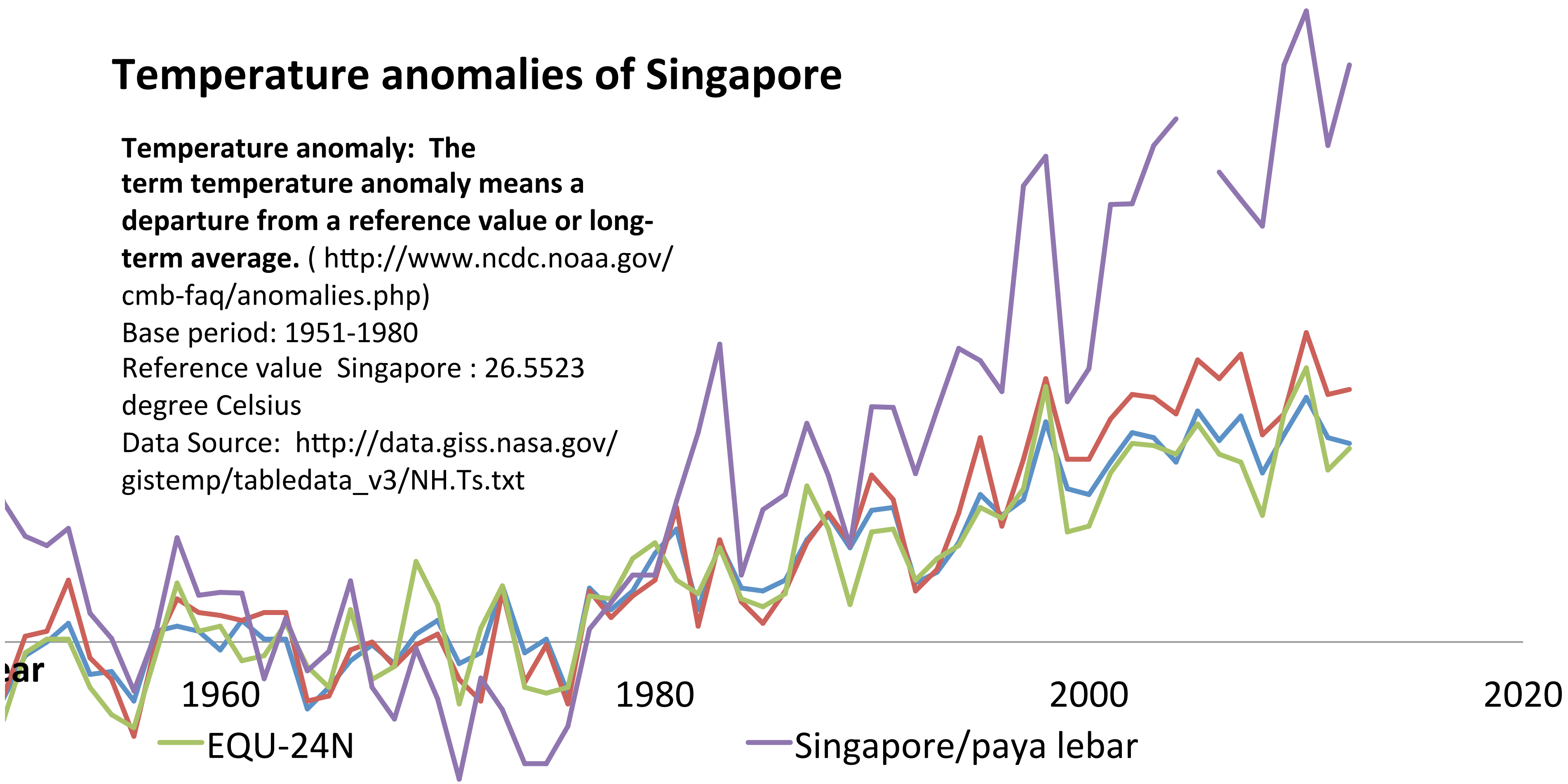
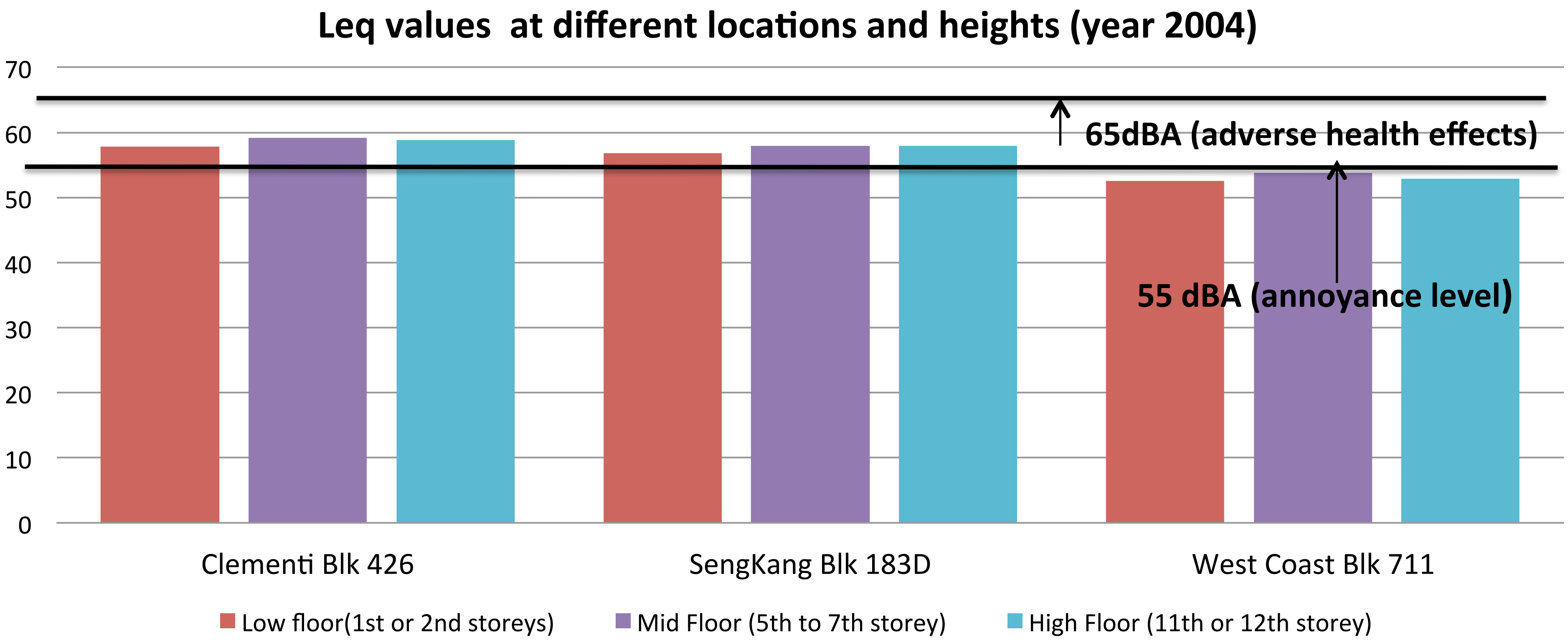
2011
2012


Temperature anomalies of Singapore
Temperature anomaly: The term temperature anomaly means a departure from a reference value or long-term average. (http://www.ncdc.noaa.gov/cmb-faq/anomalies.php)
Base period: 1951-1980
Reference value Singapore : 26.5523 degree Celsius
Data Source: http://data.giss.nasa.gov/gistemp/tabledata_v3/NH.Ts.txt
ear
1960
1980
2000
2020
EQU-24N
Singapore/paya lebar

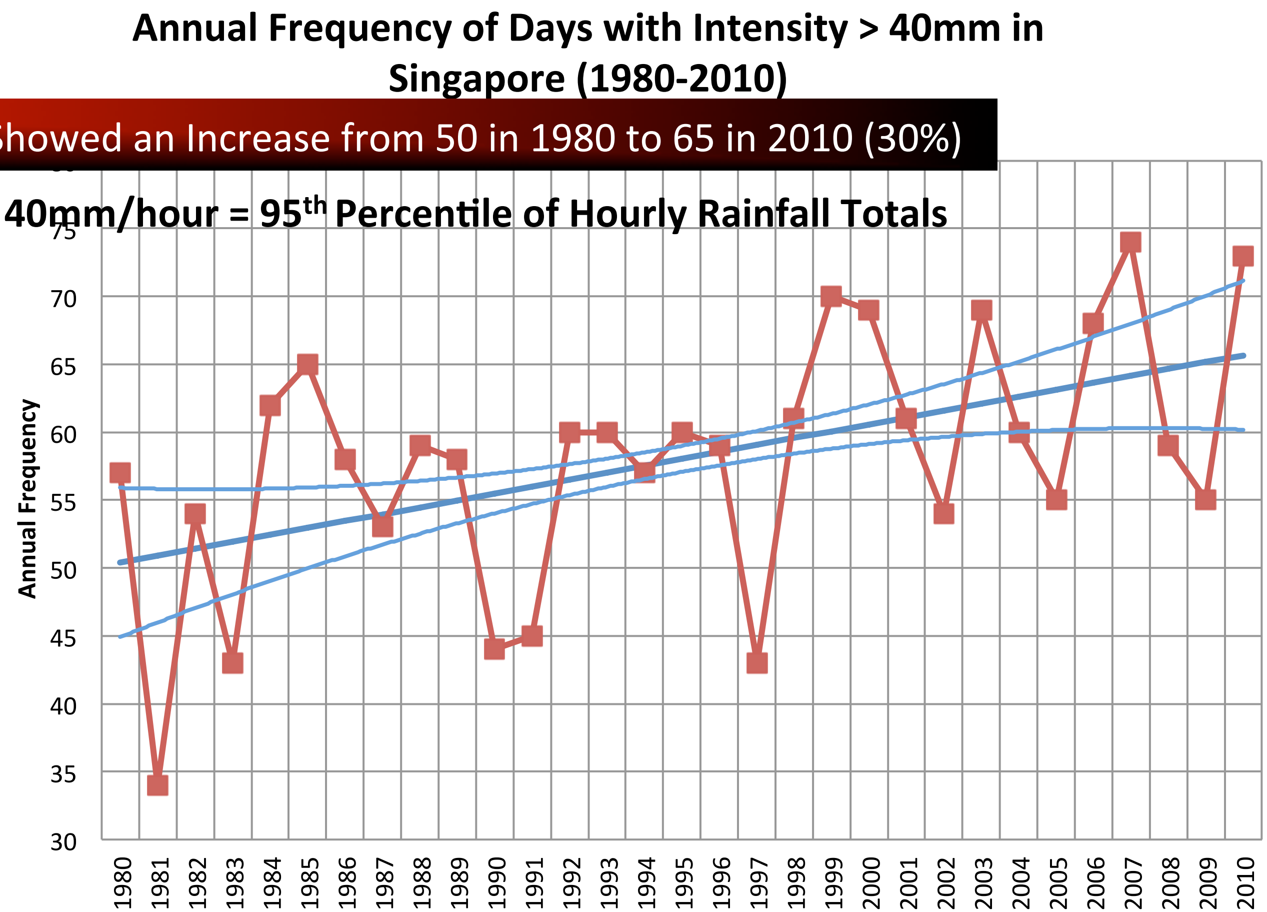


Leq: Equivalent Continuous Sound level is the preferred single value figure to describe Sound Pressure levels that carry over time and would produce the same Sound Energy that would be produced over the stated period of time 'T'. (http://www.acousticglossary.co.uk/leq.htm)

Data Source: STUDY OF TRAFFIC NOISE LEVELS IN SINGAPORE, H.T. Chui(1), Raymond B.W. Heng(1) and K.Y. Ng(2), (1) Sheffield Hallam University, United Kingdom, (2) School of Design & The Environment, Singapore Polytechnic, Singapore, http://whqlibdoc.who.int/hq/1999/a68672.pdf

40mm/hour Rainfall Trend Line Showed an Increase from 50 in 1980 to 65 in 2010 (30%)

40mm/hour = 95th Percentile of Hourly Rainfall Totals



Best fit trend line with 95% confidence interval
Trend: +0.5 per year (with 95% confidence interval 0.2 to 0.8)
Statistically significant uptrend (p-value = 0.004)

Cooler Calmer Singapore CCS - Goals

In the next 20 years

- Lower temperature
- Reduce noise
- Reduce flooding
- Increase quality of life

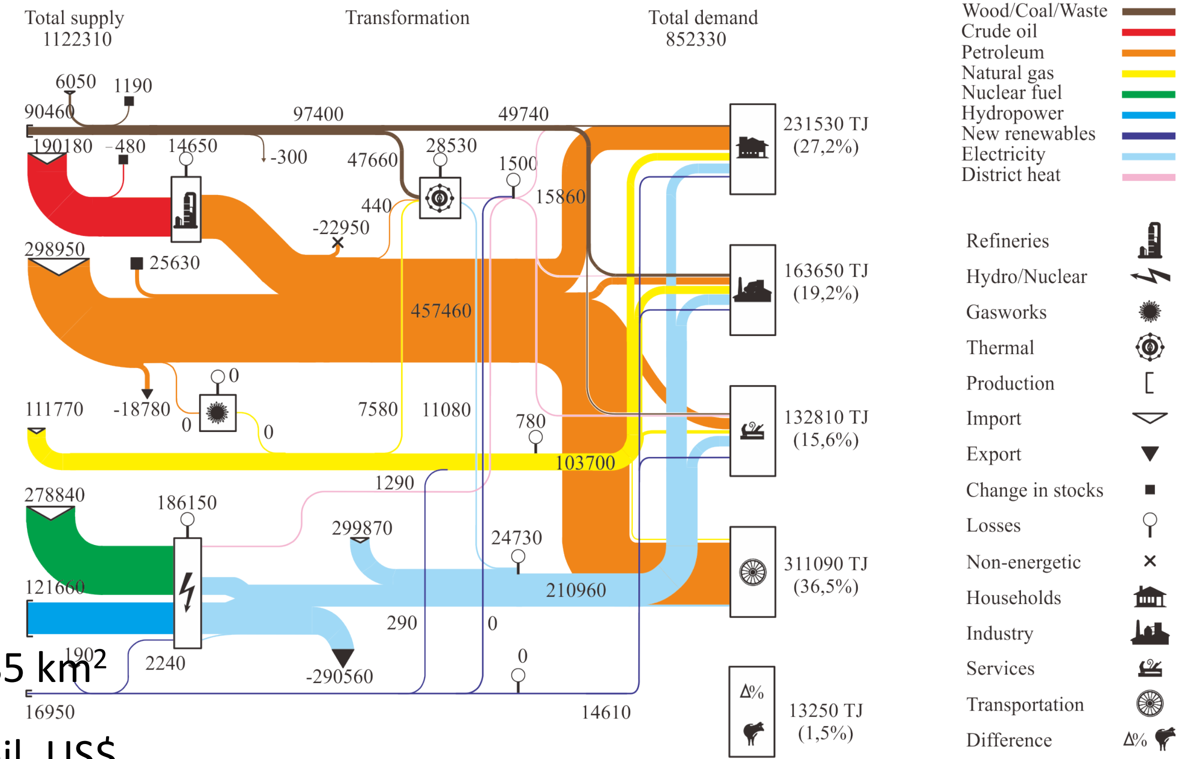
Cooler Calmer Singapore – Facts

Contribution to Heat Flux in Singapore

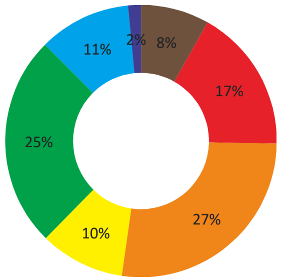
- Industry (60%)
- Transportation (22%)
- Buildings (17%)
- The existing Urban Planning model

