Our Planet, Our Health, Our Cities

Healthy City Design International
London, 15 October 2018
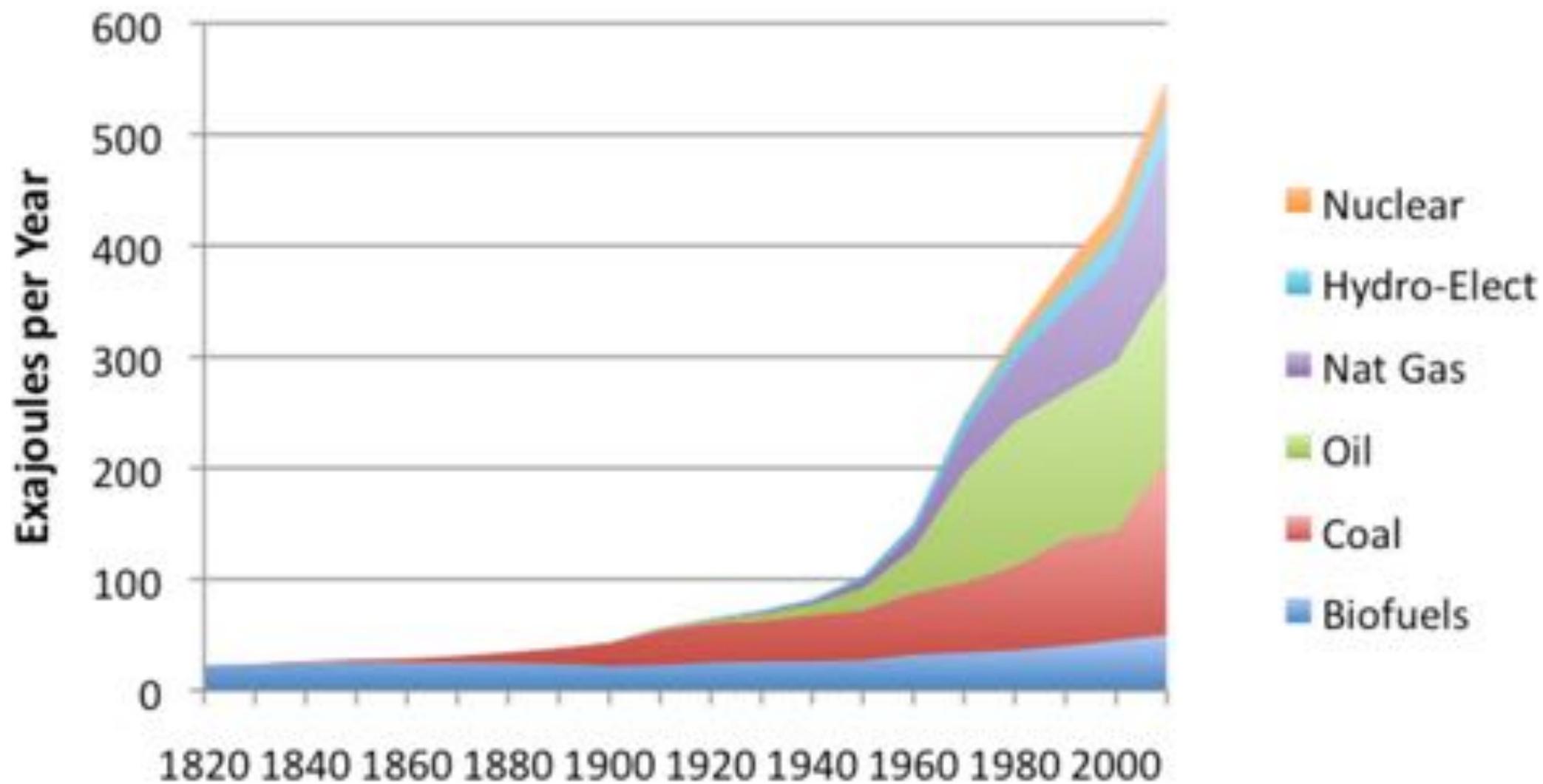

Howard Frumkin, M.D., Dr.P.H.
Head, Our Planet, Our Health
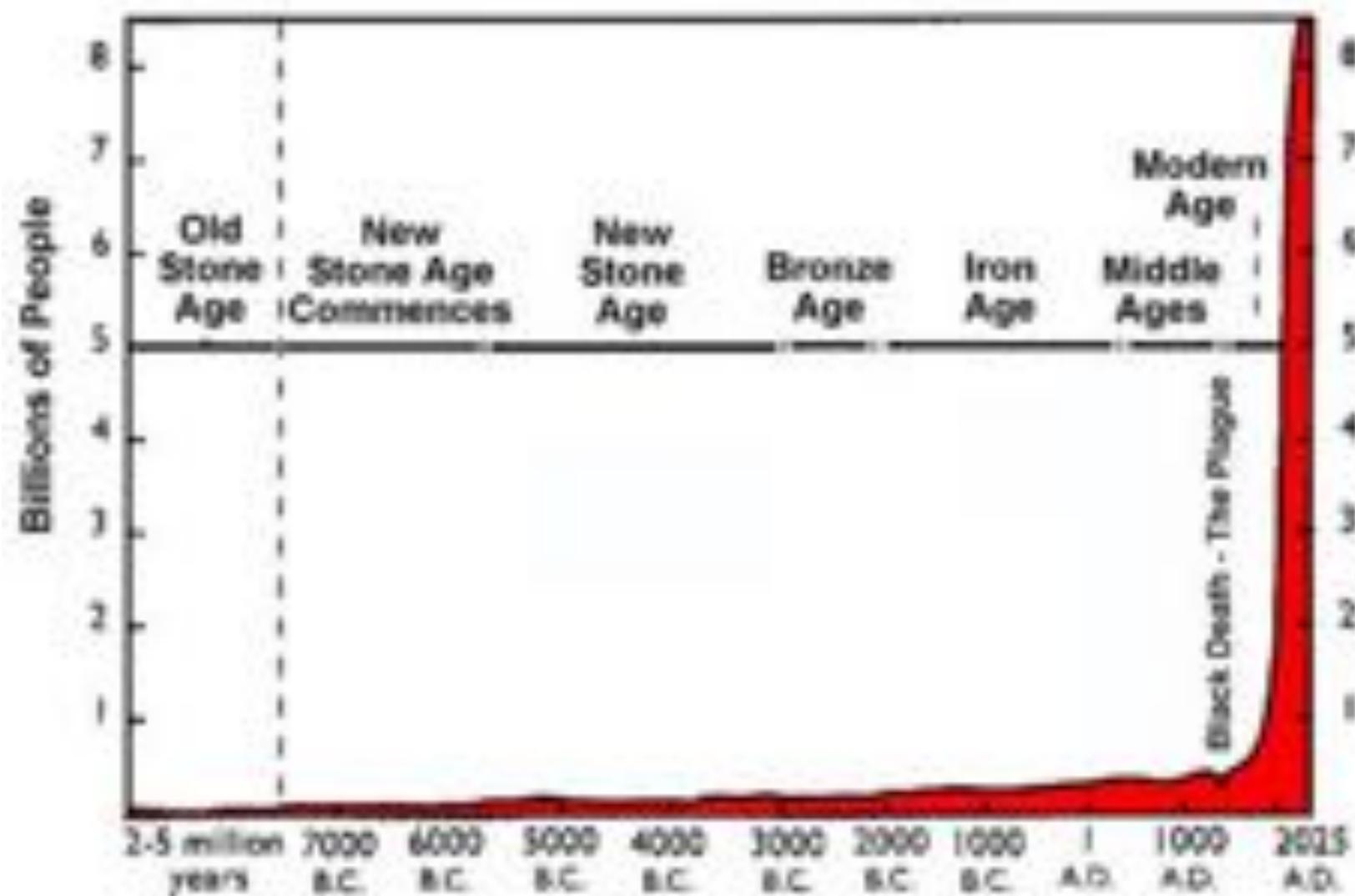
wellcome

BOTTOM OF PIT SHAFT, 1860

World Energy Consumption

Chart showing World Energy Consumption in Exajoules per Year from 1820 to 2000, with stacked areas for: Nuclear, Hydro-Elect, Nat Gas, Oil, Coal, and Biofuels. The vertical axis ranges from 0 to 600.

World Population Growth Through History

Socio-economic trends

Steffen et al. 2011. The Anthropocene: From global change to planetary stewardship. *Ambio* 40:739-761. Images from International Geosphere-Biosphere Program www.igbp.net
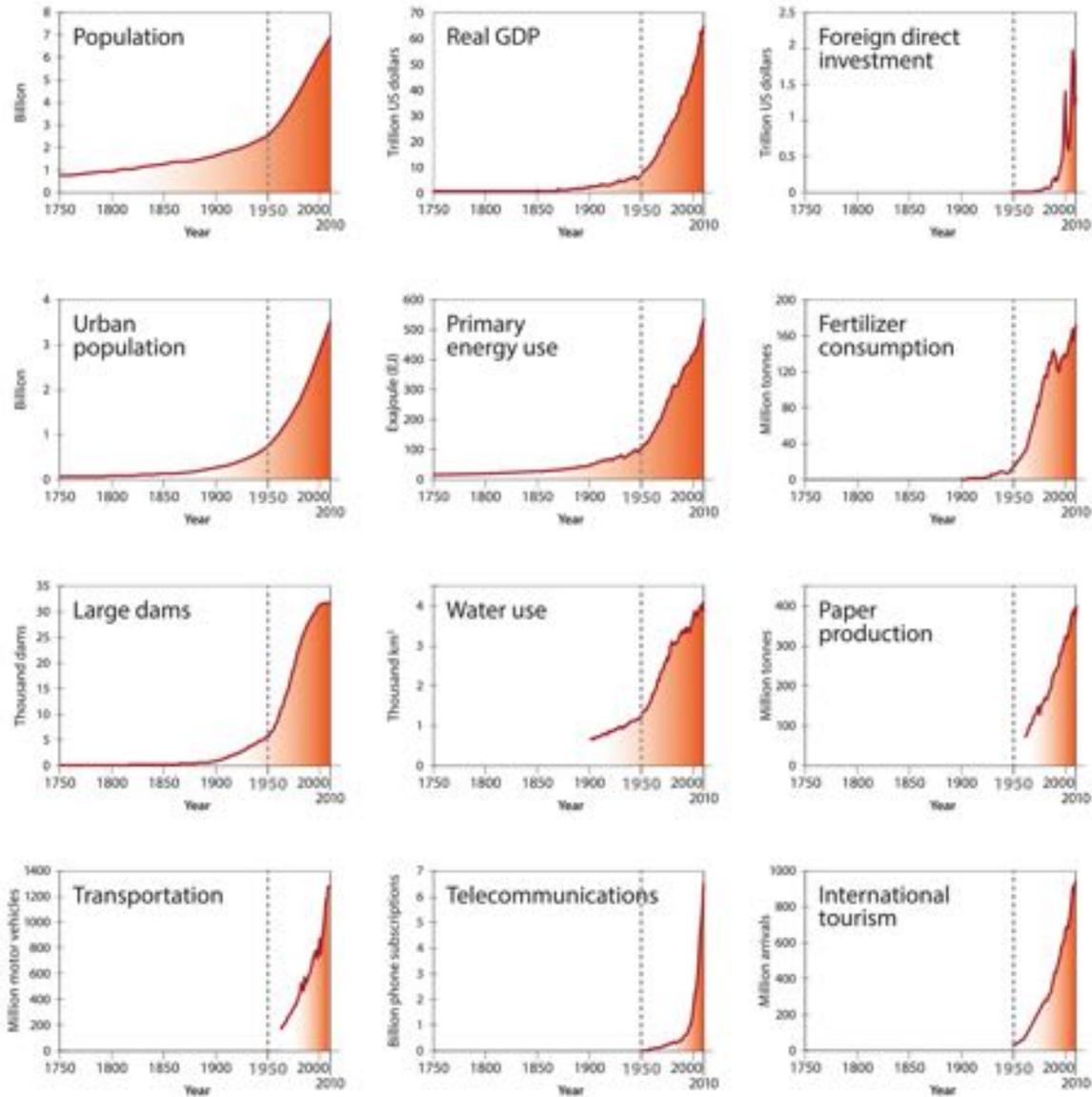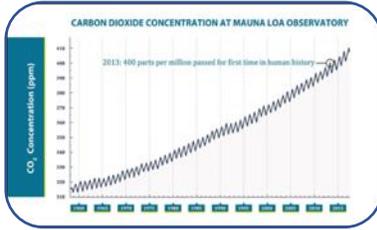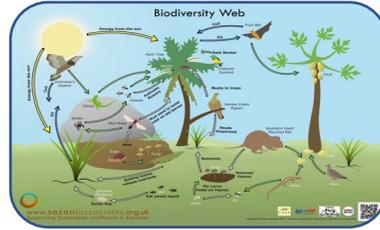
The challenge: A changing planet