Comparison of
the Energy Landscape
in Switzerland
and Singapore

Energy flows in TJ for Switzerland



Population	8’014’000
Energy dem.	852’330 TJ
Area	41’285 km²
Density	194/ km²
GDP(PPP)	340 bil. US$



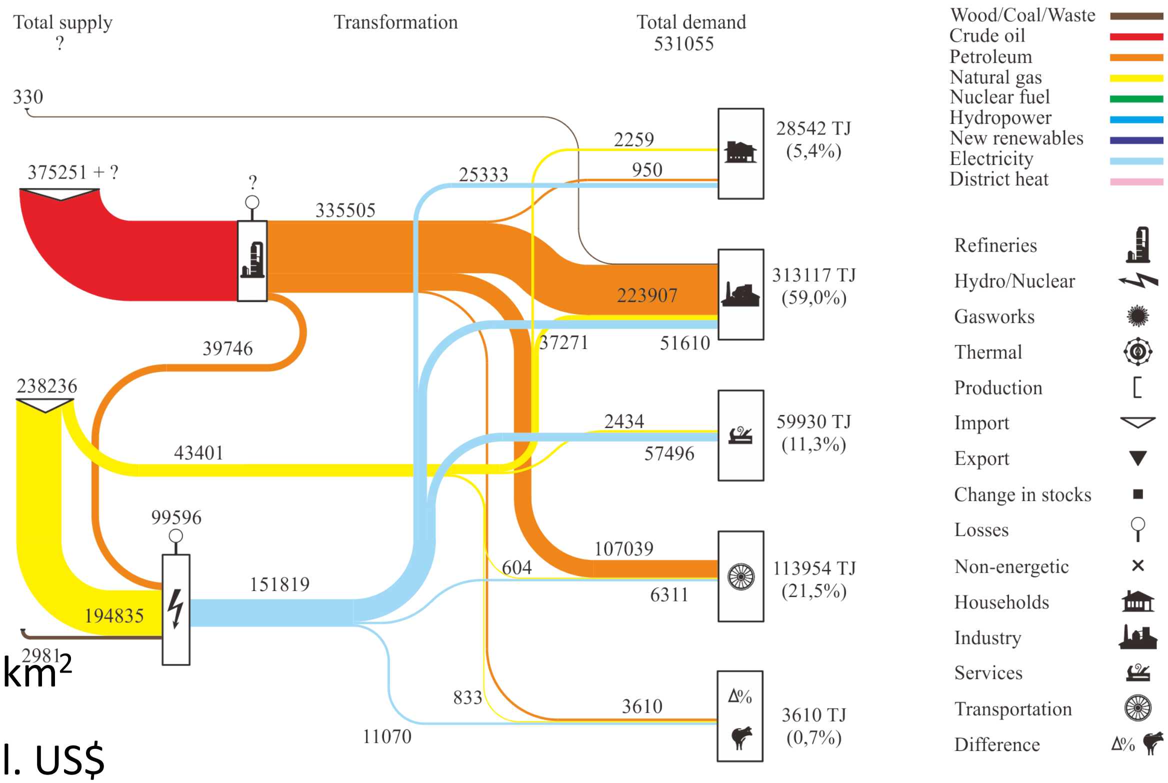
Total Primary Energy Supply (TPES)

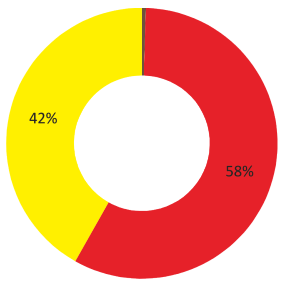
$$dE = \delta Q + \delta W$$
$$= [J]$$

Image courtesy of Swiss Federal Office of Energy.

Energy flows in TJ for Singapore

Population	5’312’400
Energy dem.	531’055 TJ
Area	712.4 km^2
Density	7126/ km^2
GDP(PPP)	315 bil. US$





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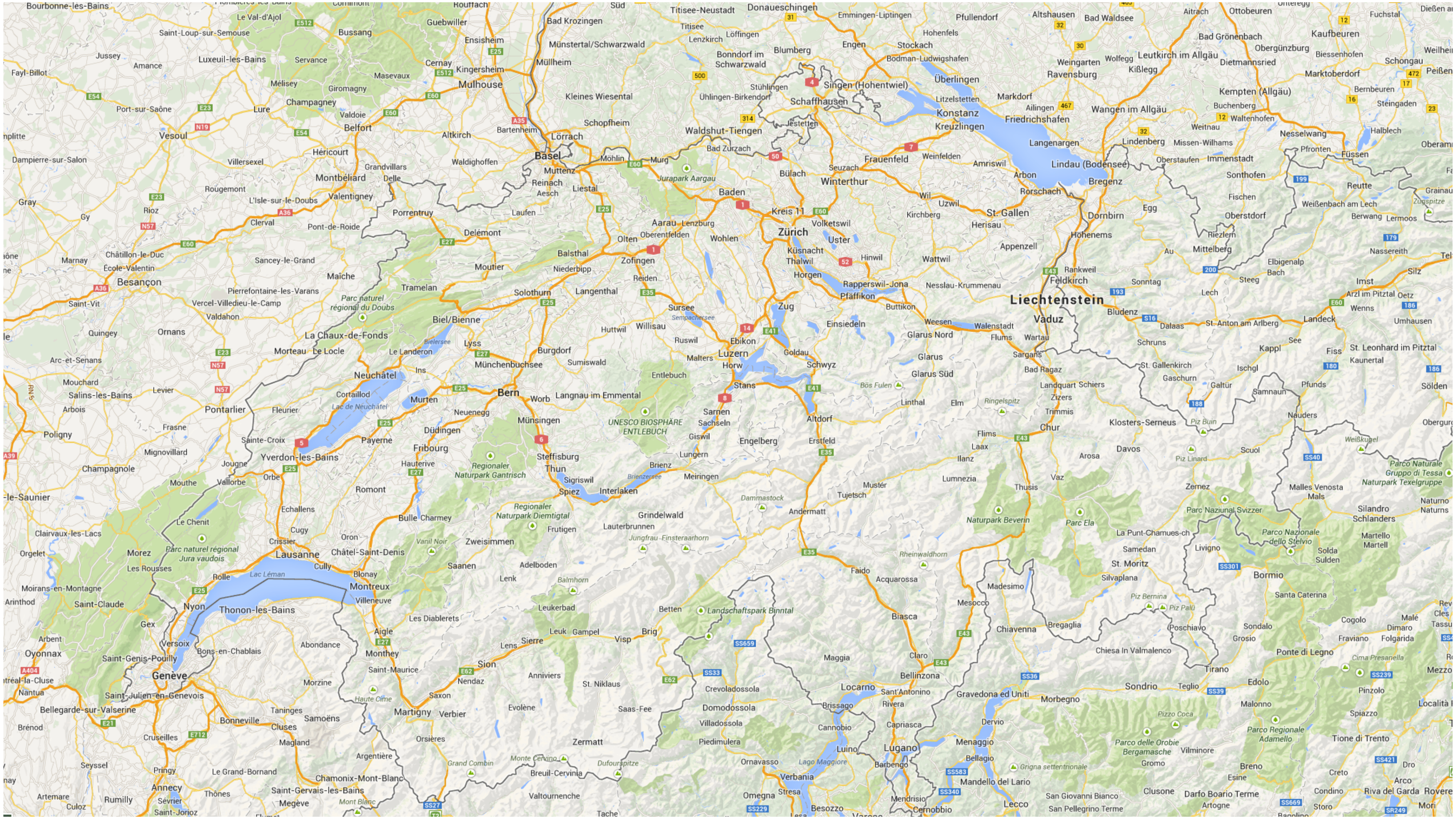


Liechtenstein
Vaduz
Basel
Zürich
Bern
Luzern
Lausanne
Genève
Neuchâtel
Biel/Bienne
Fribourg
Thun
Interlaken
Sion
Martigny
Montreux
Chur
St. Gallen
Winterthur
Schaffhausen
Konstanz
Friedrichshafen
Lindau (Bodensee)
Bregenz
Dornbirn
Feldkirch
Mulhouse
Belfort
Besançon
Vesoul
Montbéliard
Pontarlier
La Chaux-de-Fonds
Yverdon-les-Bains
Thonon-les-Bains
Annecy
Chamonix-Mont-Blanc
Zermatt
Grindelwald
Lugano
Locarno
Bellinzona
Como
Lecco
Sondrio
St. Moritz
Davos
Bormio
Landeck
Kempten (Allgäu)
Singen (Hohentwiel)
Waldshut-Tiengen
Aarau
Baden
Olten
Solothurn
Zug
Schwyz
Altdorf
Glarus
Sarnen
Stans
Lörrach
Freiburg
Lac Léman
Lac de Neuchâtel

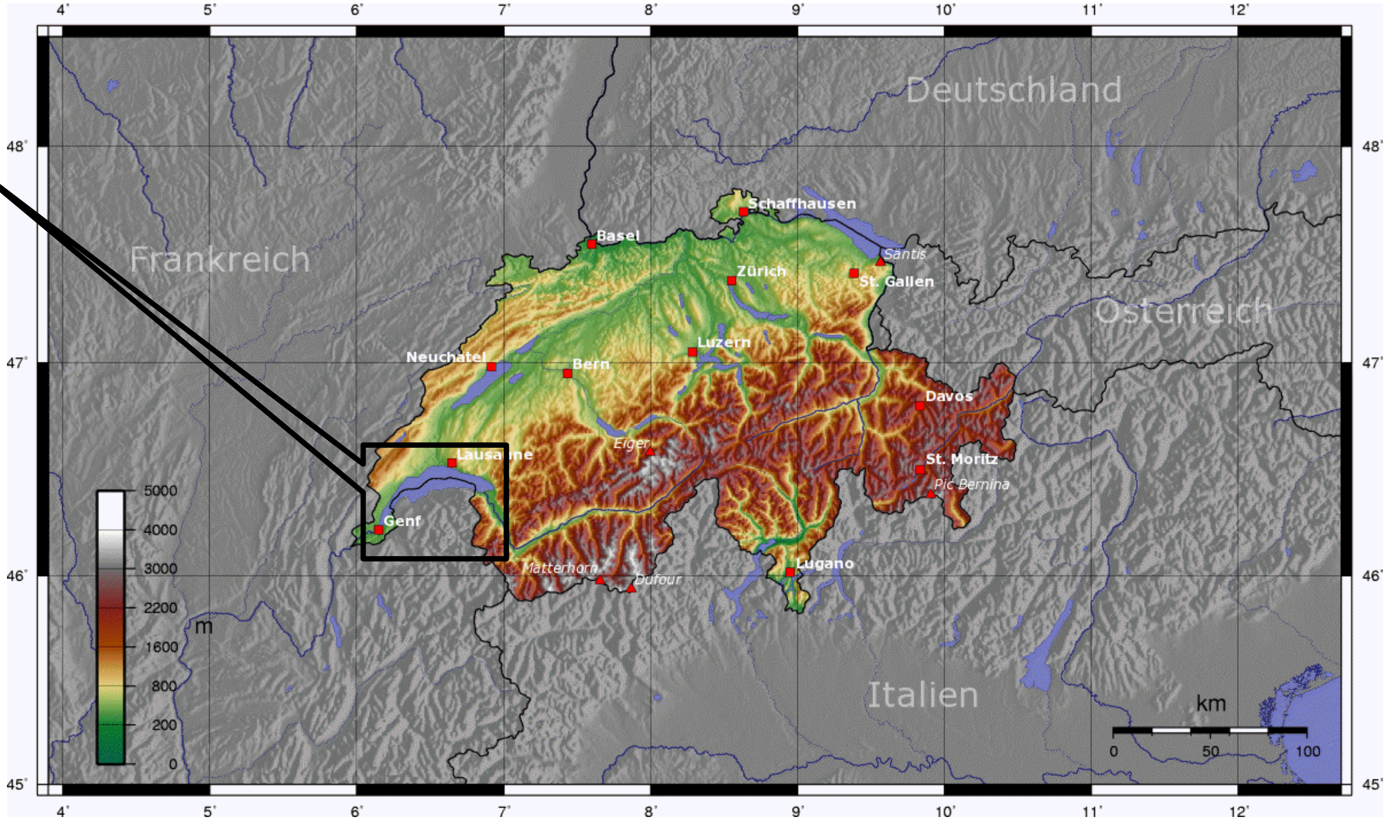
Singapore: 715 km2
Mean temperature: 27° C

Lake Geneva: 580 km2
Mean temperature: 11° C

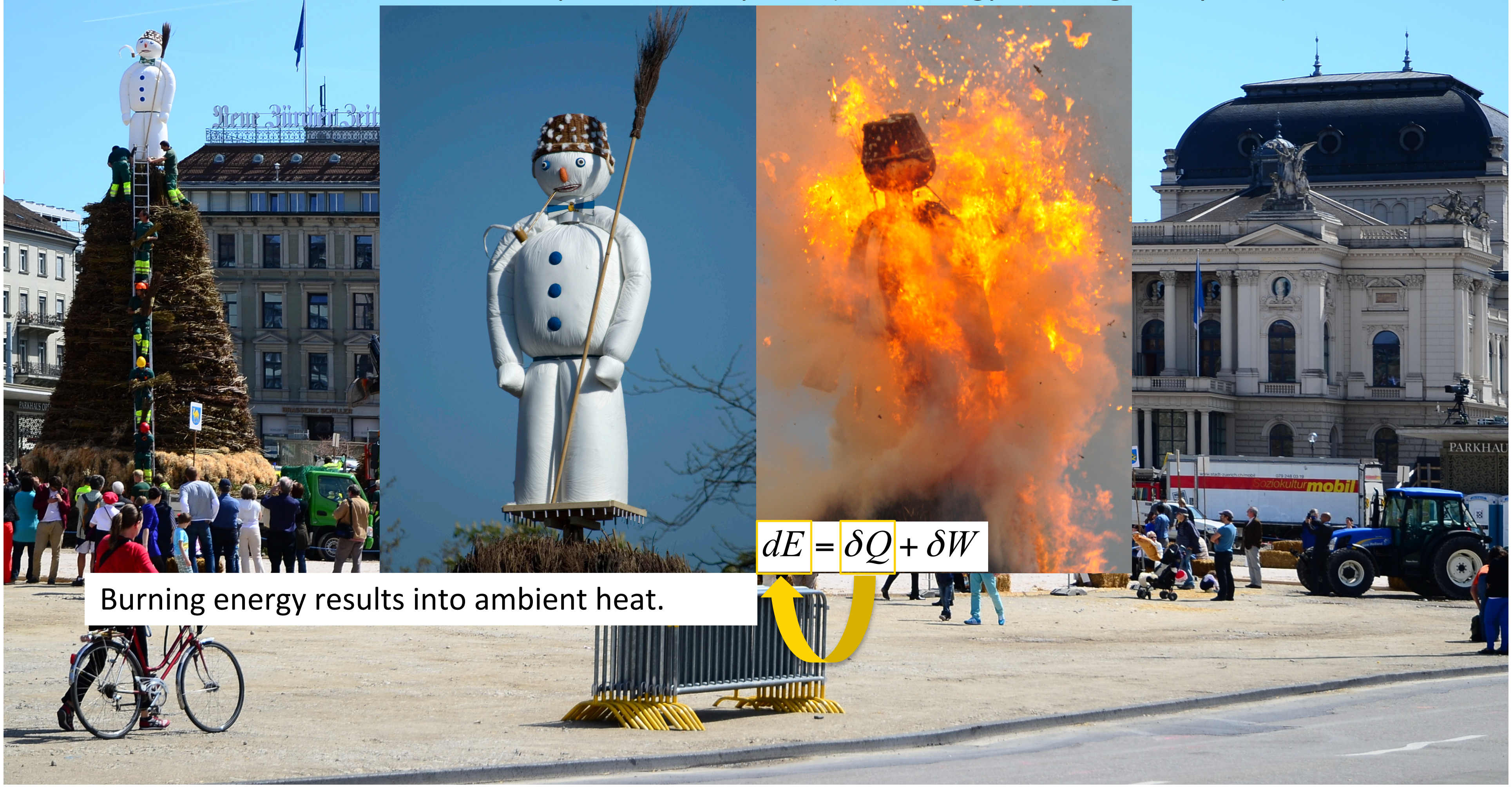
Singapore energy demand:
531000 TJ

Swiss Energy demand:
852000 TJ

Imagine: 2/3 of Swiss
energy supply to be
released on Lake Geneva

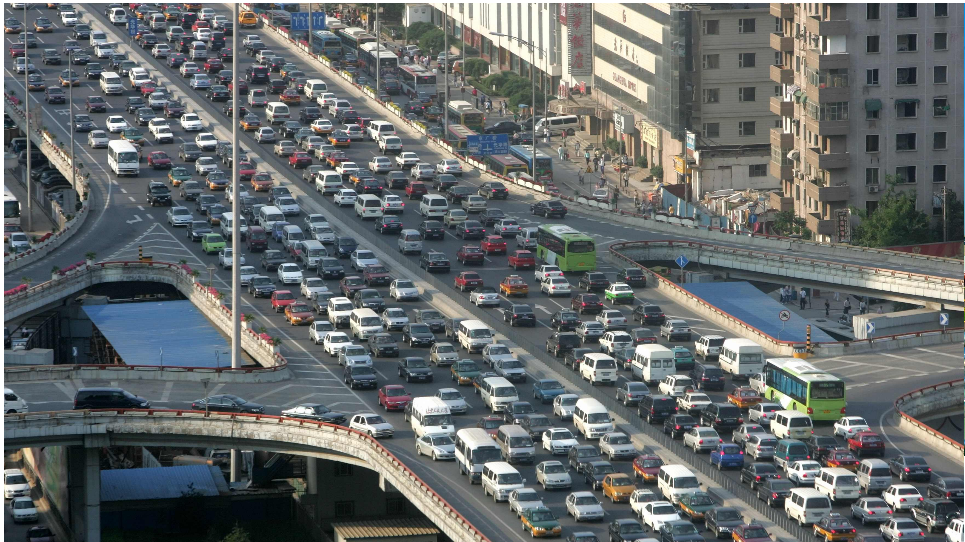


W is the work done by the system (energy exiting the system as work),
Q is the heat put into the system (heat energy entering the system),



$$dE = \delta Q + \delta W$$

Burning energy results into ambient heat.



W is the work done by the system (energy exiting the system as work),
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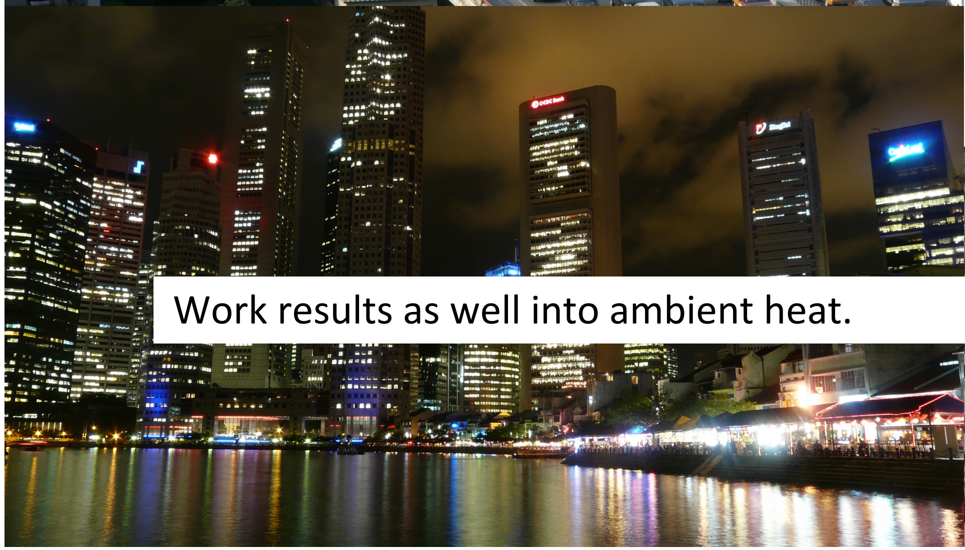
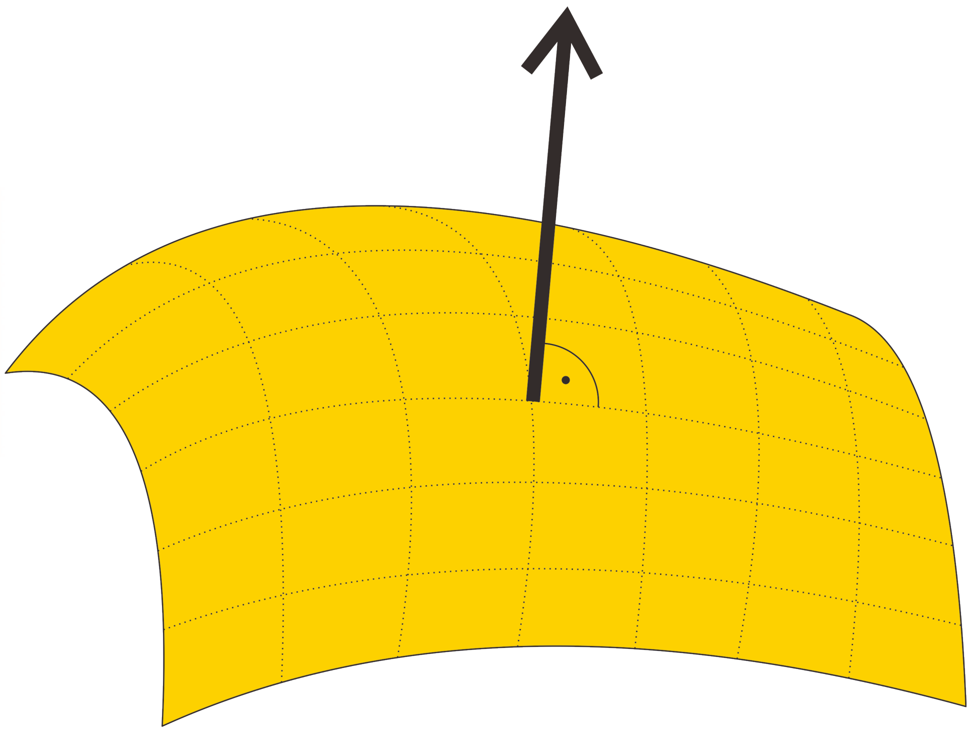
$$dE = \delta Q + \delta W$$



Work results as well into ambient heat.

Interlude:
From Energy
to Power Density
or Heat Flux

Heat flux



$$\frac{\partial E}{\partial t} = \int_S \vec{\phi}_q \cdot d\vec{S}$$

$$= \left[W / m^2 \right]$$

$\phi_q \ldots$ heat flux density

$S \ldots$ surface

Conservative energy demand estimate

Translating annual energy demand into heat flux

$$531055\,\frac{TJ}{a} = \frac{531055}{8760\cdot 3600}\,\frac{TJ}{s} = 16840\,\frac{MJ}{s}$$

$$\frac{16840}{712.4}\,\frac{MW\cdot s}{s\cdot km^2} \approx 24\,\frac{W}{m^2}$$

$$32.77\,\frac{Mtoe}{a} = \frac{32.77\cdot 41868}{8760\cdot 3600}\,\frac{TJ}{s} = 43506\,\frac{MJ}{s}$$

$$\frac{43506}{712.4}\,\frac{W}{m^2} \approx 61\,\frac{W}{m^2}$$

$$\left\{\frac{\text{energy}}{\text{time}}\right. = \text{power}$$

$$\left\{\frac{\text{power}}{\text{surface}}\right. = \text{power density}$$

$$= \text{heat flux}$$

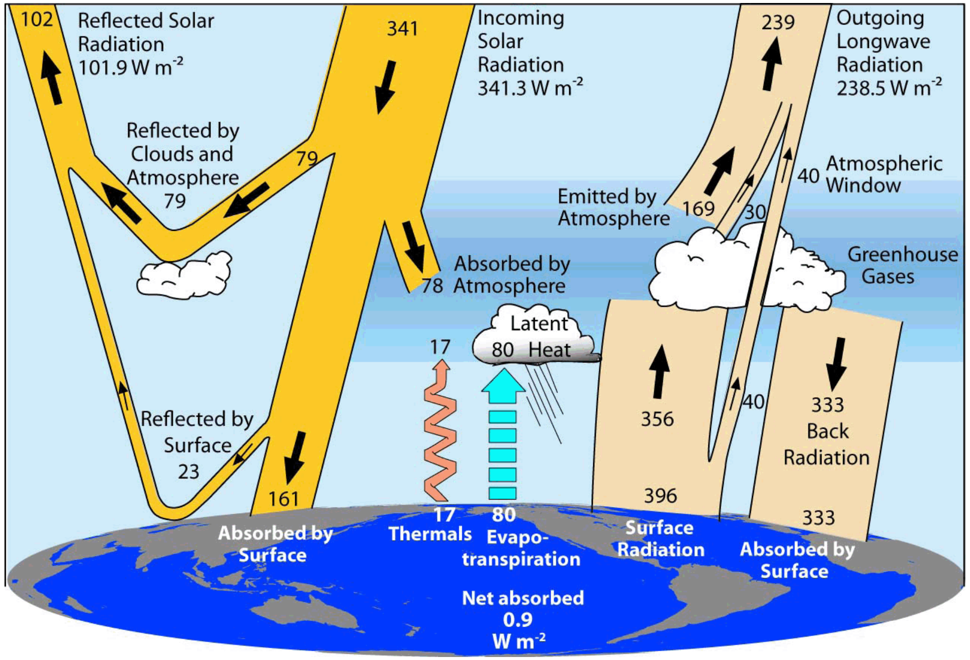
Official 2010 IEA TPES

Mtoe: Million tons of oil equivalent

Countries	**Energy density** in W/m²
Mongolia	0.0027
Switzerland	0.866
Bahrain	16.4
Singapore	24-61

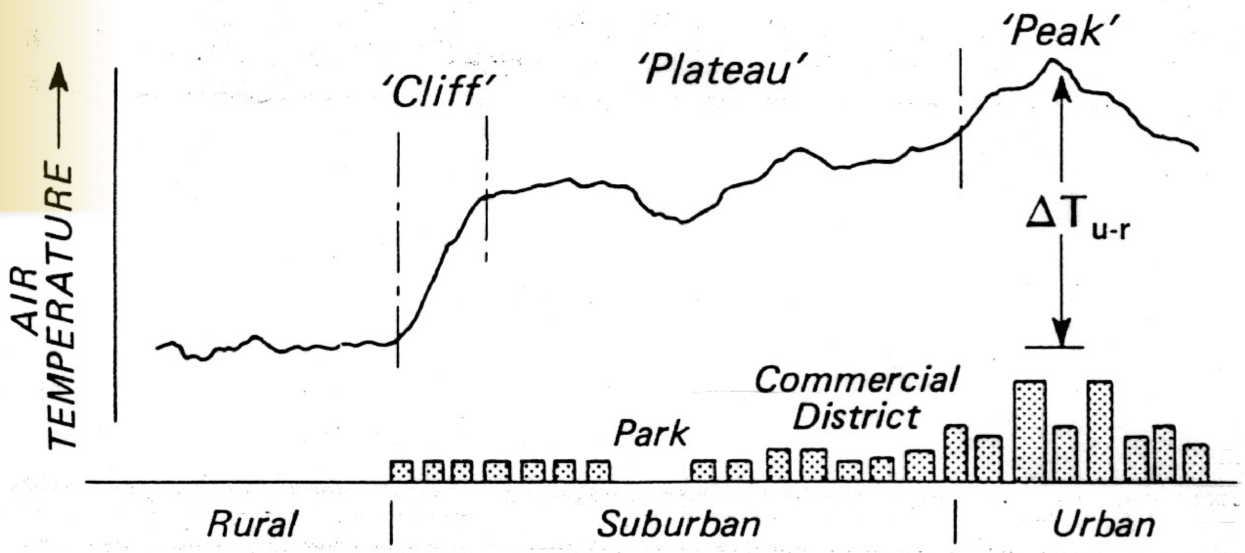
The Urban
Heat Island
Effect (UHI)

Global energy balance in W/m²



The background values (shown in black) of the energy fluxes are based on observations for 2000–05 (Trenberth et al. 2009).