CLIMATE CHANGE
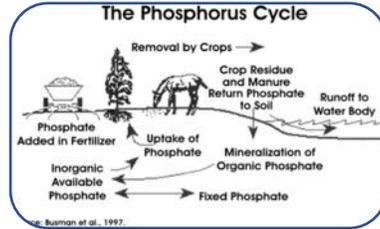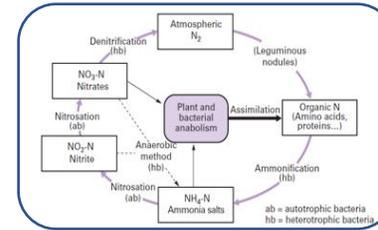
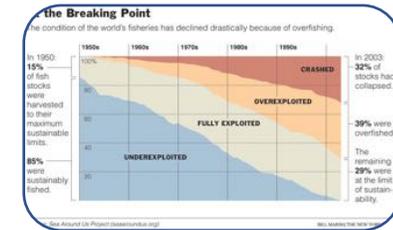BIODIVERSITY LOSS

OCEAN ACIDIFICATION

LAND USE CHANGES

SOIL LOSS

ALTERED P CYCLE

ALTERED N CYCLE

DEPLETED FISHERIES

CHEMICAL CONTAMINATION
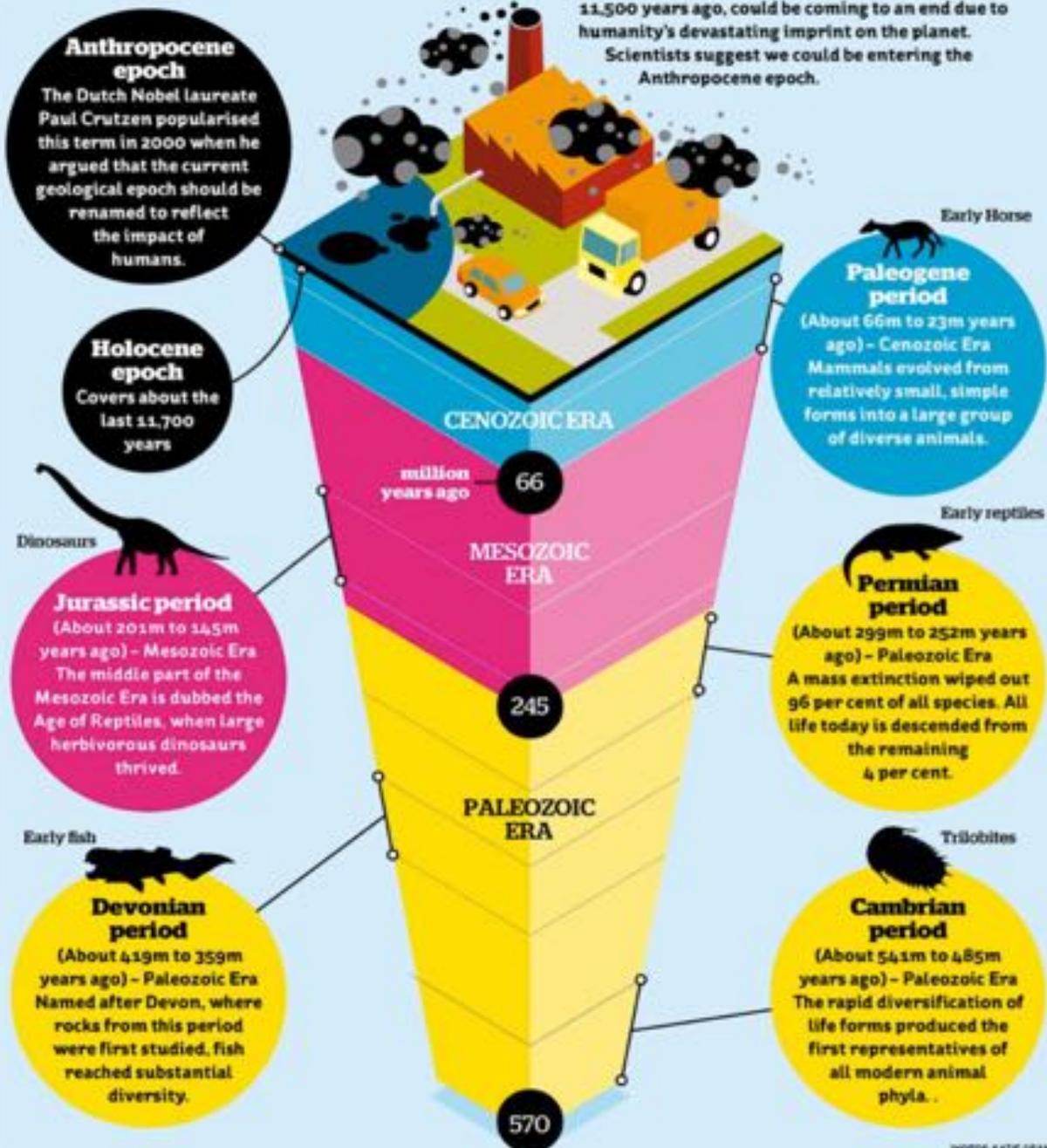
FRESH WATER DEPLETION

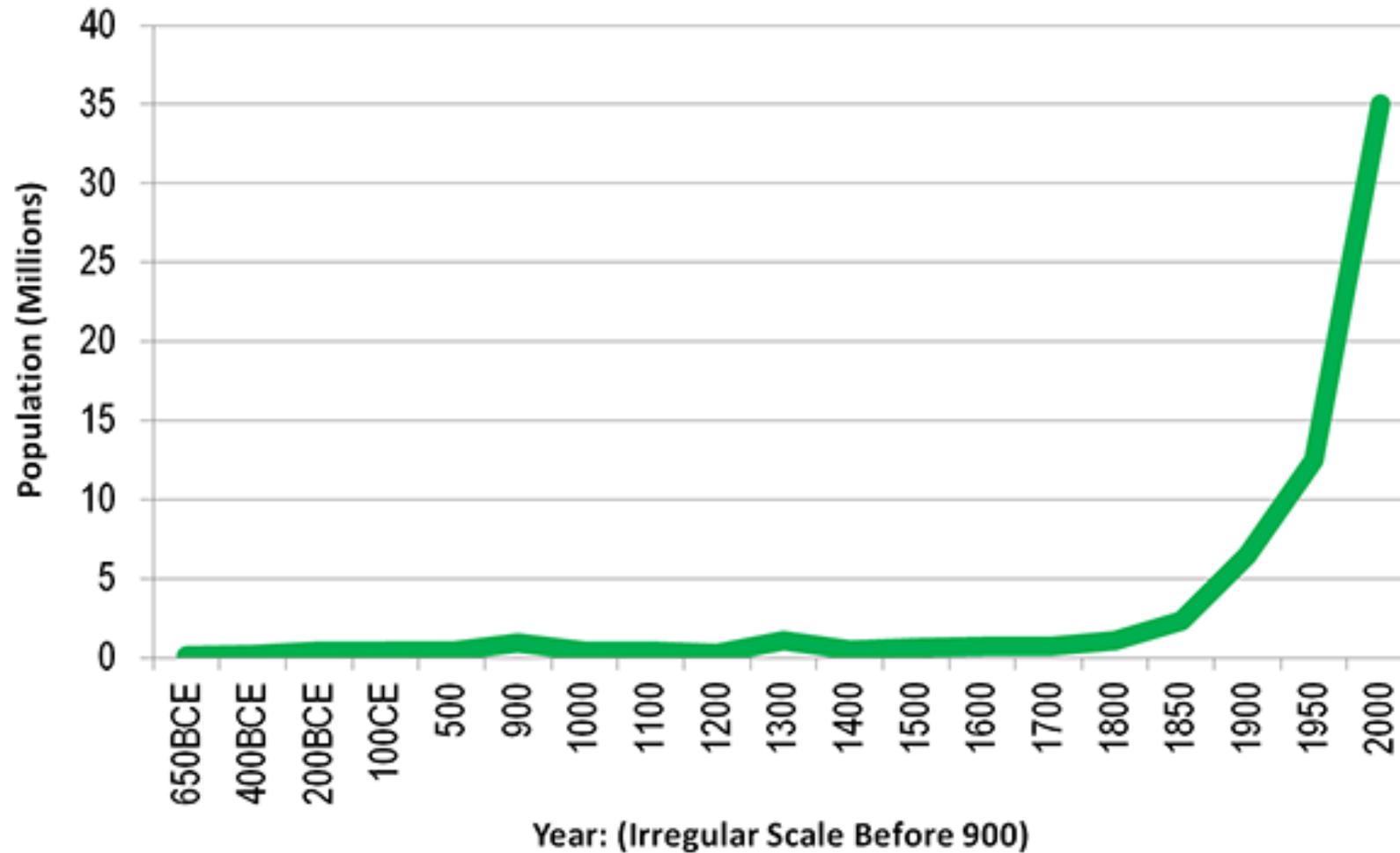ATMOSPHERIC AEROSOL LOADING

URBANIZATION

An epoch for humankind?