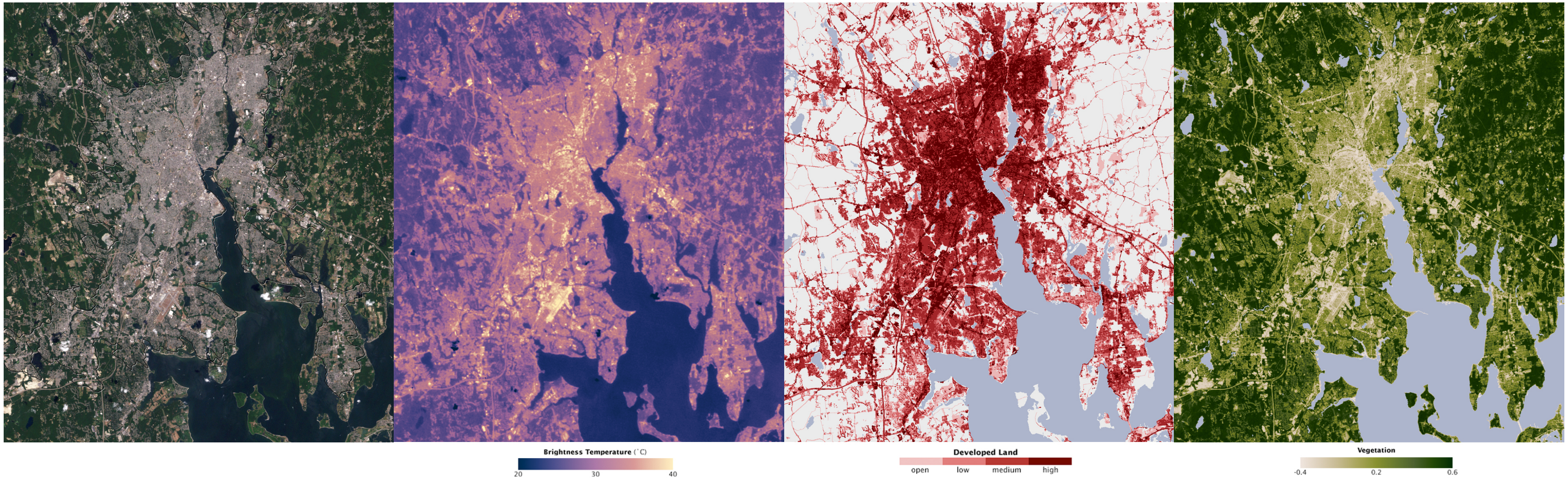
Temperature profile of UHI's



T. R. Oke, "City size and the urban heat island," *Atmospheric Environment (1967),* vol. 7, pp. 769-779, 1973.
T. R. Oke, "The energetic basis of the urban heat island," *Quarterly Journal of the Royal Meteorological Society,* vol. 108, pp. 1-24, 1982.

Providence,
Rhode Island

Population	178’042
Area	48 km^2
Density	3710/ km^2
Metro	1’630’956



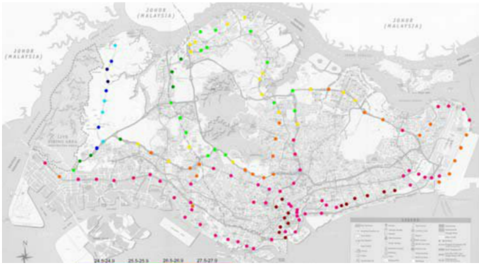
Insolation & Climate
(*natural cause*)

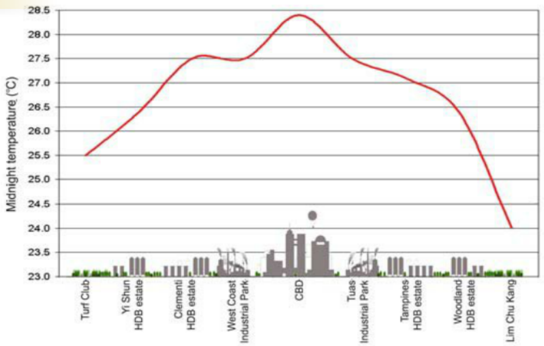
causality →

Urban heat island effect

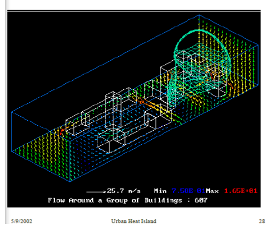
Cause	**Energy density** in W/m^2
city centers	25
urban area	15
maximal	75
Chicago	53
Cincinnati	26
LA	21
Fairbanks	19
St. Louis	16
Manhattan	117-159
Moscow	127
Montreal	99
Budapest	43
Osaka	26
Vancouver	19

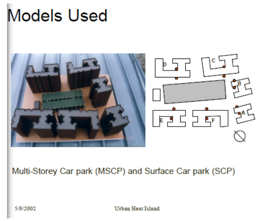
Theory:
UHI in Singapore

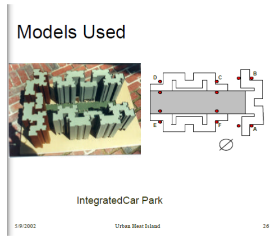




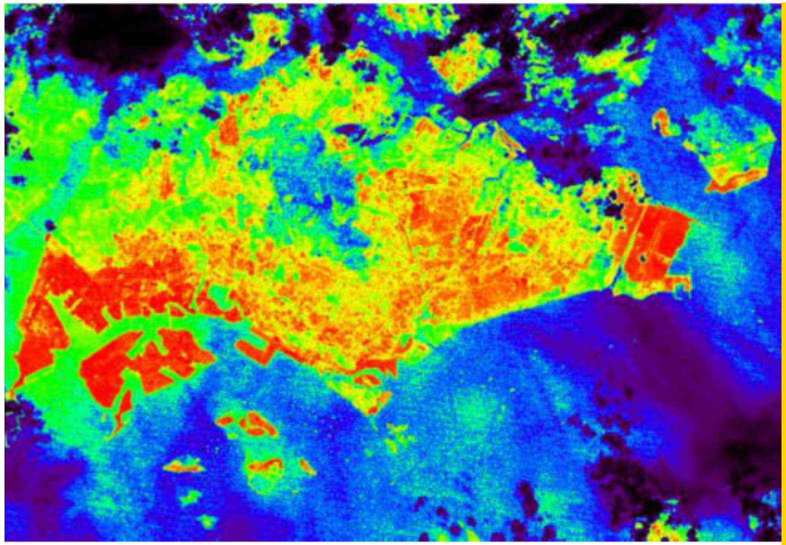
- Taking spatial temperature profiles
- Enhancing wind flow through wind tunnel and CFD studies
- Cooling surfaces by greenery and color change (albedo)
- Built artificial sun shading







Source: A study of Urban Heat Island (UHI) in Singapore *by Dr. Wong Nyuk Hien*

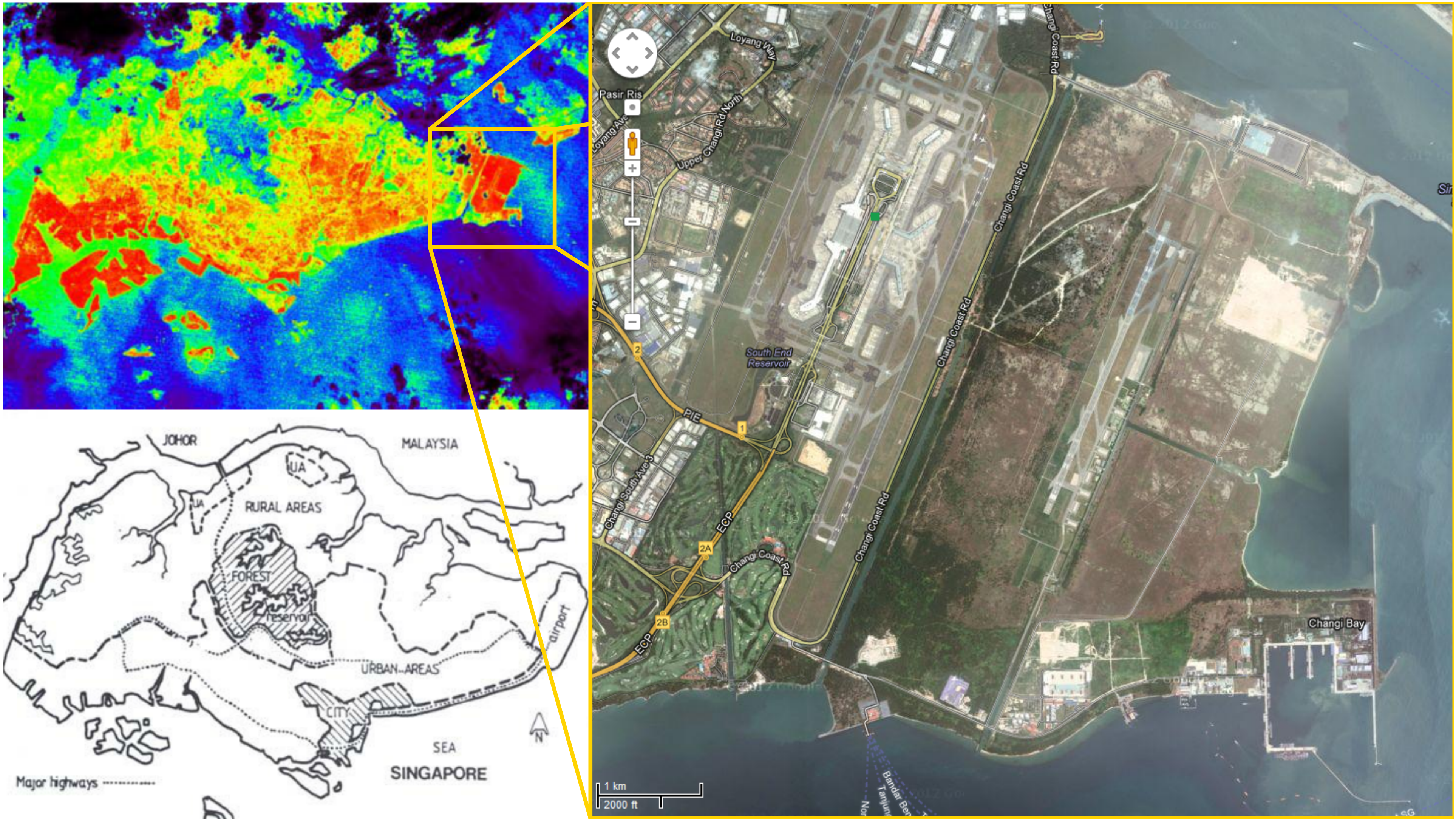


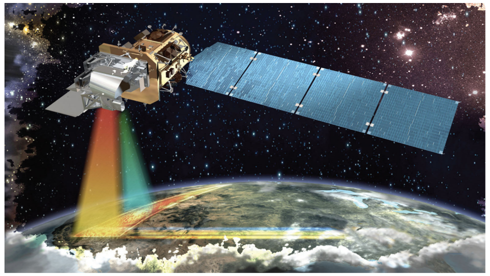
«Through the satellite image, the 'hot' spots are normally observed on exposed hard surfaces in the urban context during daytime. It is suggested that these exposed hard surfaces should be strategically shaded by greenery or artificial sun-shading devices.»

«Air conditioning condenser units spaced widely apart doesn't contribute much to the heat build up […] as long as there is some wind flow. […] The effect of traffic is not found to be very significant.»

As well suggested: better cooling by enhanced wind flow, wind tunnel experiments

Source: A study of Urban Heat Island (UHI) in Singapore *by Dr. Wong Nyuk Hien*


JOHOR
MALAYSIA
UA
UA
RURAL AREAS
FOREST
reservoir
airport
URBAN AREAS
CITY
SEA
SINGAPORE
N
Major highways
Loyang Way
Pasir Ris
Loyang Ave
Upper Changi Rd North
Changi Coast Rd
South End Reservoir
PIE
ECP
Changi South Ave 3
Changi Coast Rd
Changi Bay
1 km
2000 ft



Infrared radiation

≠

Surface temperature

≠

Air temperature

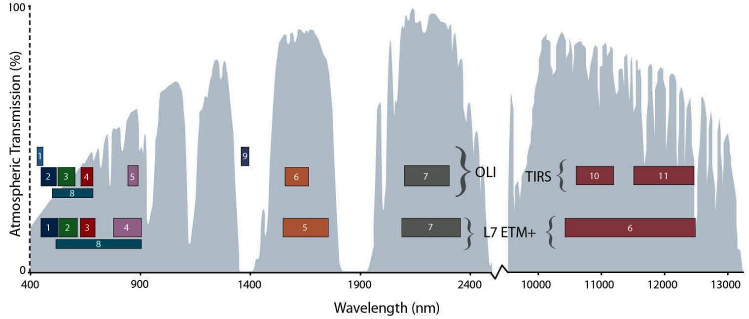
≠

Heat

≠

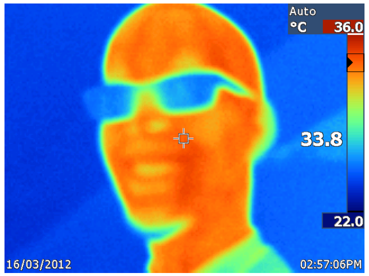
Heat flux

$$dE = \frac{2h\nu^3}{c^2}\frac{1}{e^{h\nu/kT}-1}$$



$$dE = \varepsilon \cdot \sigma \cdot S \cdot T^4 \quad \left| \varepsilon = f(\nu) \right.$$

$$Q = m \cdot c \cdot \Delta T \quad \left| m, c \left\{ H_2O + \text{gases} \right\} \right.$$



Band 1 Visible (0.45-0.52 µm) 30 m

Band 2 Visible (0.52-0.60 µm) 30 m

Band 3 Visible (0.63-0.69 µm) 30 m

Band 4 Near-Infrared (0.77-0.90 µm) 30 m

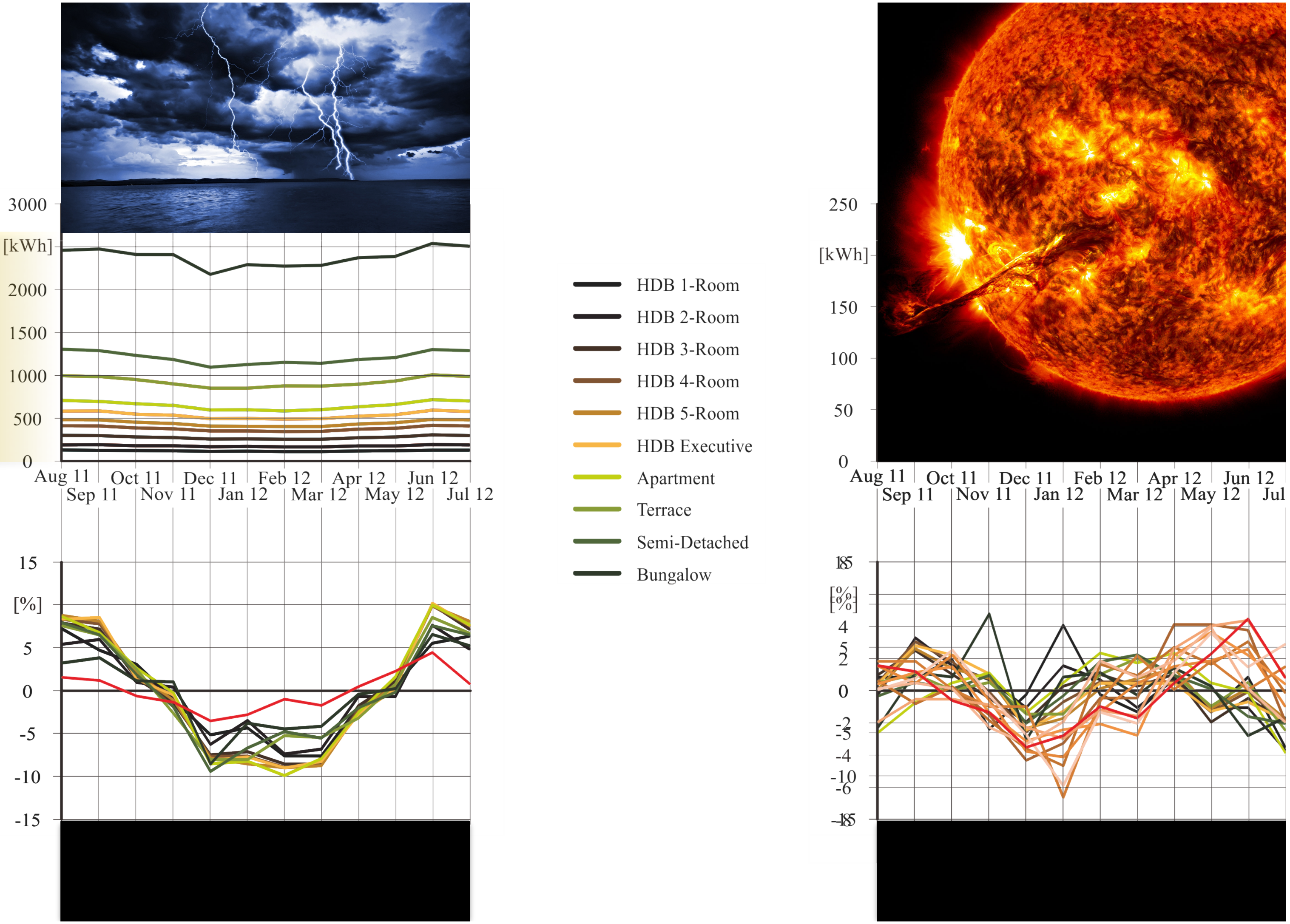
Band 5 Near-Infrared (1.55-1.75 µm) 30 m

Band 6 Thermal (10.40-12.50 µm) 60 m

Band 7 Mid-Infrared (2.08-2.35 µm) 30 m

Band 8 Panchromatic (0.52-0.90 µm) 15 m

Electricity and gas consumption in Singapore



5.2% of total energy demand

Insolation & Climate
(*natural cause*)

causality →

Urban heat island effect

Cause	**Energy density** in W/m²
incoming solar radiation	341
reflected radiation	102
outgoing longwave	239
thermals, ground to air	17
evapotranspiration	80
radiation from ground	396
gas turbine	100000000
CD-player	1000
tornado or thunderstorm	1000
peak traffic density	700
monsun	100
growth of trop. Forrest	1
soil erosion global mean	0.05
global energy use	0.03

Case Study:
Ghim Moh Valley
HDB estate

Site plan of Ghim Moh Valley

Queenstown N6 RC25

Standard Flats

Site Plan

- 2- Room
- 3- Room
- 4 - Room
- 5 - Room
- Eating House, Shops and Supermarket at 1st Storey
- Surrounding Buildings / Bus Stop
- Footbridge
- Reserved for / Existing Development
- Linkway / Drop-Off Porch / Shelter / Precinct Pavilion
- Residents' Committee Centre (RCC) at 1st Storey
- Education Centre (EC) at Roof Deck
- Children Playground (PG) / Hard Court (HC) / Elderly Fitness Station (EFS) / Fitness Corner
- Electrical Substation (ESS) / Bin Centre (BC) at 1st Storey
- Utility Centre (UC) at 1st Storey
- Carparking
- Open Space
- Staircase
- Service Bay / Loading & Unloading Bay
- Refuse Chute
- Lift

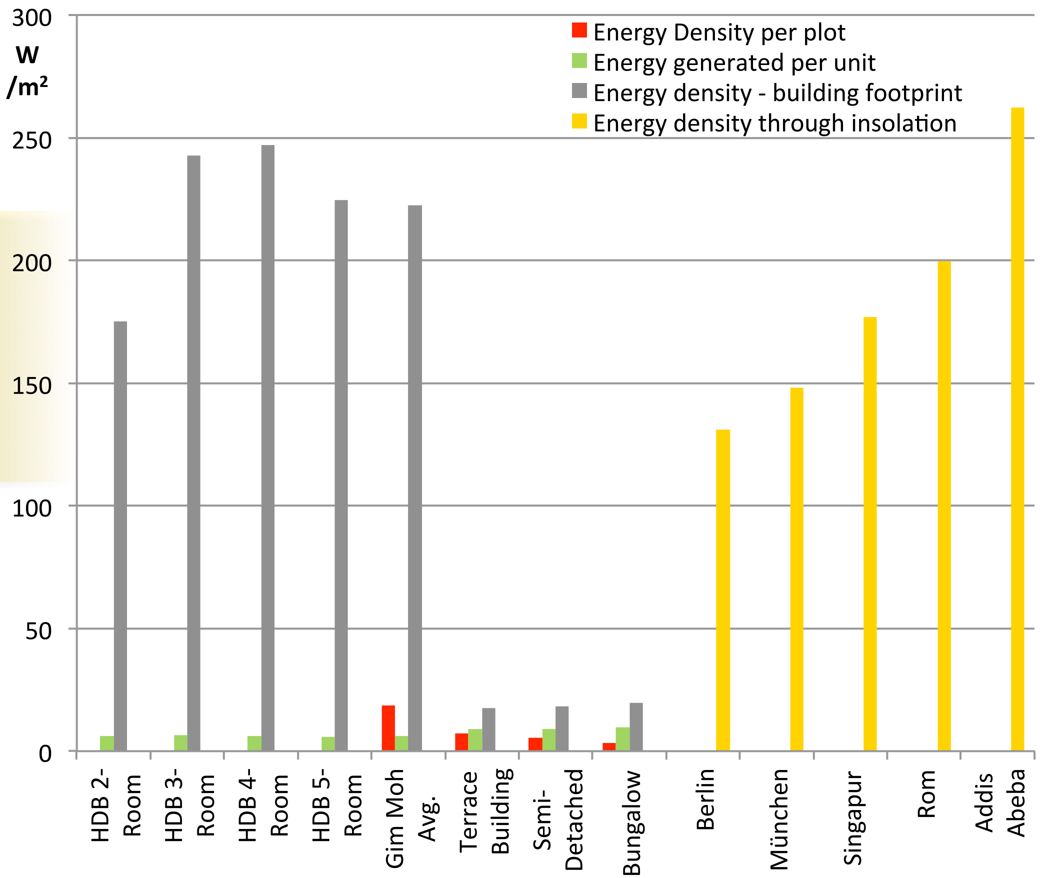
Block Number	Number of Storeys	2 Room	3 Room	4 Room	5 Room	Lift Opens At
22	35/40	-	-	214	74	Every Storey
23	35/40	-	-	215	76	Every Storey
26	30	84	143	-	-	Every Storey
27	30/40	87	76	117	-	Every Storey
28	40	-	-	233	75	Every Storey
	Total	171	219	779	225	

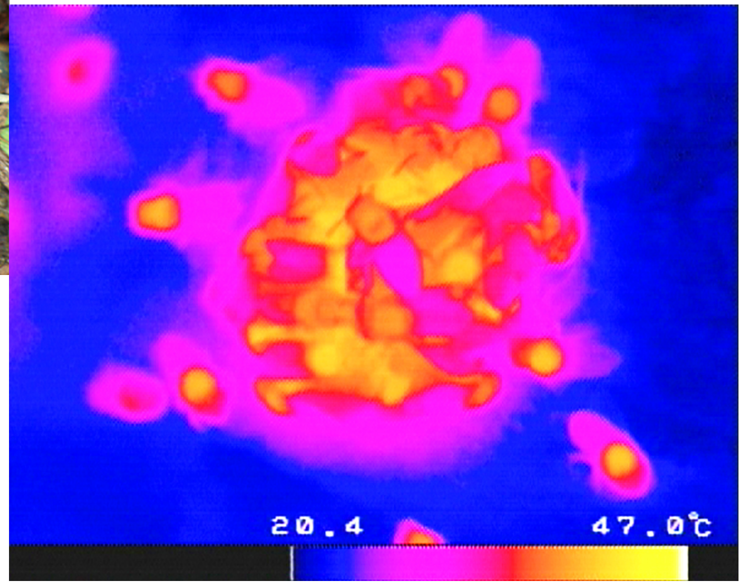
Image courtesy of the Housing & Development Board (HDB) Singapore.

The information contained herein is subject to change at any time without notice and cannot form part of an offer or contract. The proposed facilities and their locations as shown are only estimates. The implementation of the facilities is subject to review by the Government or competent authorities. While reasonable care has been taken in providing this information, HDB shall not be responsible in any way for any damage or loss suffered by any person whether directly or indirectly as a result of reliance on the said information or as a result of any error or omission therein.

Image courtesy of the Housing & Development Board (HDB) Singapore.

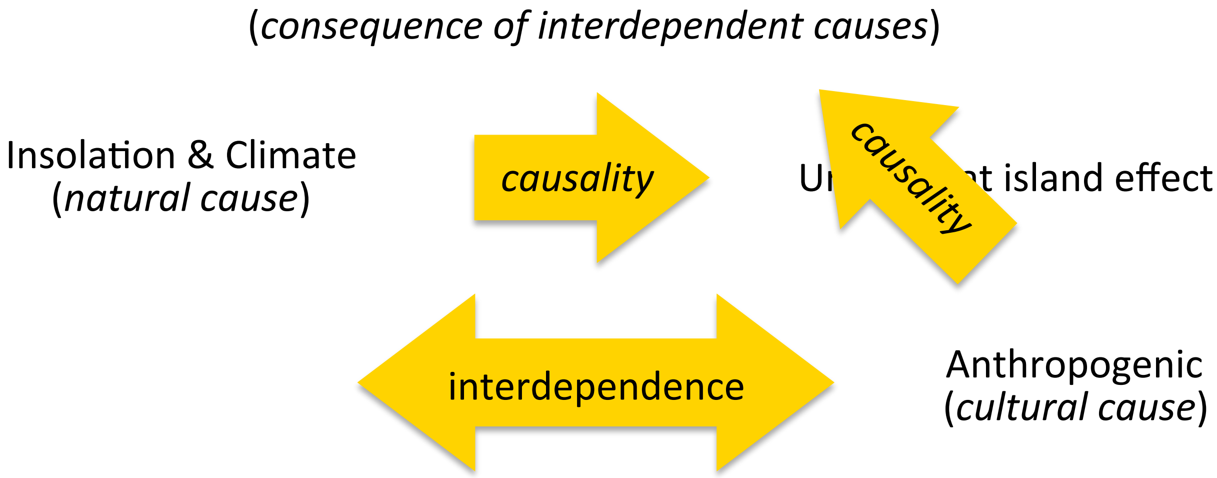
Comparison of anthropogenic heat release and natural insolation





The “unusual
thermal defence
by a honeybee [...]”

M. Ono, T. Igarashi, E. Ohno, and M. Sasaki, "Unusual thermal defence by a honeybee against mass attack by hornets," *Nature,* vol. 377, pp. 334-336, 1995.
H. Käfer, H. Kovac, and A. Stabentheiner, "Resting metabolism and critical thermal maxima of vespine wasps (Vespula sp.)," *Journal of Insect Physiology,* vol. 58, 2012.