Humankind is entering a new epoch, according to an influential group of geologists, ecologists and climate experts. The Holocene epoch, which began roughly 11,500 years ago, could be coming to an end due to humanity's devastating imprint on the planet. Scientists suggest we could be entering the Anthropocene epoch.
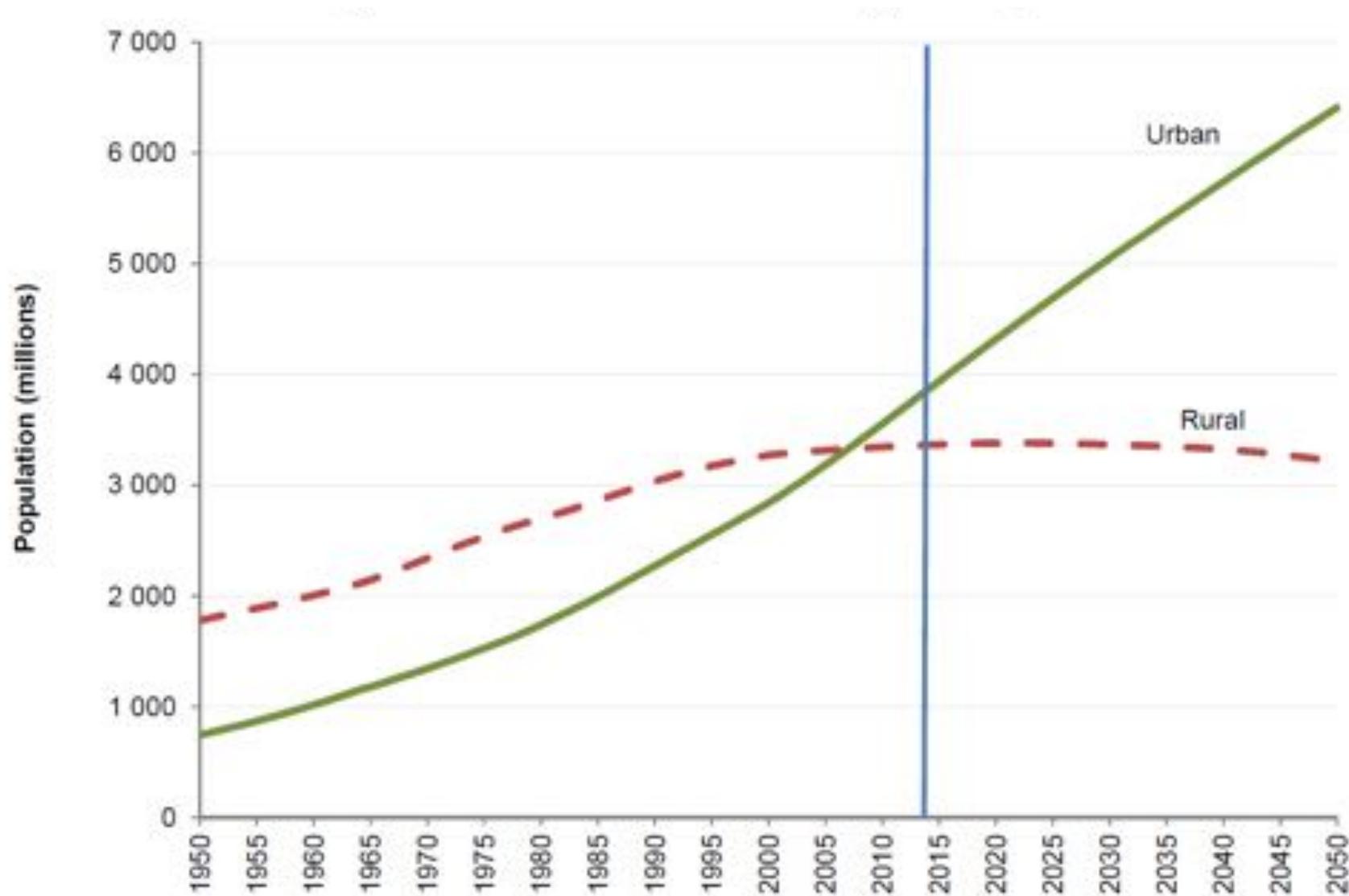
Anthropocene epoch

The Dutch Nobel laureate Paul Crutzen popularised this term in 2000 when he argued that the current geological epoch should be renamed to reflect the impact of humans.

Holocene epoch

Covers about the last 11,700 years

Early Horse

Paleogene period

(About 66m to 23m years ago) – Cenozoic Era
Mammals evolved from relatively small, simple forms into a large group of diverse animals.

CENOZOIC ERA

million years ago — **66**

MESOZOIC ERA

Dinosaurs

Jurassic period

(About 201m to 145m years ago) – Mesozoic Era
The middle part of the Mesozoic Era is dubbed the Age of Reptiles, when large herbivorous dinosaurs thrived.

Early reptiles

Permian period

(About 299m to 252m years ago) – Paleozoic Era
A mass extinction wiped out 96 per cent of all species. All life today is descended from the remaining 4 per cent.

245

PALEOZOIC ERA

Early fish

Devonian period

(About 419m to 359m years ago) – Paleozoic Era
Named after Devon, where rocks from this period were first studied, fish reached substantial diversity.

Trilobites

Cambrian period

(About 541m to 485m years ago) – Paleozoic Era
The rapid diversification of life forms produced the first representatives of all modern animal phyla. .

570

World's Largest Cities (Urban Areas)
650 BCE TO 2000

The world's urban and rural populations, 1950-2050

World urbanization trends 1950-2050

Litman T. Public policies for optimal urban development. Planetizen, 13 April 2015.
https://www.planetizen.com/node/75766/public-policies-optimal-urban-development
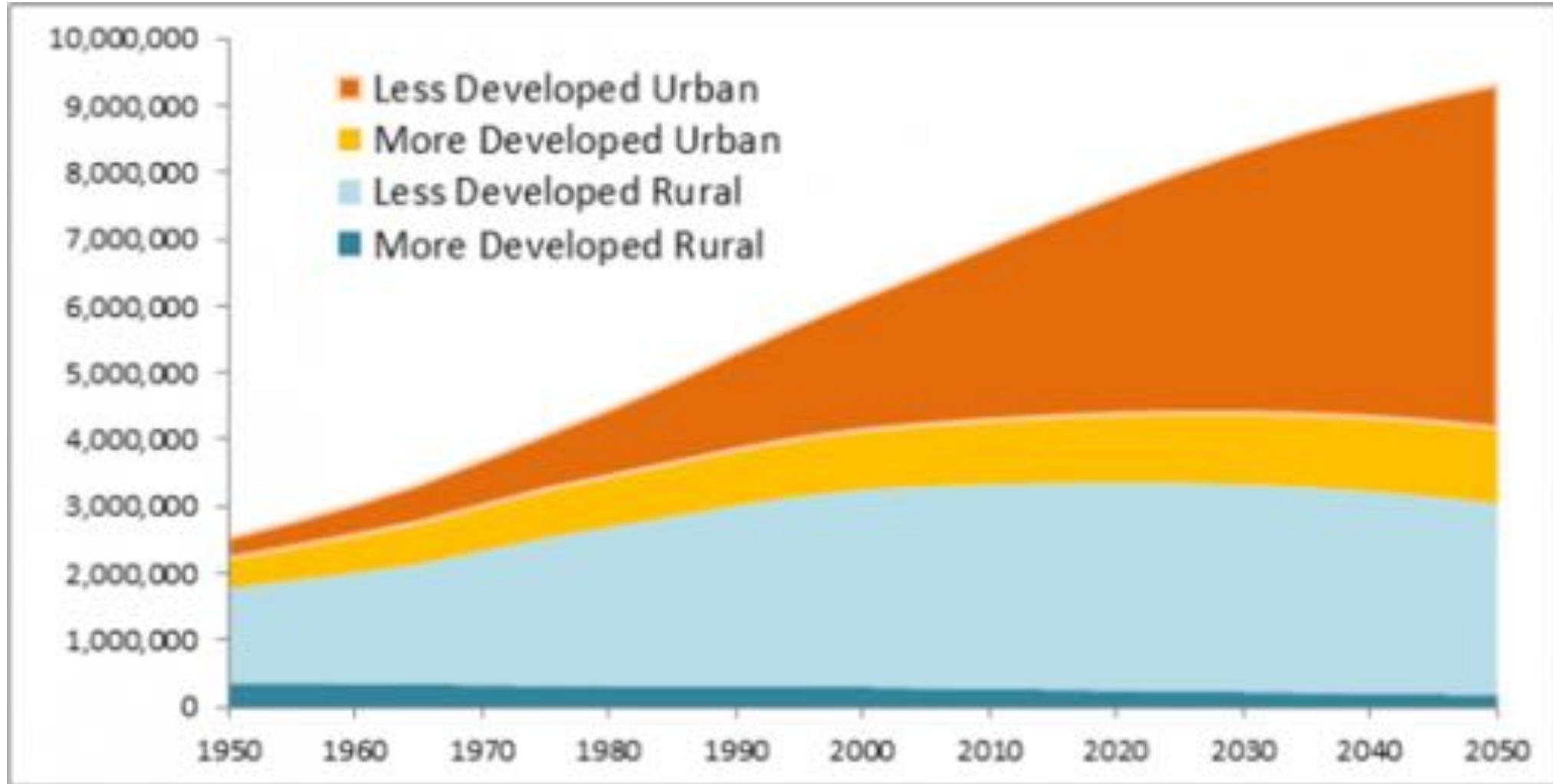
- Preparedness
- Migration
- Sustainability
- Happiness

How to prepare cities for coming disasters?

Flooding

As Waters Rise, Miami Beach Builds Higher Streets And Political Willpower

May 10, 2016 · 4:39 PM ET
Heard on All Things Considered

GREG ALLEN

Louis Fernandez walks along a flooded Collins Avenue in Miami Beach in September 2015. The city is tackling sea-level rise by rebuilding roads and installing new storm sewers and pumps.