(*consequence of interdependent causes*)
Insolation & Climate
(*natural cause*)
causality
causality
island effect
interdependence
Anthropogenic
(*cultural cause*)

Whitepaper

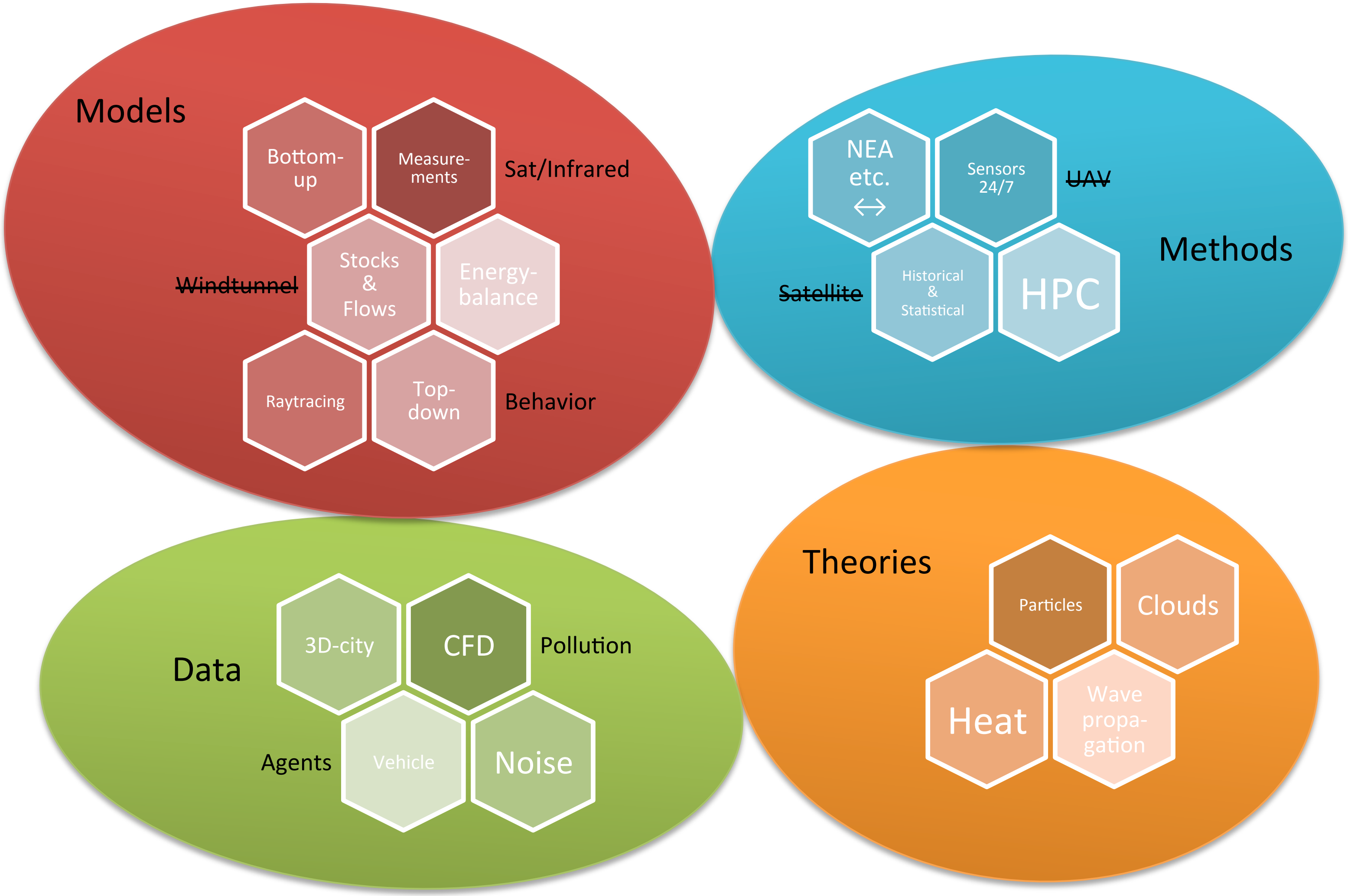
Cooler
Calmer

Singapore

Cooler calmer Singapore is an FCL synergy project involving partners such as TUM-CREATE, NUS, NTU, and A*Star. Researchers will investigate the degree to which we can reduce anthropogenic heat and noise generation through technical methods and policies, and whether there is a link between the two.

The goals are to reduce the urban heat island effect and noise pollution, ultimately increasing the quality of life and lowering energy consumption for a sustainable Singapore.

FCL Leads
Prof. Gerhard Schmitt
Dr. Matthias Berger


Models
Bottom-up
Measure-ments
Sat/Infrared
Windtunnel
Stocks & Flows
Energy-balance
Raytracing
Top-down
Behavior
NEA etc. ↔
Sensors 24/7
UAV
Methods
Satellite
Historical & Statistical
HPC
Data
3D-city
CFD
Pollution
Agents
Vehicle
Noise
Theories
Particles
Clouds
Heat
Wave propa-gation

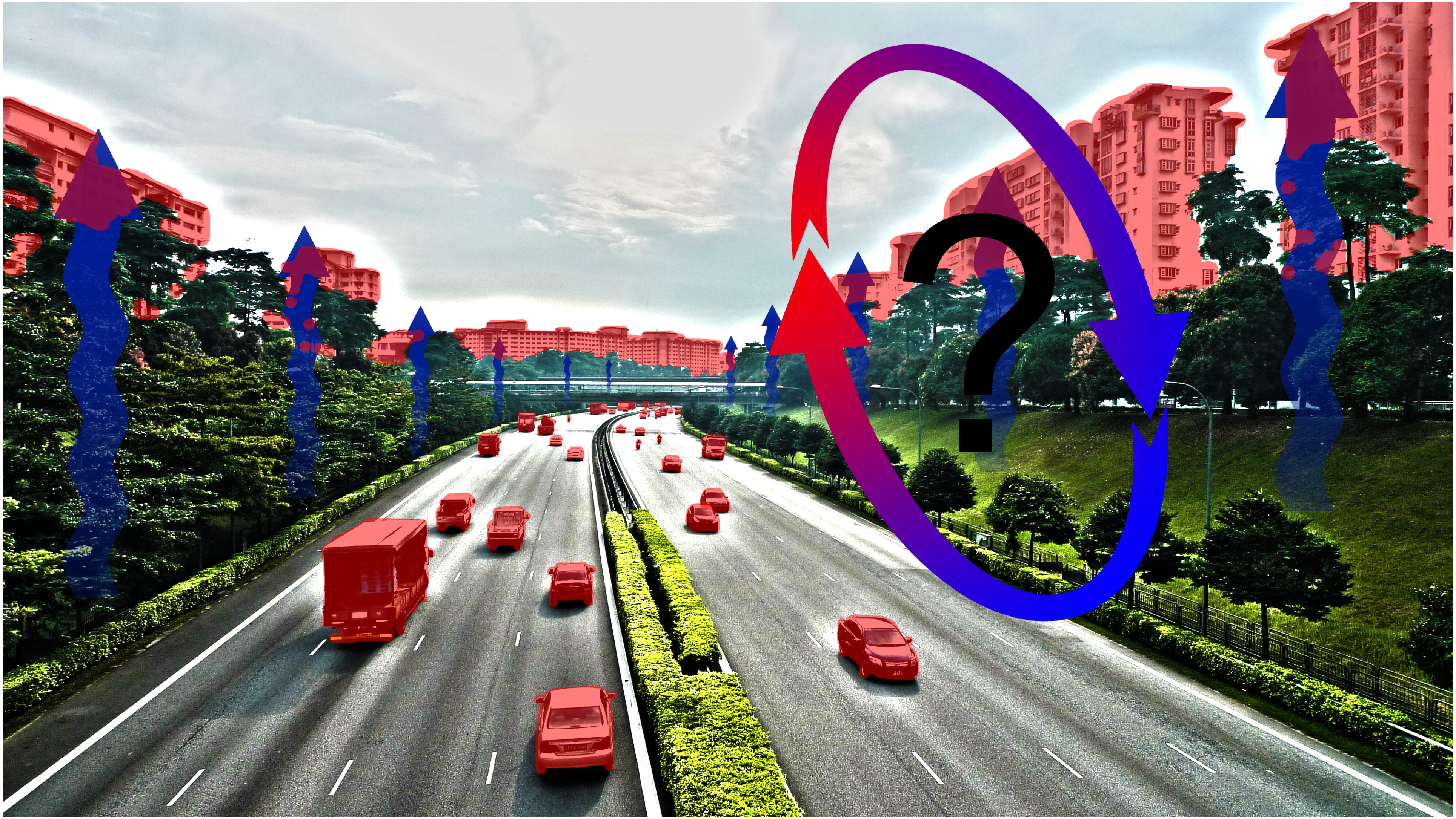
WP4

E-Vehicles/
Traffic

WP4 E-Vehicles/ Traffic
TUM-CREATE, RP5
Dr. Heiko Aydt

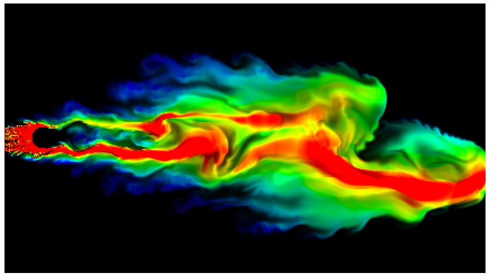
WP2

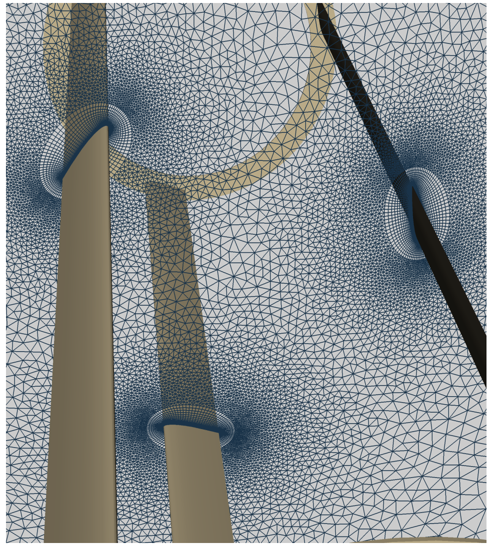
Computational
Fluid Dynamics



$$\rho\left(\frac{\partial \mathbf{v}}{\partial t}+\mathbf{v}\cdot\nabla\mathbf{v}\right)=-\nabla p+\mu\nabla^2\mathbf{v}+\left(\mu+\mu^{\nu}\right)\nabla\left(\nabla\cdot\mathbf{v}\right)+\mathbf{f}$$

WP2 Computational Fluid Dynamics
NTU, Thermal and Fluids Engineering
Prof. Martin Skote

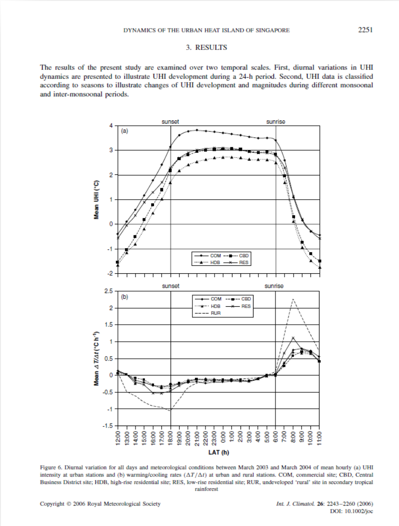




WP1

Climate Modelling

WP1 Climate modelling
NUS, Geography
Prof. Matthias Roth


DYNAMICS OF THE URBAN HEAT ISLAND OF SINGAPORE 2251

3. RESULTS

The results of the present study are examined over two temporal scales. First, diurnal variations in UHI dynamics are presented to illustrate UHI development during a 24-h period. Second, UHI data is classified according to seasons to illustrate changes of UHI development and magnitudes during different monsoonal and inter-monsoonal periods.

Figure 6. Diurnal variation for all days and meteorological conditions between March 2003 and March 2004 of mean hourly (a) UHI intensity at urban stations and (b) warming/cooling rates ($\Delta T/\Delta t$) at urban and rural stations. COM, commercial site; CBD, Central Business District site; HDB, high-rise residential site; RES, low-rise residential site; RUR, undeveloped 'rural' site in secondary tropical rainforest

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Int. J. Climatol. **26**: 2243–2260 (2006)
DOI: 10.1002/joc

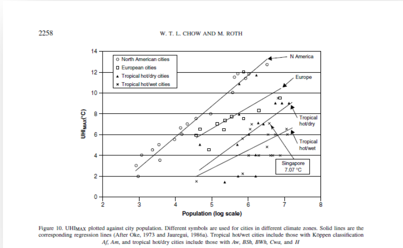

2258 W. T. L. CHOW AND M. ROTH

Figure 10. UHI_{MAX} plotted against city population. Different symbols are used for cities in different climate zones. Solid lines are the corresponding regression lines (After Oke, 1973 and Jauregui, 1986a). Tropical hot/wet cities include those with Köppen classification *Af*, *Am*, and tropical hot/dry cities include those with *Aw*, *BSh*, *BWh*, *Cwa*, and *H*

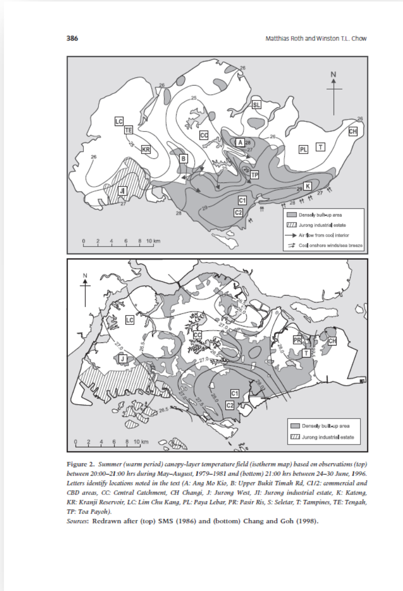
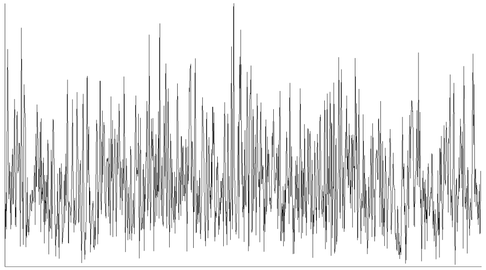
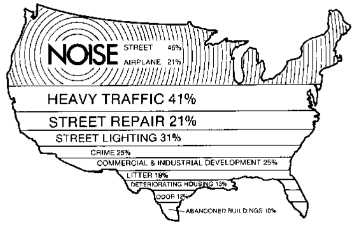

386 Matthias Roth and Winston T.L. Chow

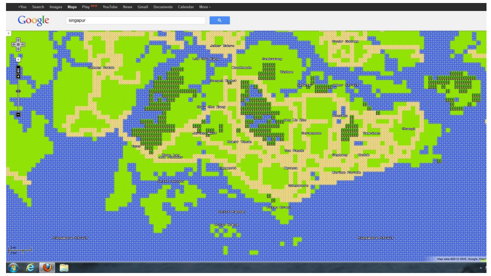
Figure 2. *Summer (warm period) canopy-layer temperature field (isotherm map) based on observations (top) between 20:00–21:00 hrs during May–August, 1979–1981 and (bottom) 21:00 hrs between 24–30 June, 1996. Letters identify locations noted in the text (A: Ang Mo Kio, B: Upper Bukit Timah Rd, C1/2: commercial and CBD areas, CC: Central Catchment, CH Changi, J: Jurong West, JI: Jurong industrial estate, K: Katong, KR: Kranji Reservoir, LC: Lim Chu Kang, PL: Paya Lebar, PR: Pasir Ris, S: Seletar, T: Tampines, TE: Tengah, TP: Toa Payoh).*
Sources: Redrawn after (top) SMS (1986) and (bottom) Chang and Goh (1998).

WP3

Urban Planning/ Computer Science







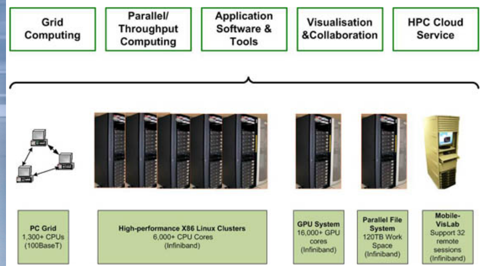
WP3 Urban Planning/ Computer Science

SEC, FCL

Prof. Gerhard Schmitt

*A*Star, IHPC*

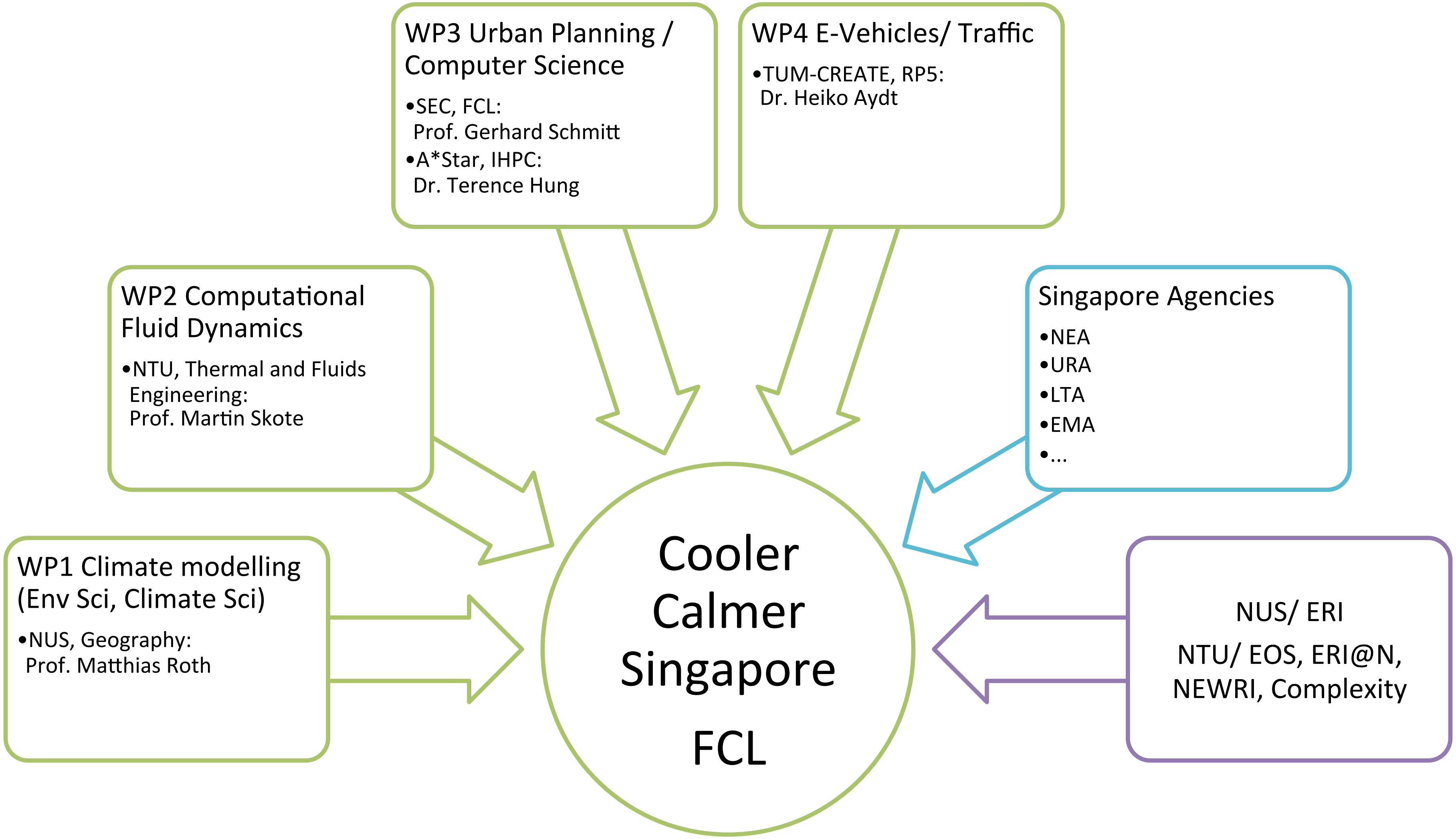
Dr. Terence Hung



Cooler Calmer Singapore – Scenarios

In the next 20 years

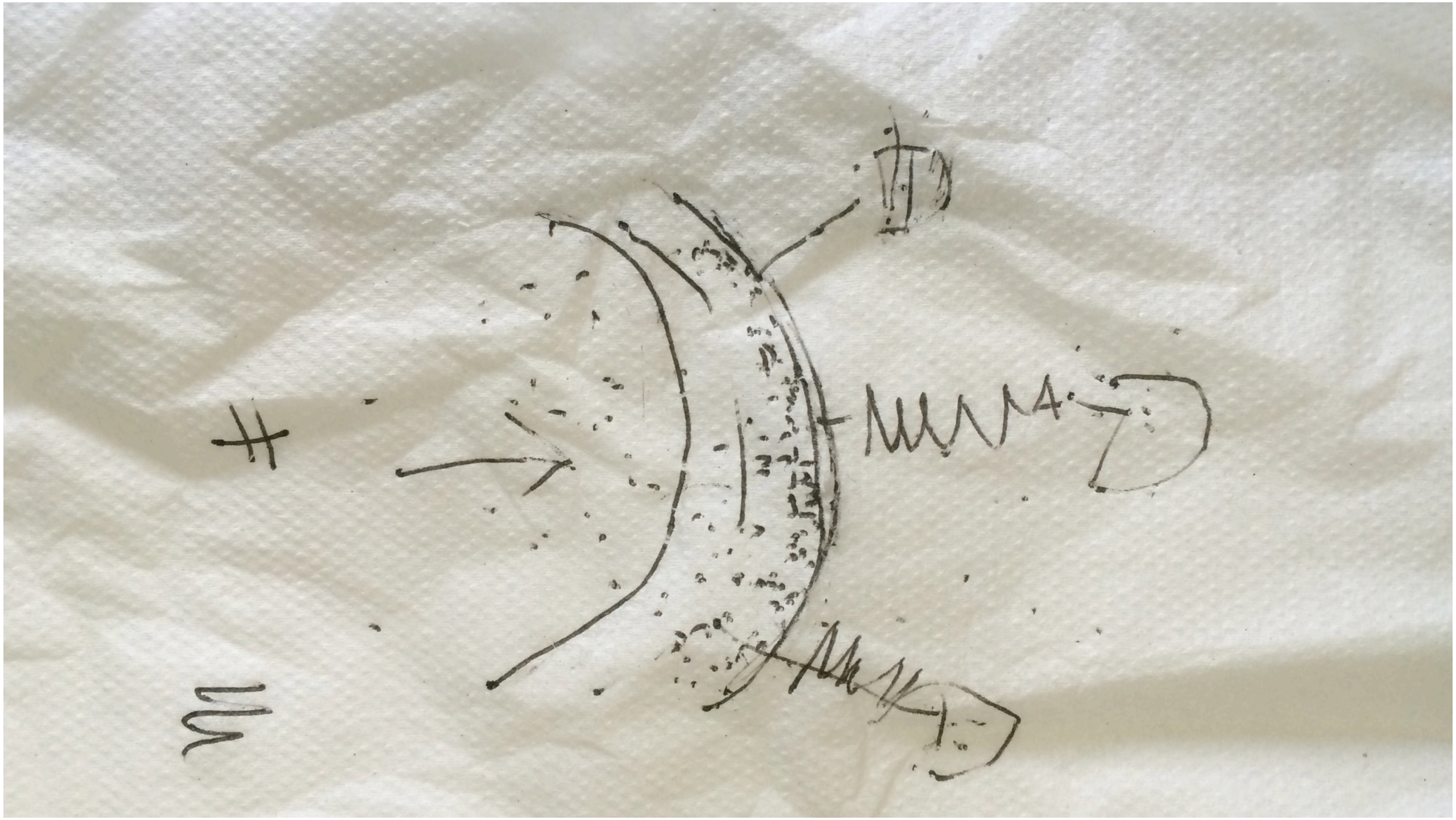
- Moving heat sources out of the city
- Decentralize Production of electricity
- Increasing efficiency of industry (60%)
- Electrification of transportation (22%)
- Increasing efficiency of buildings (17%)
- Use Urban Planning to achieve the above


WP3 Urban Planning / Computer Science
•SEC, FCL: Prof. Gerhard Schmitt
•A*Star, IHPC: Dr. Terence Hung
WP4 E-Vehicles/ Traffic
•TUM-CREATE, RP5: Dr. Heiko Aydt
WP2 Computational Fluid Dynamics
•NTU, Thermal and Fluids Engineering: Prof. Martin Skote
Singapore Agencies
•NEA
•URA
•LTA
•EMA
•...
WP1 Climate modelling (Env Sci, Climate Sci)
•NUS, Geography: Prof. Matthias Roth
Cooler Calmer Singapore
FCL
NUS/ ERI
NTU/ EOS, ERI@N, NEWRI, Complexity

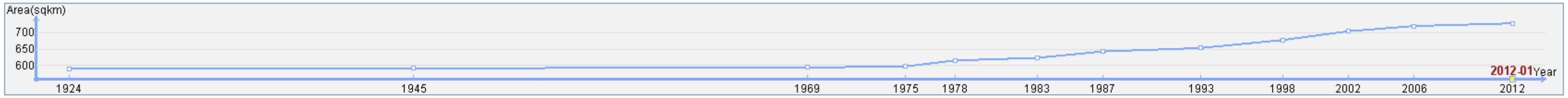
Cooler Calmer Singapore – Scenario 2030

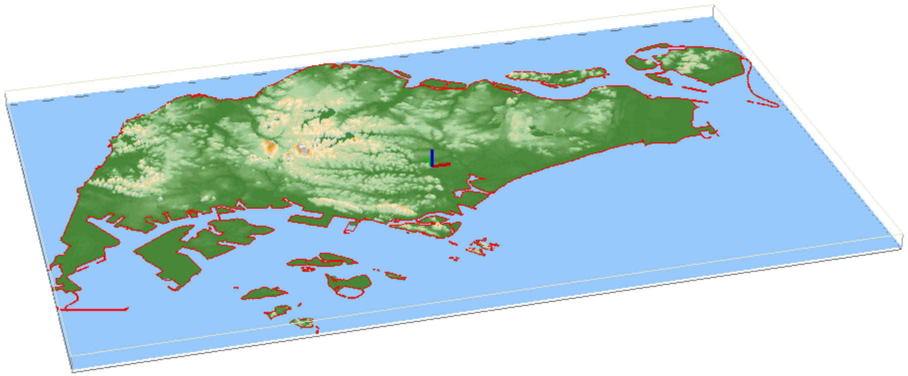
Next Steps

- White Paper to be submitted to NRF in mid June 2013
- Pre-study on data availability and on CFD obstacles throughout Summer 2013
- Submission by Leading House SEC in late Autumn 2013
- Start in January 2014
- Project duration: 5 years



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





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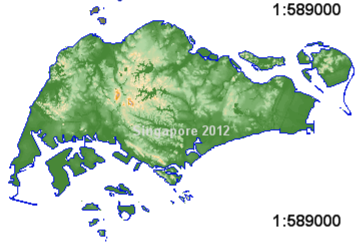