Lynne Sladky/AP

Jakarta Is Sinking So Fast, It Could End Up Underwater

570 cities with expected sea level rise >0.5m by 2050

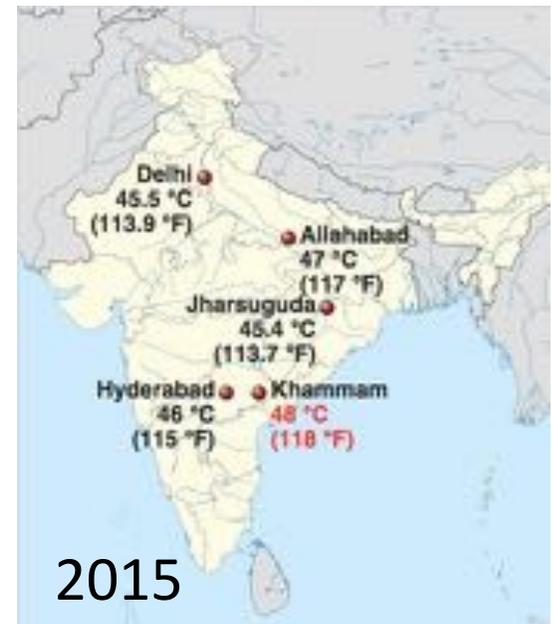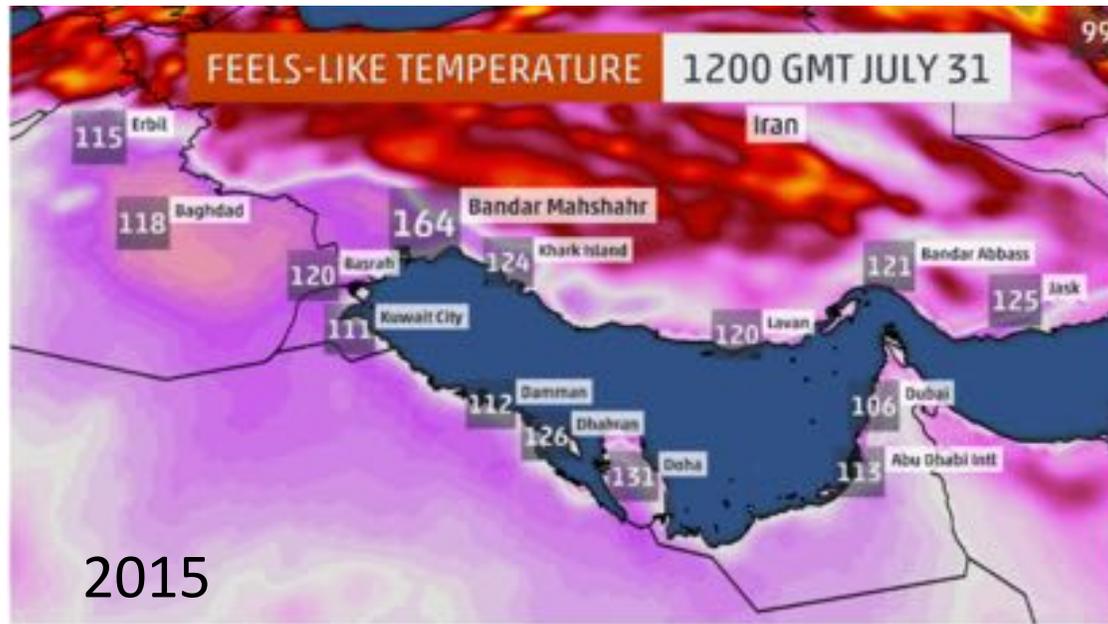**800 million** people living in these at-risk areas
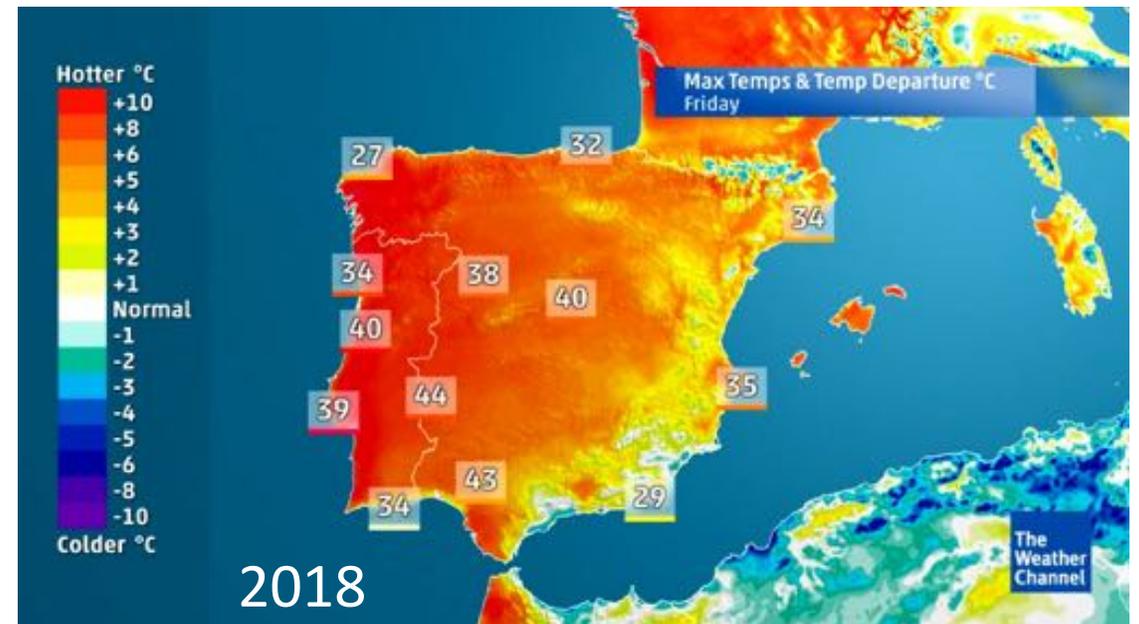
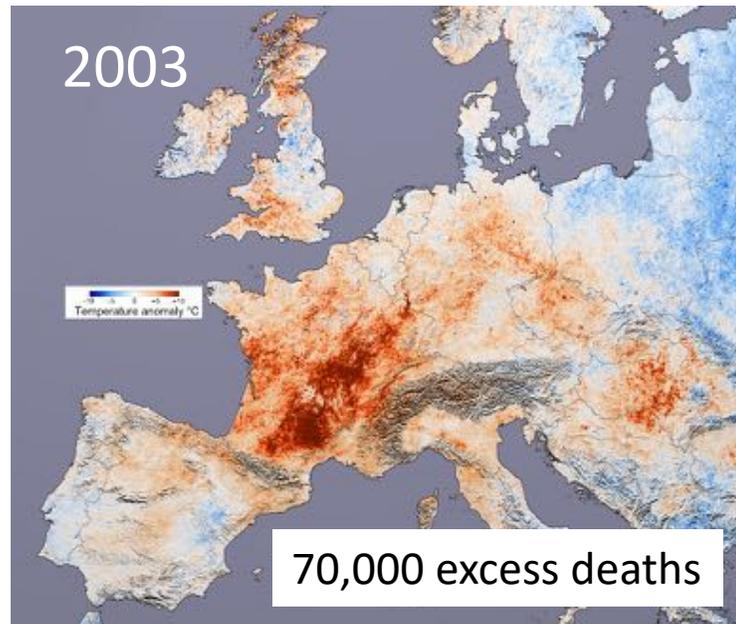After 2°C of warming

After 4°C of warming

Heat waves

Asia

FEELS-LIKE TEMPERATURE   1200 GMT JULY 31

99

115 Erbil
118 Baghdad
120 Basrah
111 Kuwait City
Iran
Bandar Mahshahr
164
124 Khark Island
120 Lavan
121 Bandar Abbass
125 Jask
112 Dammam
126 Dhahran
131 Doha
106 Dubai
115 Abu Dhabi Intl

2015

Delhi
45.5 °C
(113.9 °F)

Allahabad
47 °C
(117 °F)

Jharsuguda
45.4 °C
(113.7 °F)

Hyderabad
46 °C
(115 °F)

Khammam
48 °C
(118 °F)

2015

Europe

2003

70,000 excess deaths

Hotter °C
+10
+8
+6
+5
+4
+3
+2
+1
Normal
-1
-2
-3
-4
-5
-6
-8
-10
Colder °C

Max Temps & Temp Departure °C
Friday

27   32
34
34   38   40
40
39   44   35
34   43   29

The Weather Channel

2018

Heat wave changes with global warming

Heat wave days

Number of heat wave events

Heat wave duration

Peak heat wave intensity

nature climate change

LETTERS

PUBLISHED ONLINE: 26 OCTOBER 2015 | DOI: 10.1038/NCLIMATE2833

Future temperature in southwest Asia projected to exceed a threshold for human adaptability

Jeremy S. Pal[1,2] and Elfatih A. B. Eltahir[2]*
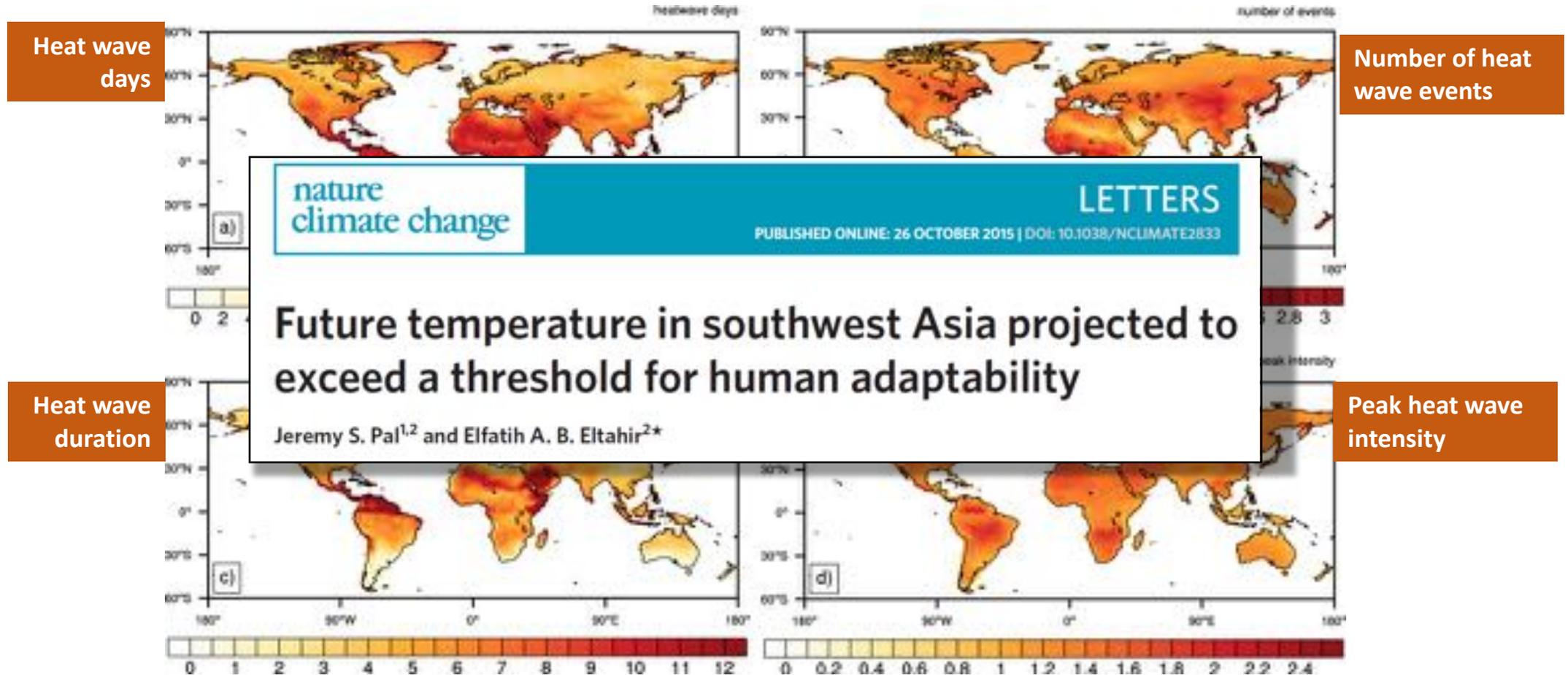
Water shortages

AFRICA 9 MARCH 2018

**Cape Town is running out of w
and Day Zero is looming**

"You can't avoid it. If Day Zero happens, Cape To
dysfunctional space." But isn't it already?

BY
SIGRID RAUSING

C ape Town may be the first global city to run out of water. "Day
Zero", when the city will transition from the curre
measures (50 litres/day) to disaster restrictions, will be

Cape Town's Water Crisis: Could It Happen in Arizona?

Counting down to 'Day Zero': Like Cape Town, many Indian cities are fast running out of water

The gap between demand for water and its supply is estimated to touch 50% by 2030.

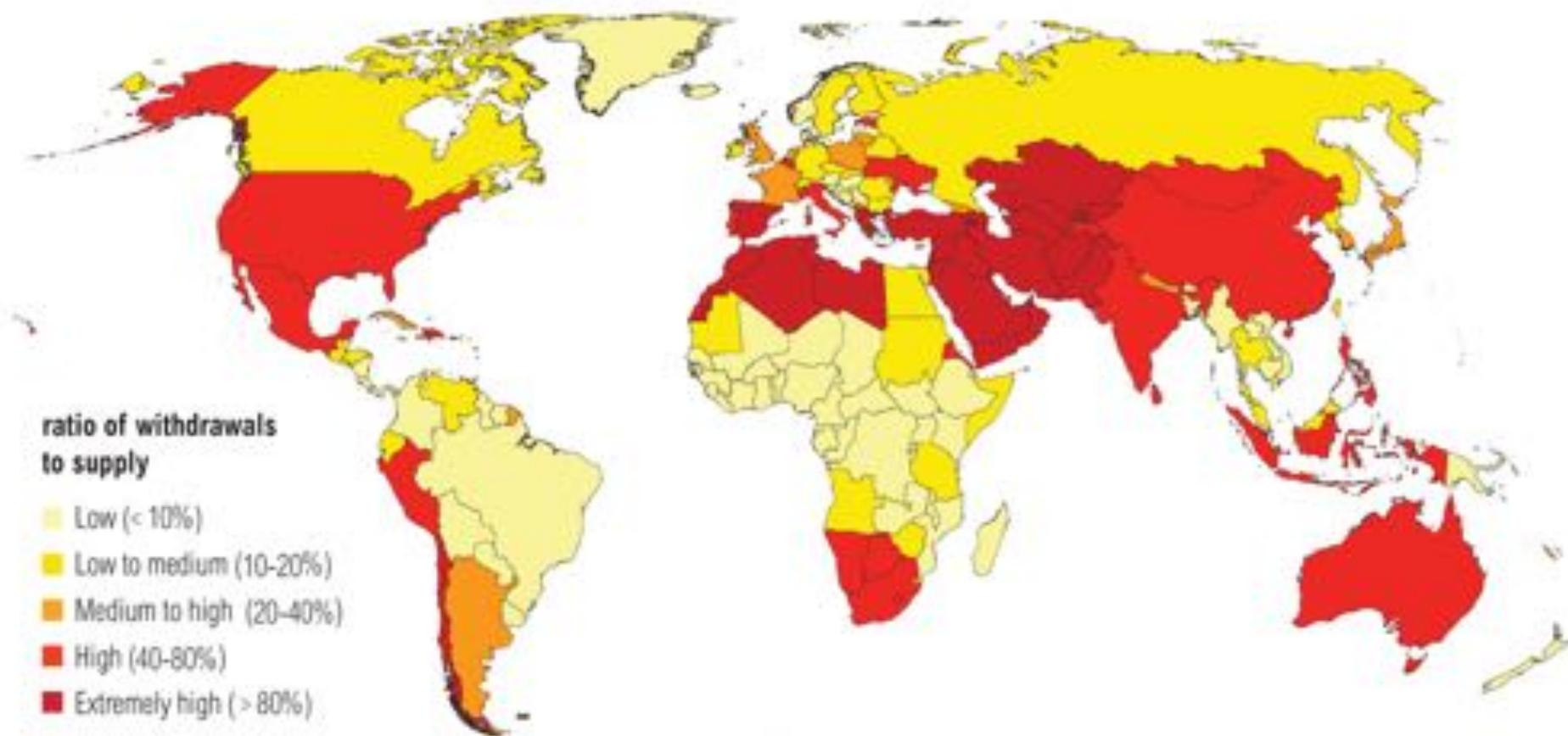**Istanbul approaching water crisis**

Mexico City, Parched and Sinking, Faces a Water Crisis

A Megacity Without Water: São Paulo's Drought

Water-Stressed Beijing Exhausts Its Options

'Day Zero': From Cape Town to São Paulo, large cities are facing water shortages

Water Stress by Country: 2040

ratio of withdrawals to supply

- Low (< 10%)
- Low to medium (10–20%)
- Medium to high (20–40%)
- High (40–80%)
- Extremely high (> 80%)

NOTE: Projections are based on a business-as-usual scenario using SSP2 and RCP8.5.

For more: ow.ly/RiWop

Urban resilience strategies

Flooding:
- Elevate structures
- ⇩ flood plain building
- Storm water mgt.

- Early warning systems
- Evacuation plans
- Health system prep
- Public education

- Social capital

Heat:
- Increase vegetation
- Light surfaces
- Air conditioning

- Early warning systems
- Cooling centres
- Health system prep
- Public education
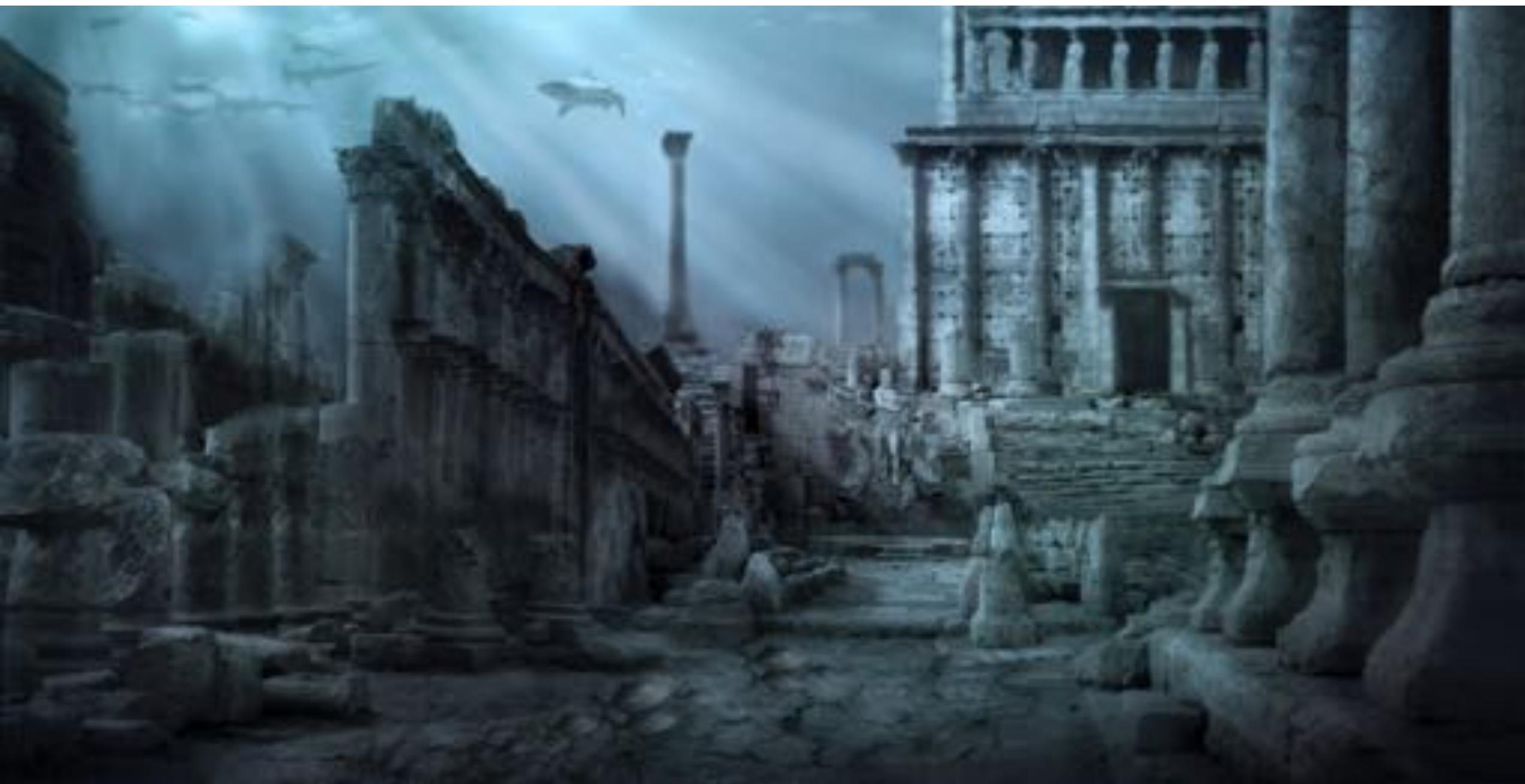
- Social capital

Water scarcity:
- Gray water reuse
- Vegetation selection
- Leakage abatement

- Demand management
- Pressure management
- Water use restrictions
- Shifts from agriculture

- Social capital

How to prepare cities for sudden influxes of displaced people?

"…and the island of Atlantis in like manner was swallowed up by the sea and vanished; wherefore also the ocean at that spot has now become impassable and unsearchable, being blocked up by the shoal mud which the island created as it settled down."

Plato, *Timaeus*

Classic Period collapse of the Central Maya Lowlands: Insights about human–environment relationships for sustainability

B. L. Turner II[a,1] and Jeremy A. Sabloff[b,1]

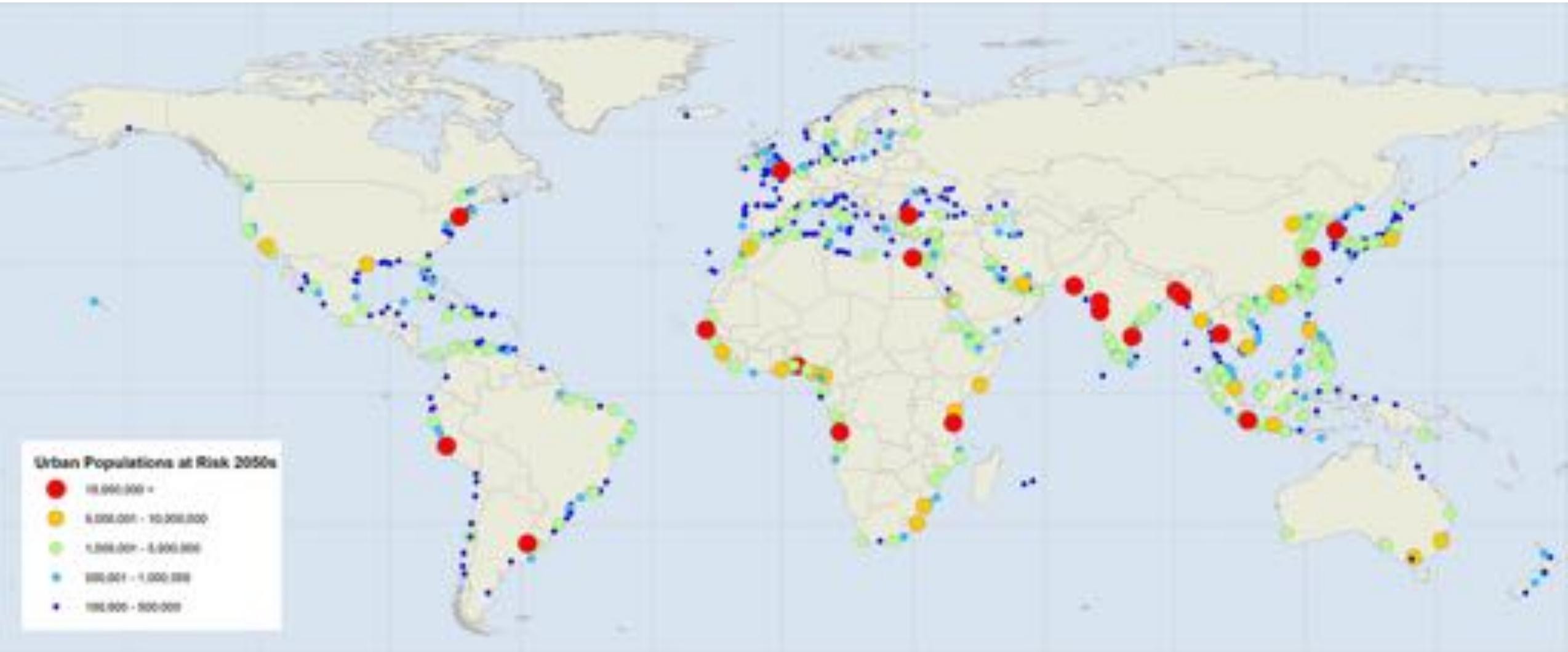[a]School of Geographical Sciences and Urban Planning, School of Sustai
and [b]Santa Fe Institute, Santa Fe, NM 87501

Climate and the Collapse of Maya Civilization

Gerald H. Haug,[1]*[†] Detlef Günther,[2] Larry C. Peterson,[3] Daniel M. Sigman,[4] Konrad A. Hughen,[5] Beat Aeschlimann[2]

Global cities at risk from sea level rise

Urban Populations at Risk 2050s

- 10,000,000 +
- 5,000,001 - 10,000,000
- 1,000,001 - 5,000,000
- 500,001 - 1,000,000
- 100,000 - 500,000

From Miami to Shanghai: 3C of warming will leave world cities below sea level

Jonathan Watts
Fri 3 Nov 2017 06.48 GMT

▲ How Shanghai would look with a rise of just 2C; the UN warned this week of a potential 3C scenario. Photograph: Nickolay Lamm/Courtesy Climate Central

An elevated level of climate change would lock in irreversible sea-level rises affecting hundreds of millions of people, Guardian data analysis shows

Katrina's Diaspora

The victims of Hurricane Katrina have filed for assistance from FEMA from every state. The map shows the distribution and number of the 1.36 million individual assistance applications as of Sept. 23.

Number of applications from selected metropolitan areas

Counties from which families filed applications

Circles are sized according to the number of applications from a ZIP code

10,000
5,000
1,000
100
10

They are scattered through all 50 states, the District of Columbia and Puerto Rico — 422 in Utah, 1,114 in Kansas, 201 way out in Alaska. They are clustered by the thousands in large Southern cities like Dallas, Atlanta and Memphis, and huddled in handfuls in unlikely hamlets like Shell Knob, Mo. (pop. 1,392) and Fountain Run, Ky. (pop. 246).

Evacuees fled Hurricane Katrina and the floods that followed to caravans of cars and fleets of buses, on helicopters and chartered planes, by boat and, a few, on foot. A month after the storm, a map emerges of where they landed, based on ZIP codes from which applications for aid were submitted to the Federal Emergency Management Agency as of Sept. 21.