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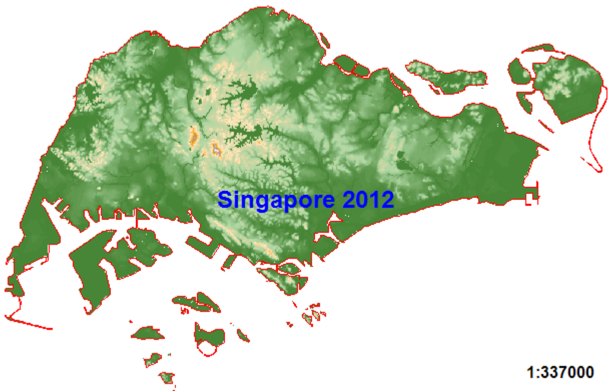
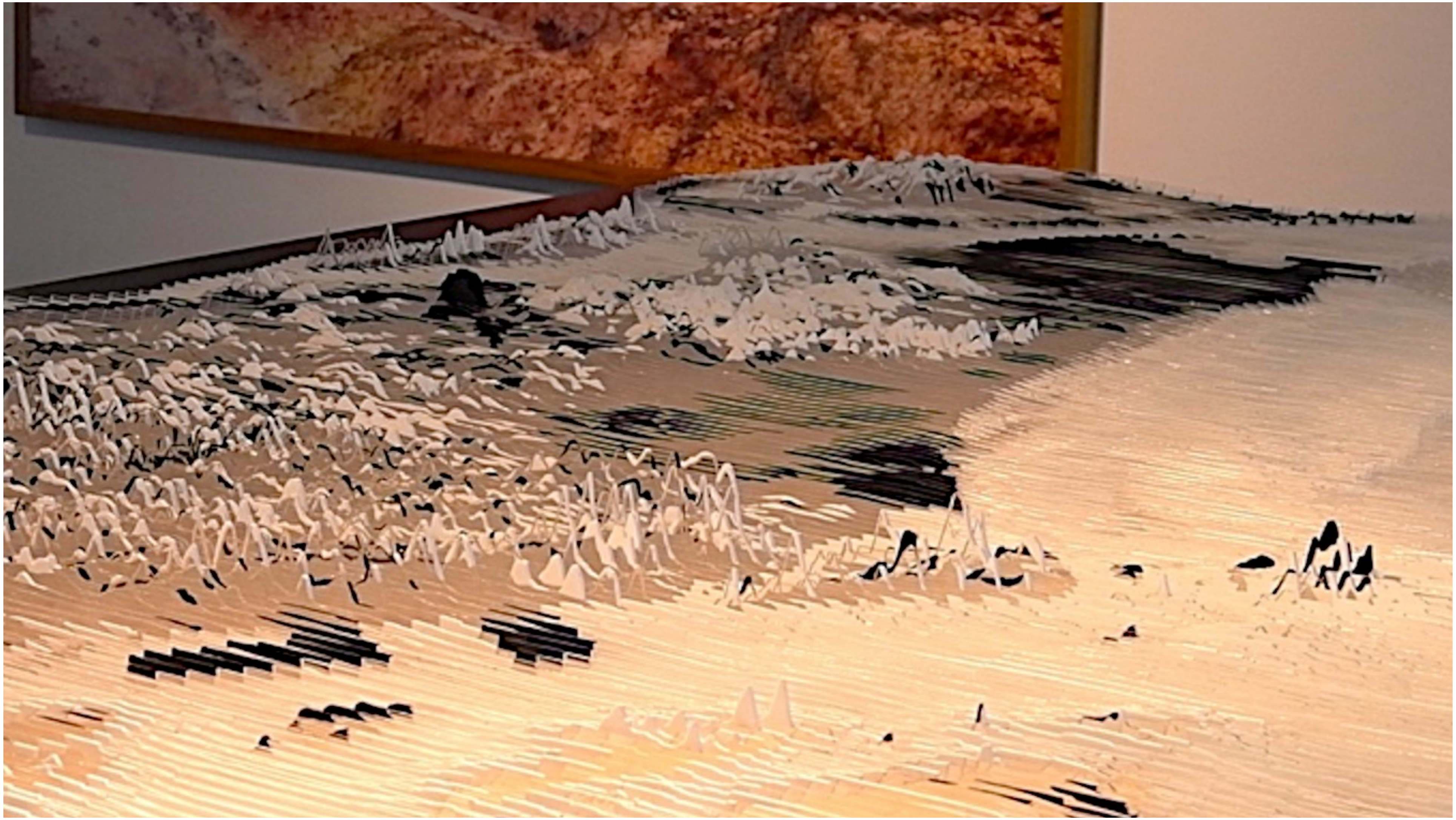
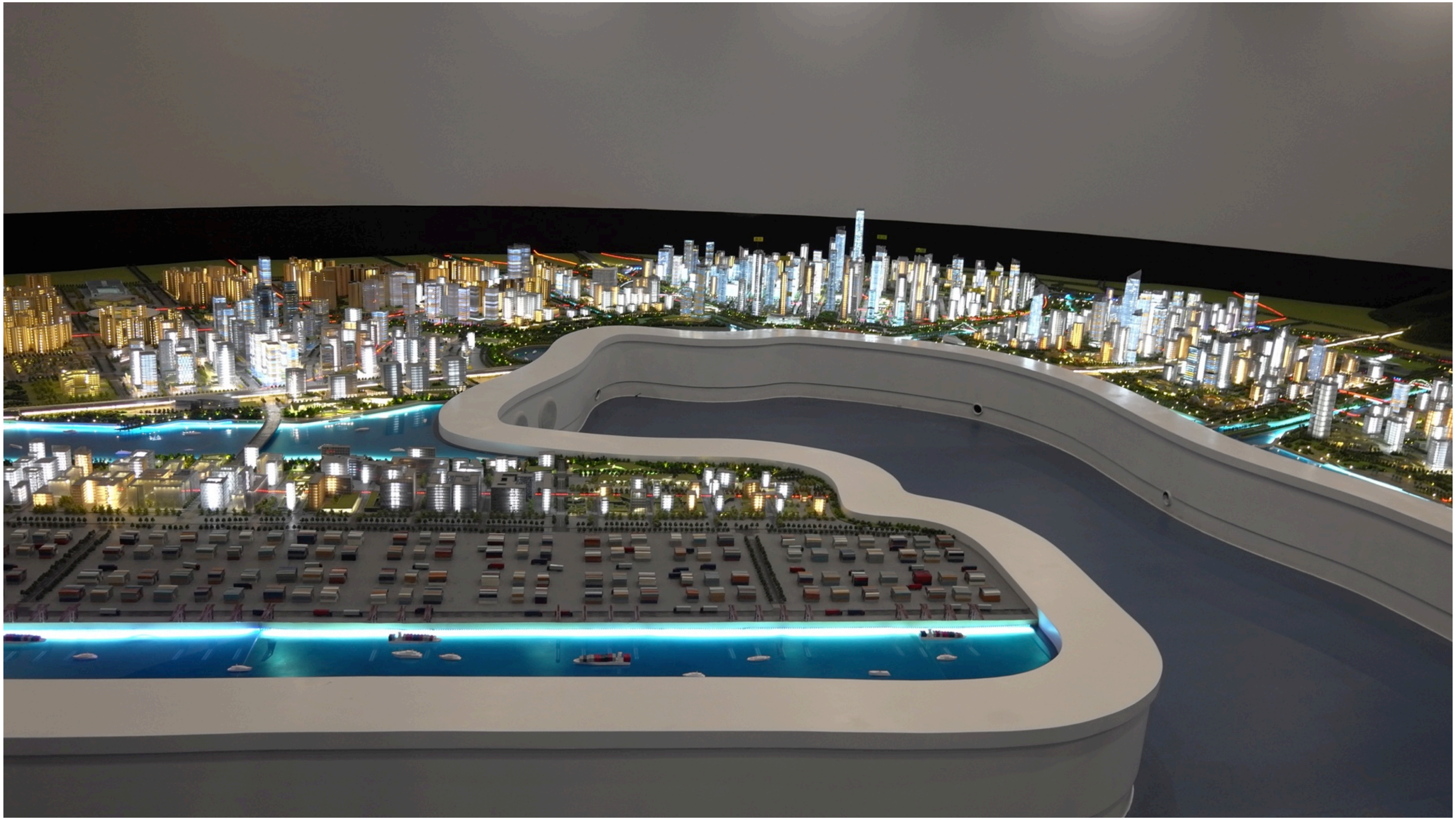


1:337000

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.

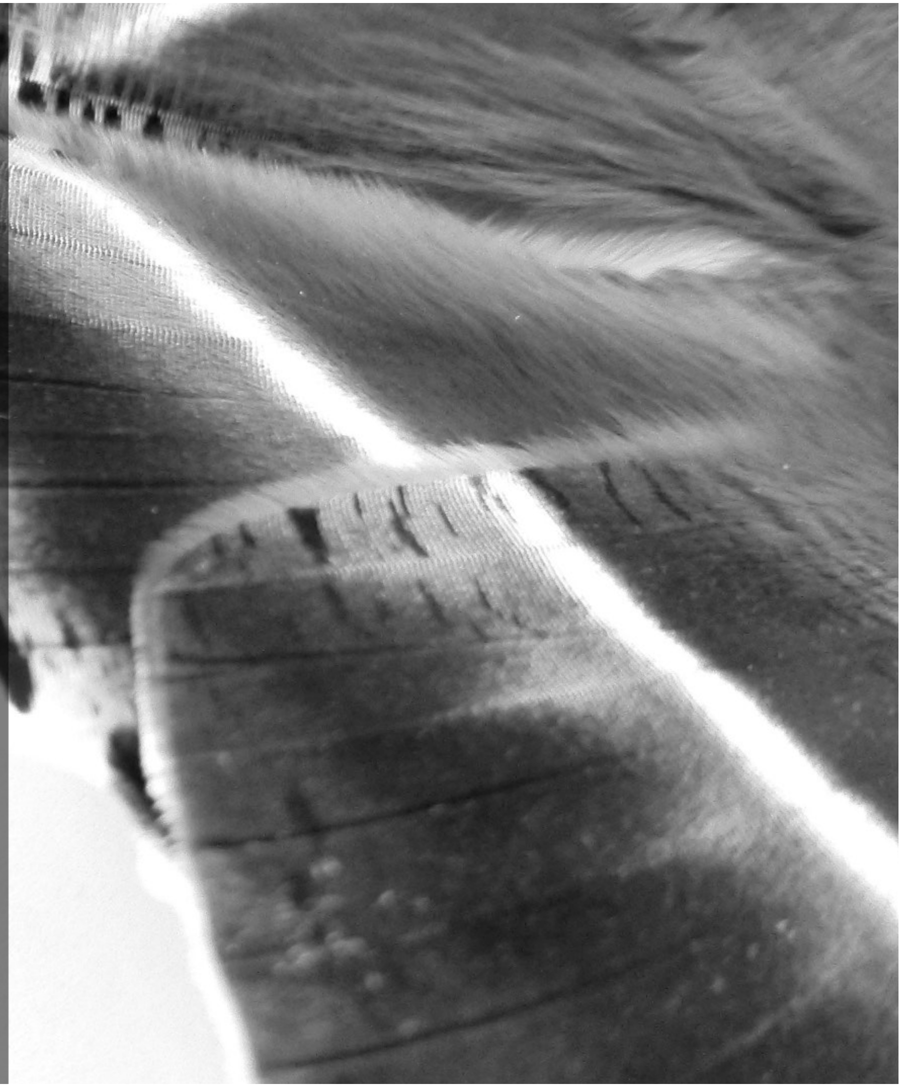




Chapter 10

Urban System Design

The ultimate goal of modelling, simulation, and projection is design. Design is situated outside of science and art, but building on discoveries of both areas. Urban system design is special in that it connects architectural design and territorial design. Informed and responsible parent, system design builds on information and knowledge derived from modelling, simulation and projection.



DESCRIPTION

Urban system design is a new discipline. Situated between naturally and slowly growing cities, between geometrically predefined cities, and between arbitrary growth, it is a challenging, responsible and proactive design activity.

Its foundations should be threefold: the first pillar is the ability to understand, to abstract and to model the urban system. The second pillar is the careful simulation of design ideas, which based on data and information can be placed in and interact with the urban system model. The third step is the projection of various possibilities and the creation of design scenarios that can be discussed with the stakeholders and decision-makers. The design of the final artefact then results in executable plans and multidimensional models, based on which the city can be built or re-built.

Urban systems are large and complex, yet most of them work because of the adaptive capabilities of humans. From the original idea through planning, competitions, commissioning, construction to management, it takes years or decades. This reduces the probability that a single idea will be followed through the entire process and will significantly influence the final result. Nevertheless exceptions are possible and stay in the mind of the public. Examples are Brasilia in Brazil, Chandigarh in India, or Shenzhen in China.

Chandigarh, designed by the Swiss architect Le Corbusier in the 1950s, was a social experiment in system design. Le Corbusier was a foreigner to India and the city has developed in a very different direction since then.

Brasilia, inaugurated in 1960, is directly connected to the work and memory of Oscar Niemeyer, and to the Brazilian president of that time, Kubitschek. It could be described as one of the first system design attempts, as it tried to integrate the human, architectural, political, planning, and infrastructure needs of a future city. Oscar Niemeyer was a native of Brazil, but still the city developed differently to what he originally intended.

Shenzhen is the newest of the three examples and there was no grand architectural urban system design scheme at the beginning. This makes it interesting, because in the city of today, more than 15 million people grew organically.

Section 2

HS 2014 - Exercise 2

Gentle Reminder

URBAN DESIGN SCALE

The liveability of a city is one of its most crucial qualities. Factors at the building scale and the urban design scale, and to some degree at the territorial scale determine the liveability of a city. International organisations have established criteria that measure and compare cities and their liveability. Examples are:

- **The Global Liveable Cities Index**
- **The EIU's Global Liveability Report**
- **Mercer's Quality of Living Survey**
- **Monocle's Most Liveable Cities Index**
- Ranking the Liveability **oft the World's Major Cities**

Factors of liveability

At the beginning of the 21st century, liveability has developed into one of the most important competitive advantages of a city. It is therefore a key quality that every city and urban system government is struggling for. In order to understand what this means in practice, you will identify your personal preferences. This exercise has 3 parts:

Part 1: List the most liveable cities that you know, building on your own experience and judgement, with the most liveable city at the top of the list

Part 2: Describe in your own words 5 characteristics defining the livability of a city and order them with the most important at the top of the list. Also state the motto of the city, if available.

Part 3: For each of the cities you select (or for the respective countries, if city data are not available), identify the Gini Coefficient, the GDP, the form of governance of the city and the surrounding country, the latitude and the mean annual temperature.

You do not have to follow the official rankings for the livability of cities, but you should know the criteria they apply. Hand in until November 17, 2014 to shin@arch.ethz.ch, with cc: to denise.weber@arch.ethz.ch

Map of Existing and Potential Future Liveable Cities

By following the link below, you get access to the map of “Existing and potential Future Liveable Cities”. This map gives you the possibility to explore and get informed of both today’s most liveable cities and the fastest growing cities in the world. On the one hand the map shows the most liveable cities in the world, according to four official rankings (Monocle´s Most Livable Cities Index, The EIU´s Liveability Ranking and Overview, Mercer Quality of Living Survey, The Global Liveable Cities Index), where liveability is defined by a number of criteria, the weighted sum of which in the end characterizes a city as liveable or not. On the other hand, the fastest growing mega-cities are also presented on the map. This way, the user is able to detect the differences among these cities and the previous ones, derived from the comparison of their Factors of Liveability characteristics, and in the end recognize which of these cities can eventually become liveable, and how this goal can be achieved.

http://www.n.ethz.ch/~gkonosc/Layout/Layout.html

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Section 3

HS 2014 - Exercise 3

TERRITORIAL SCALE

Territories contain cities, cities contain buildings. Yet they do not form a hierarchical system, as the interaction between buildings influences the city as much as the interaction between cities influences the territory. Rather, territories interact with cities and urban systems, if we consider them as entities with a metabolism and that they are functioning in the analogy to the stocks and flows model.

In this exercise you are encouraged to question the traditional definitions and roles of buildings, cities and territories, as novel non-urbanised high-density settlements will significantly influence our future habitat, as well as the architectural and urban design profession.

Non-urban Information Cities

In the past, there were strong boundaries between the city and its surrounding territory, the so-called hinterland. The separation between the city, the villages and the countryside was clear, and so was the hierarchy between them. This situation has changed drastically with the ubiquitous distribution of information technology, particularly the mobile phone and its associated services. The possibility to work at home or from home has changed the life of Swiss citizens, as well as Indian or Brazilian citizens. As the boundaries of the city disappear, urbanized systems, high-density settlements and new forms of habitat - Information Cities - are emerging rapidly throughout the world. Identify and prepare the following:

- Identify and describe two attractive non-urban, non-city settlements which nevertheless show characteristics of an urban settlement
- Identify and describe the most important stocks and flows entering, staying in, and eventually leaving this area
- Describe two approaches how buildings in urban sprawl areas could be transformed from a perceived liability into an asset for the resilience of future cities

Hand in until December 1, 2014 to shin@arch.ethz.ch, with cc to denise.weber@arch.ethz.ch

Information Architecture of Cities - Support

- The MOOC – Massive Open Online Course
  - https://www.edx.org/course/ethx/ethx-fc-01x-future-cities-1821
- The BOOK – Basic Open Offline Knowledge
  - Information Cities