Of 1,336,704 applications, 86 percent came from Louisiana, Mississippi, Texas and Alabama. But 35,539 families were more than 1,000 miles from the Gulf — among the farthest: one in Nome, Alaska, 3,811 miles from the French Quarter and another in Lihue, Hawaii, 4,279 miles away.

Residents of New Orleans, a city that was two-thirds black, seem to have flocked to the nation's African-American population centers. On average, the applicants came from counties where blacks were 28 percent of the population, more than twice the national average.

Baton Rouge, La., appears to be temporary home to 10 percent of evacuees; Houston 6.25 percent. But after the top 18 hubs, applicants are spread like the wind that whipped through their old neighborhoods: none of the other 900-plus metropolitan areas has even 1 percent of the total.

Some 4,000 ZIP codes — among them Pocahontas, Miss.; Promise City, Iowa; and Hope, Mich. — had just one applicant.

Applications by state

State	Applicants	Pct
Louisiana	523,149	38.6%
Mississippi	383,840	28.3%
Texas	156,806	11.6%
Alabama	109,469	8.1%
Georgia	35,342	2.6%
Florida	31,005	2.3%
Tennessee	15,529	1.1%
Arkansas	11,027	0.8%
California	10,983	0.8%
Illinois	6,430	0.5%
Others	73,065	5.4%

Applications by distance from New Orleans

Miles	Applicants	Pct
0-100	626,232	46.2%
100-200	338,080	24.9%
200-400	184,169	13.6%
400-800	143,497	10.6%
800-1,600	45,371	3.3%
1,600-3,200	13,403	1.0%
3,200+	232	0.0%

Relatively sudden, large-scale urban resettlement: The challenges

- Housing
- Education
- Transportation
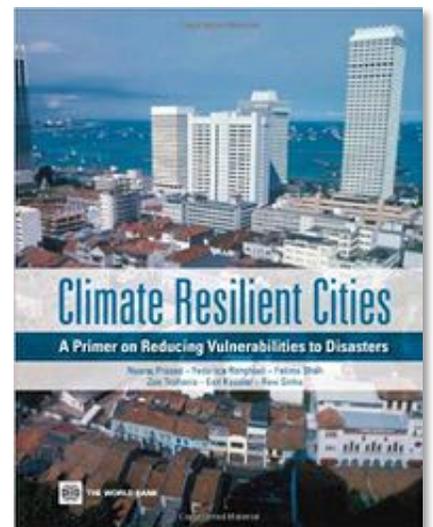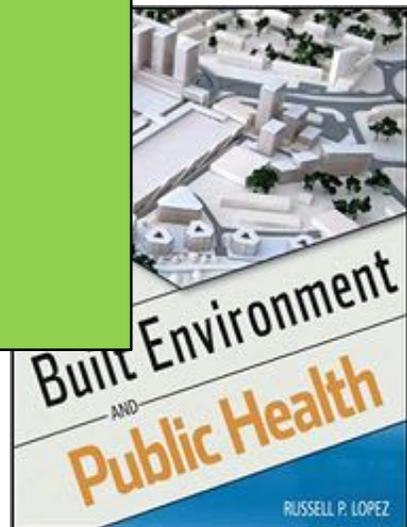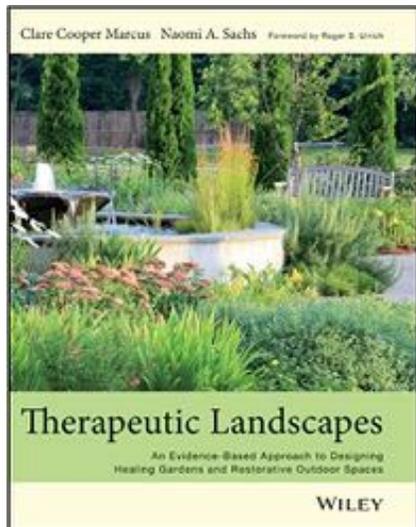- Health services
- Employment

How to envision, configure, and manage cities so they're healthy *and* sustainable habitats?

Healthy, sustainable cities: Design principles

- Transportation alternatives
- Density
- Connectivity
- Mixed land use
- Activity centers
- Parks and green spaces

Prevention-centered design thinking

Population-centered design thinking

Co-benefits and design thinking

Evidence-based design thinking
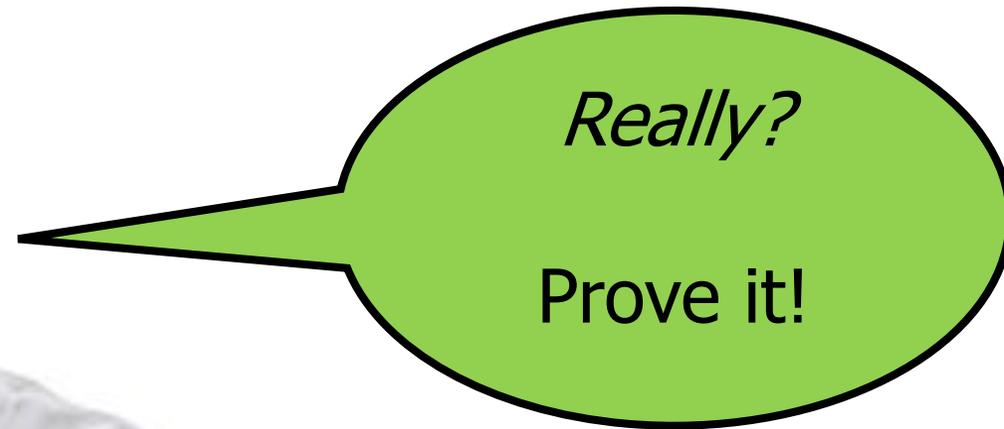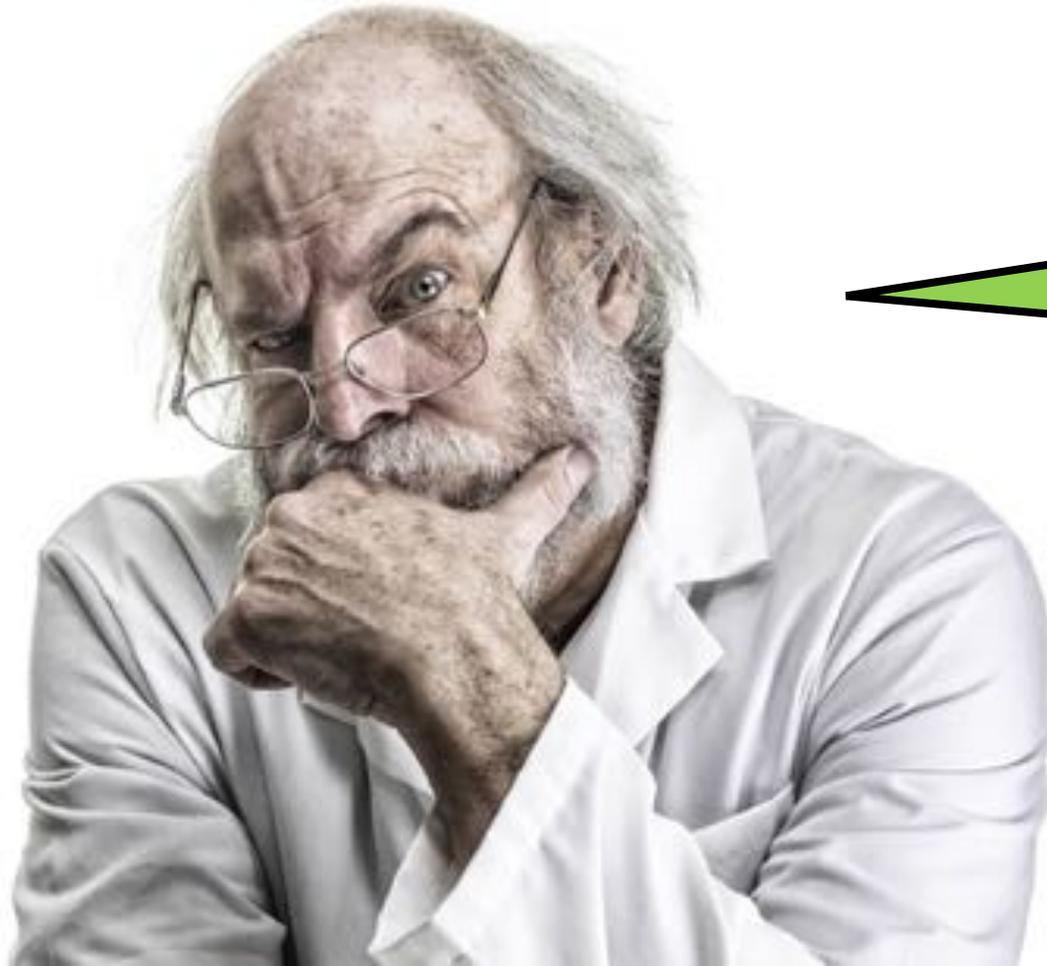
Built environmental characteristics and diabetes: a systematic review and meta-analysis

Association between adiposity outcomes and residential density: a full-data, cross-sectional analysis of 419 562 UK Biobank adult participants

Impact of Changes in Transportation and Commuting Behaviors During the 1996 Summer Olympic Games in Atlanta on Air Quality and Childhood Asthma

Evidence review on effectiveness of transport measures in reducing nitrogen dioxide

The impact of children's exposure to greenspace on physical activity, cognitive development, emotional wellbeing, and ability to appraise risk

A Review of Evidence-Based Traffic Engineering Measures Designed to Reduce Pedestrian–Motor Vehicle Crashes

Effects of greening and community reuse of vacant lots on crime

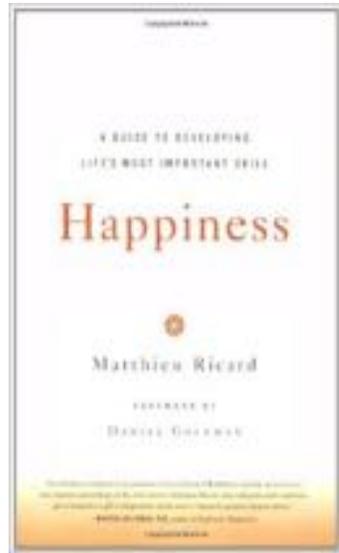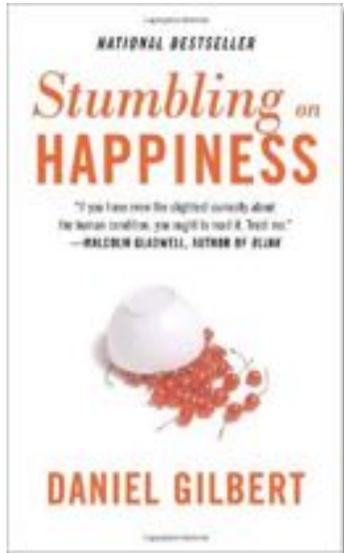## Urban Sprawl, Physical Activity, and Body Mass Index: Nurses' Health Study and Nurses' Health Study II

Obesity Relationships with Community Design, Physical Activity, and Time Spent in Cars

Bicycling to school improves the cardiometabolic risk factor profile: a randomised controlled trial

What if cities were designed to make their inhabitants happy?
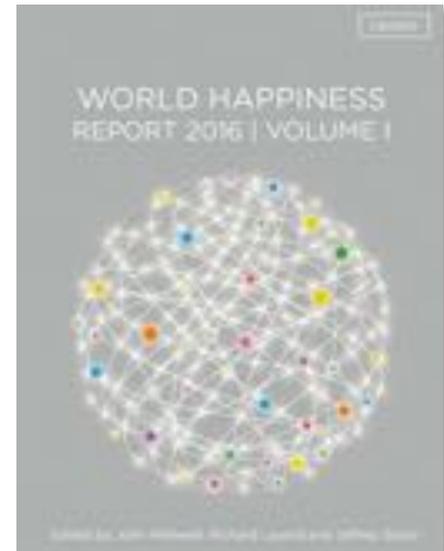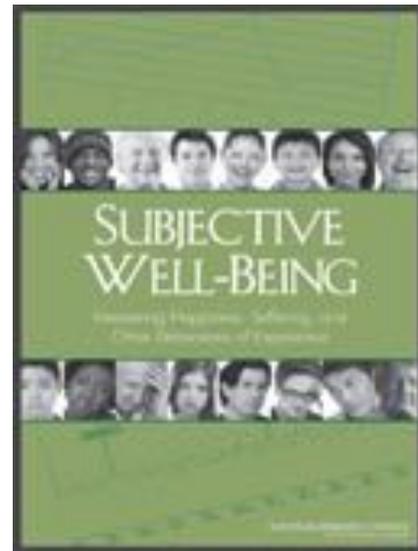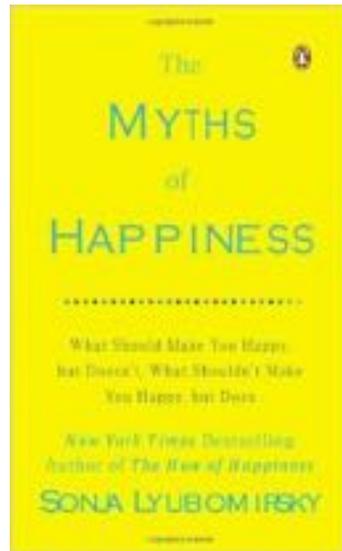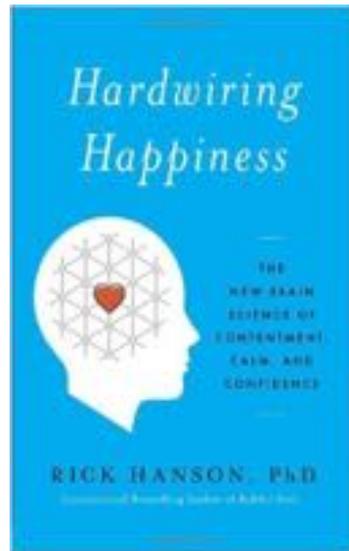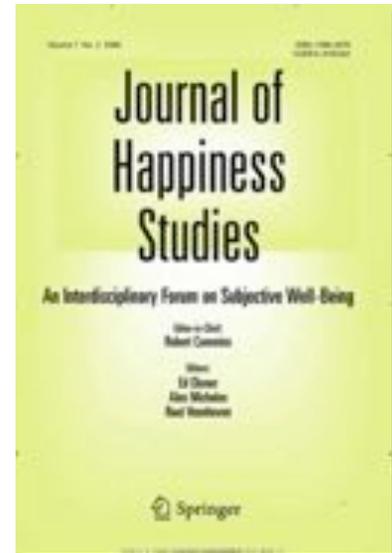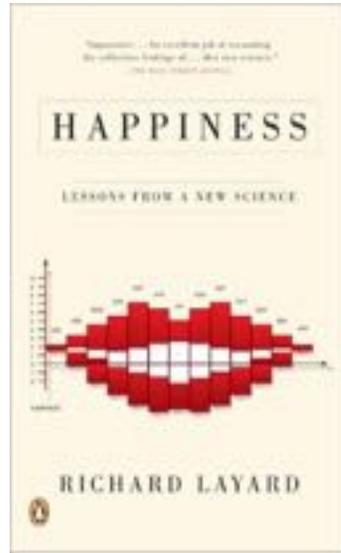
NATIONAL BESTSELLER

Stumbling on **HAPPINESS**

"If you have even the slightest curiosity about the human condition, you ought to read it. Trust me."
—MALCOLM GLADWELL, AUTHOR OF *BLINK*

DANIEL GILBERT

A GUIDE TO DEVELOPING
LIFE'S MOST IMPORTANT SKILL

Happiness

Matthieu Ricard

FOREWORD BY
Daniel Goleman

"Happiness . . . for excellent job at recounting the collective findings of . . . this new science."
—*THE WALL STREET JOURNAL*

HAPPINESS

LESSONS FROM A NEW SCIENCE

RICHARD LAYARD

Journal of Happiness Studies

An Interdisciplinary Forum on Subjective Well-Being

Editor-in-Chief
Robert Cummins

Editors
Ed Diener
Alex Michalos
Ruut Veenhoven

Springer

Hardwiring Happiness

THE NEW BRAIN SCIENCE OF CONTENTMENT, CALM, AND CONFIDENCE

RICK HANSON, PhD

The MYTHS of HAPPINESS

What Should Make You Happy
but Doesn't, What Shouldn't Make
You Happy, but Does

New York Times Bestselling
Author of *The How of Happiness*

SONJA LYUBOMIRSKY

SUBJECTIVE WELL-BEING

WORLD HAPPINESS
REPORT 2016 | VOLUME I
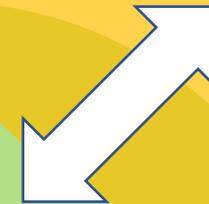
World Values Survey:

Happiness: Taking all things together, would you say you are:

1. Very happy   2. Quite happy   3. Not very happy   4. Not at all happy

General Social Survey:

Taken all together, how would you say things are these days--would you say that you are very happy, or not too happy?
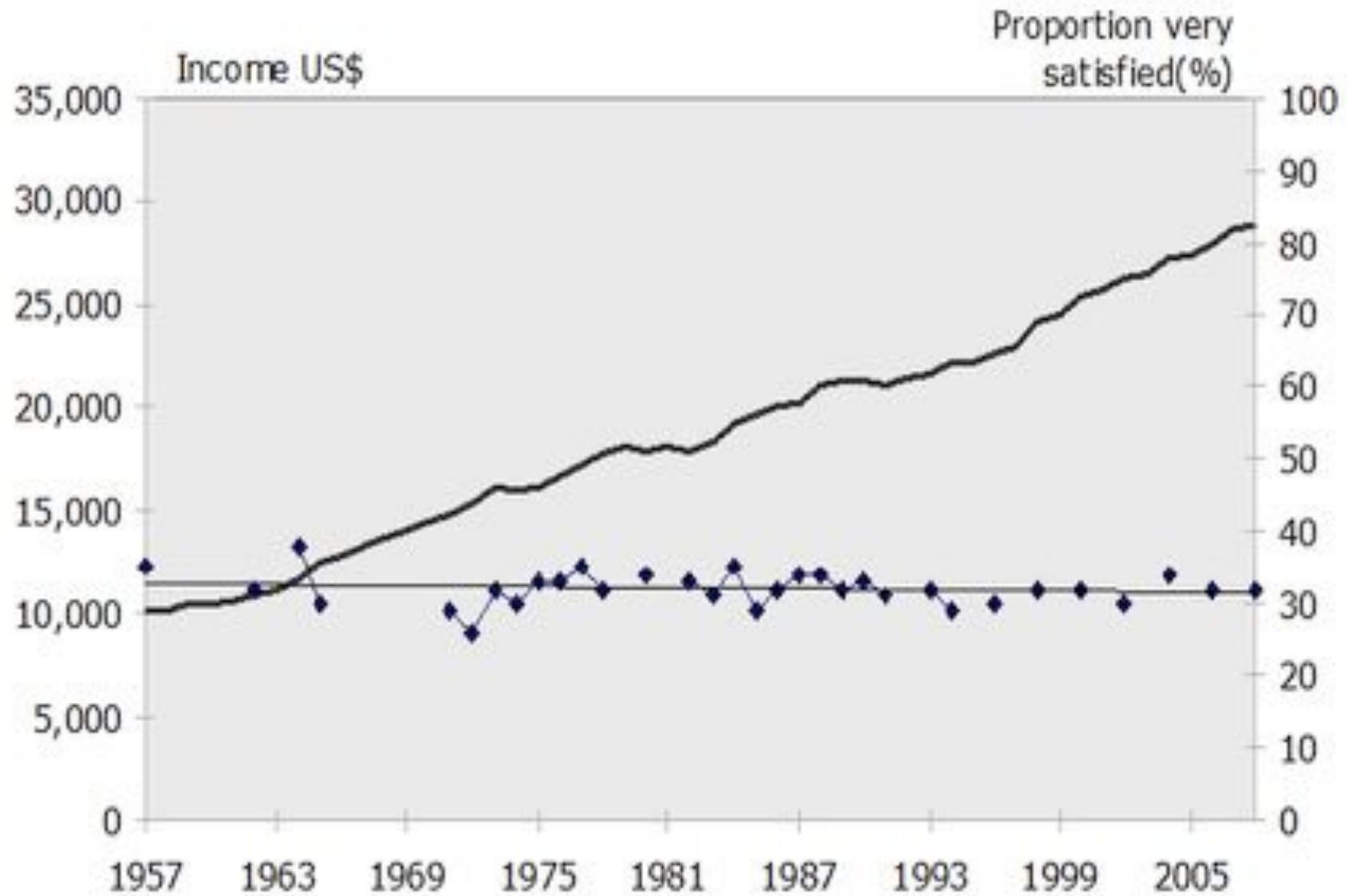
Gallup Poll:

Overall, how satisfied or dissatisfied are you with the way things are going in your life today?

Would you say you are very satisfied, somewhat satisfied, somewhat dissatisfied, or very dissatisfied?

Figure 2.2: Ranking of Happiness 2013-2015 (Part 1)
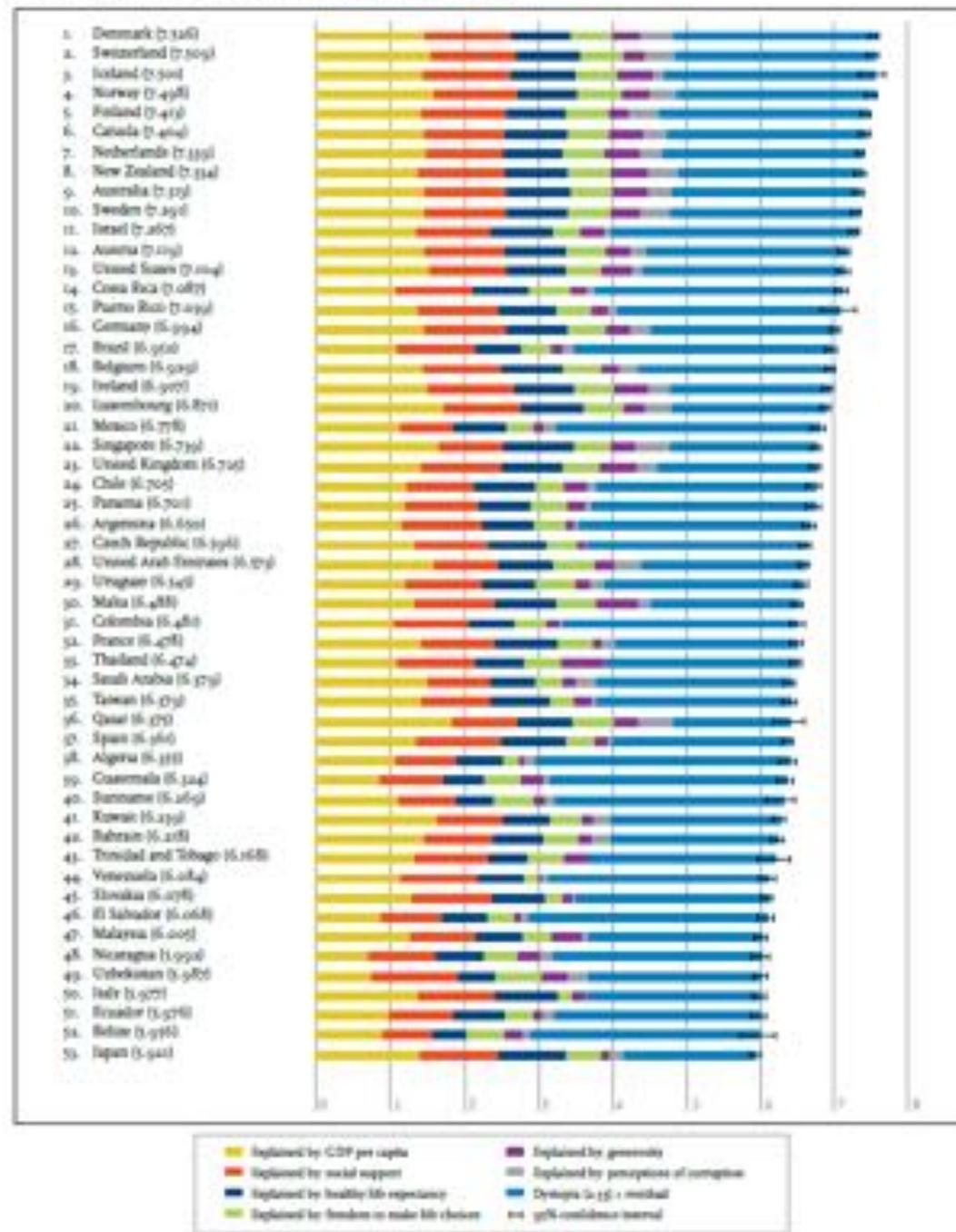
Average income and happiness, United States, 1957-2007

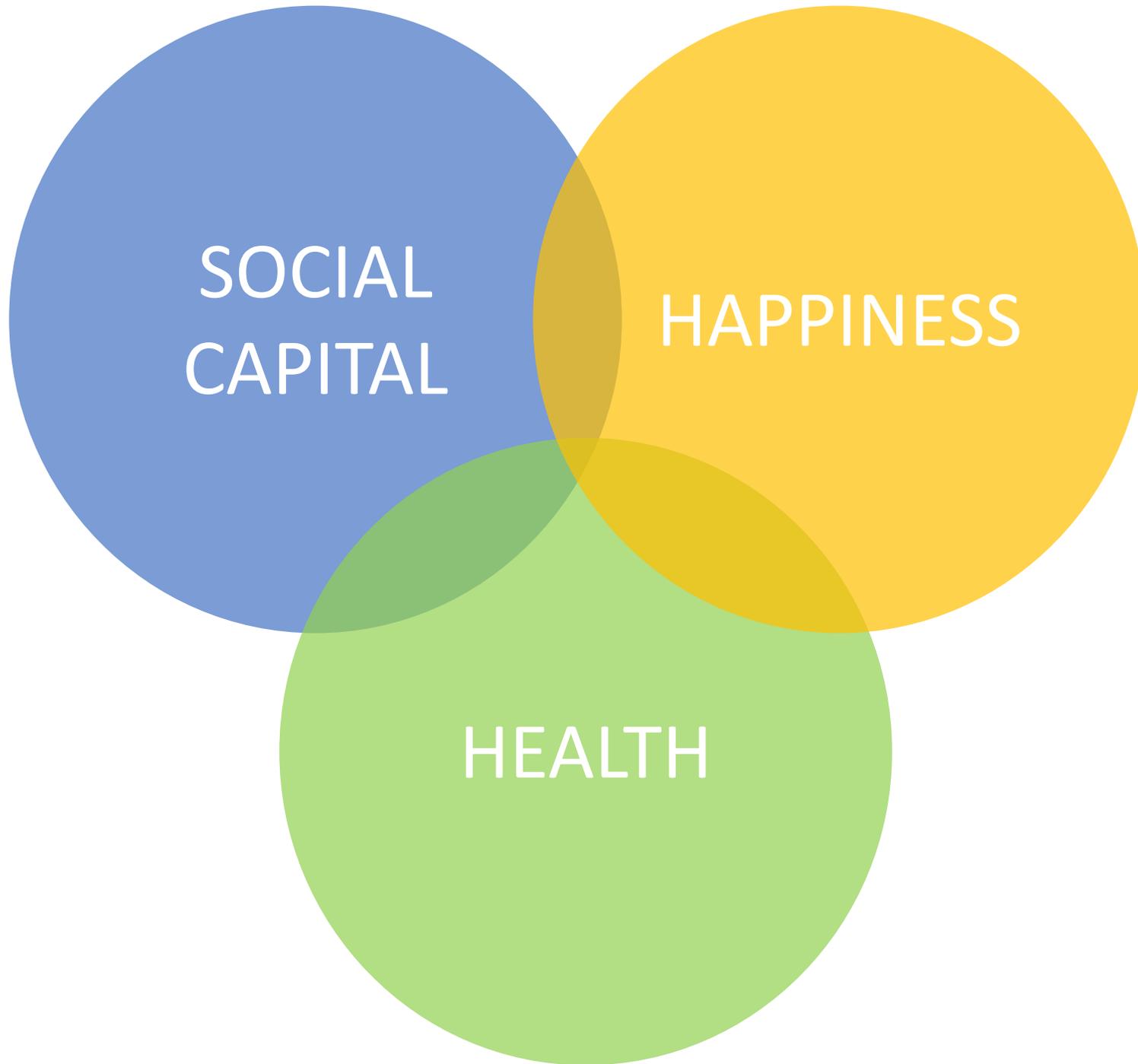"I've got the bowl, the bone, the big yard. I know I _should_ be happy."

Activity	Positive affect rating
Intimate relations	5.10
Socializing	4.59
Relaxing	4.42
Pray/worship/meditate	4.35
Eating	4.34
Exercising	4.31
Watching TV	4.19
Shopping	3.95
Preparing food	3.93
On the phone	3.92
Napping	3.87
Taking care of my children	3.86
Computer/e-mail/Internet	3.81
Housework	3.73
Working	3.62
Commuting	3.45

Kahneman D, Krueger AB, Schkade DA, Schwarz N, Stone AA. 2004. A survey method for characterizing daily life experience: The Day Reconstruction Method. *Science* 306: 1776-80

Predictors of happiness

- Family relationships
- Community and friends
- Civic participation
- Not being poor
- Meaningful work
- Health
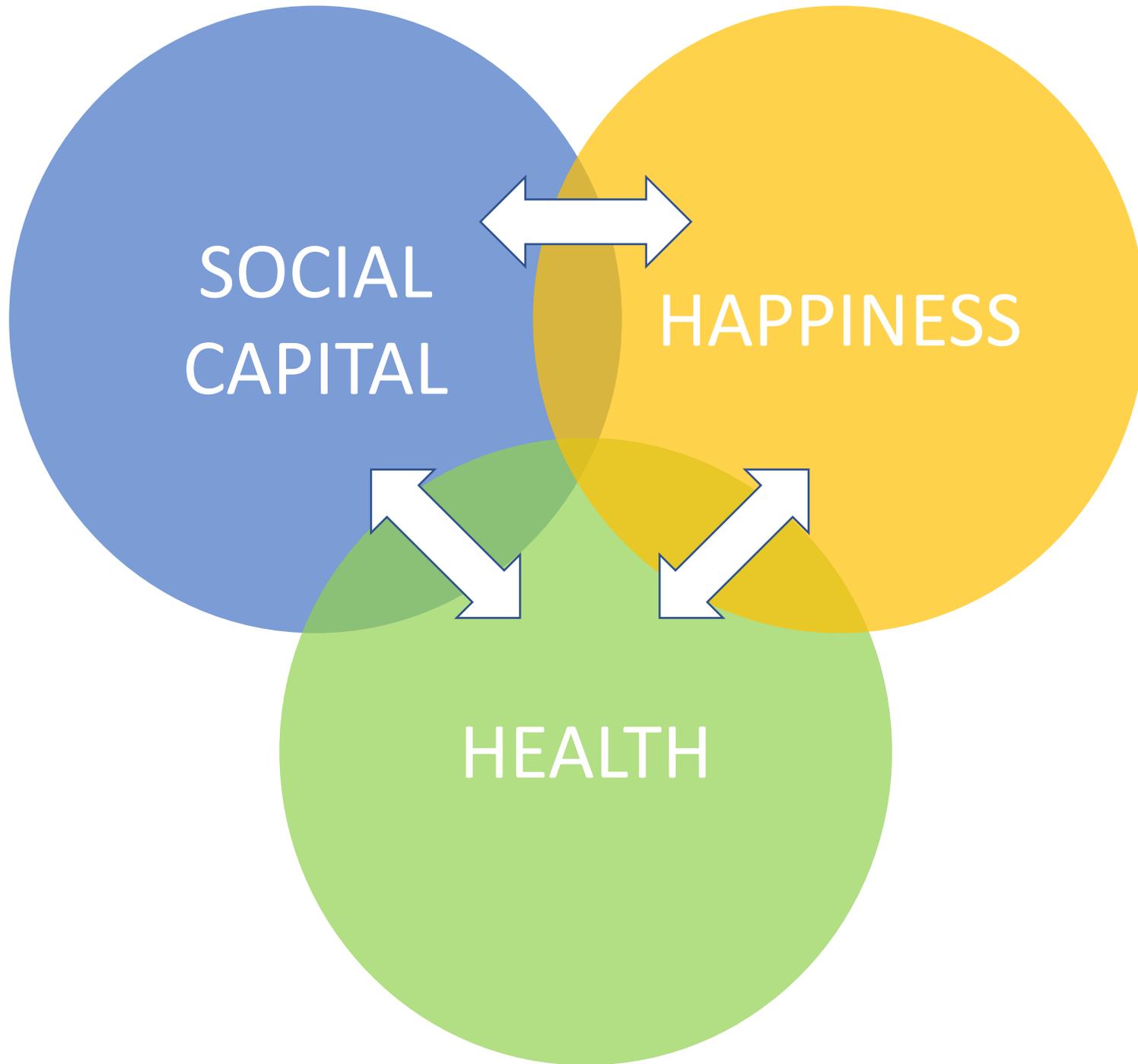- Learning new things
- Personal freedom
- Personal values
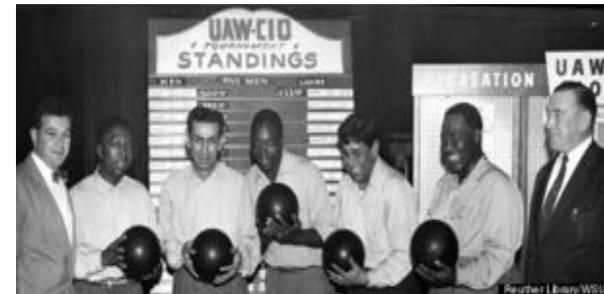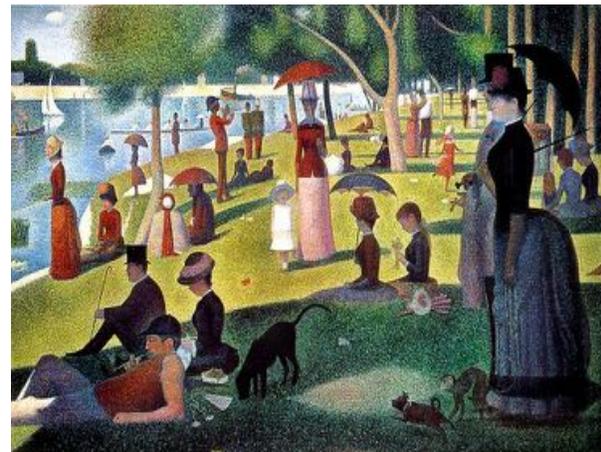
Figure 2.2: Ranking of Happiness 2015-2017 (Part 1)

Figure 2.2: Ranking of Happiness 2013-2015 (Part 1)

Charles Montgomery

Happy City

Transforming Our Lives
Through Urban Design

The Architecture
of Happiness

Alain de Botton

BUILDING
HAPPINESS

ARCHITECTURE TO MAKE YOU SMILE

black dog
publishing
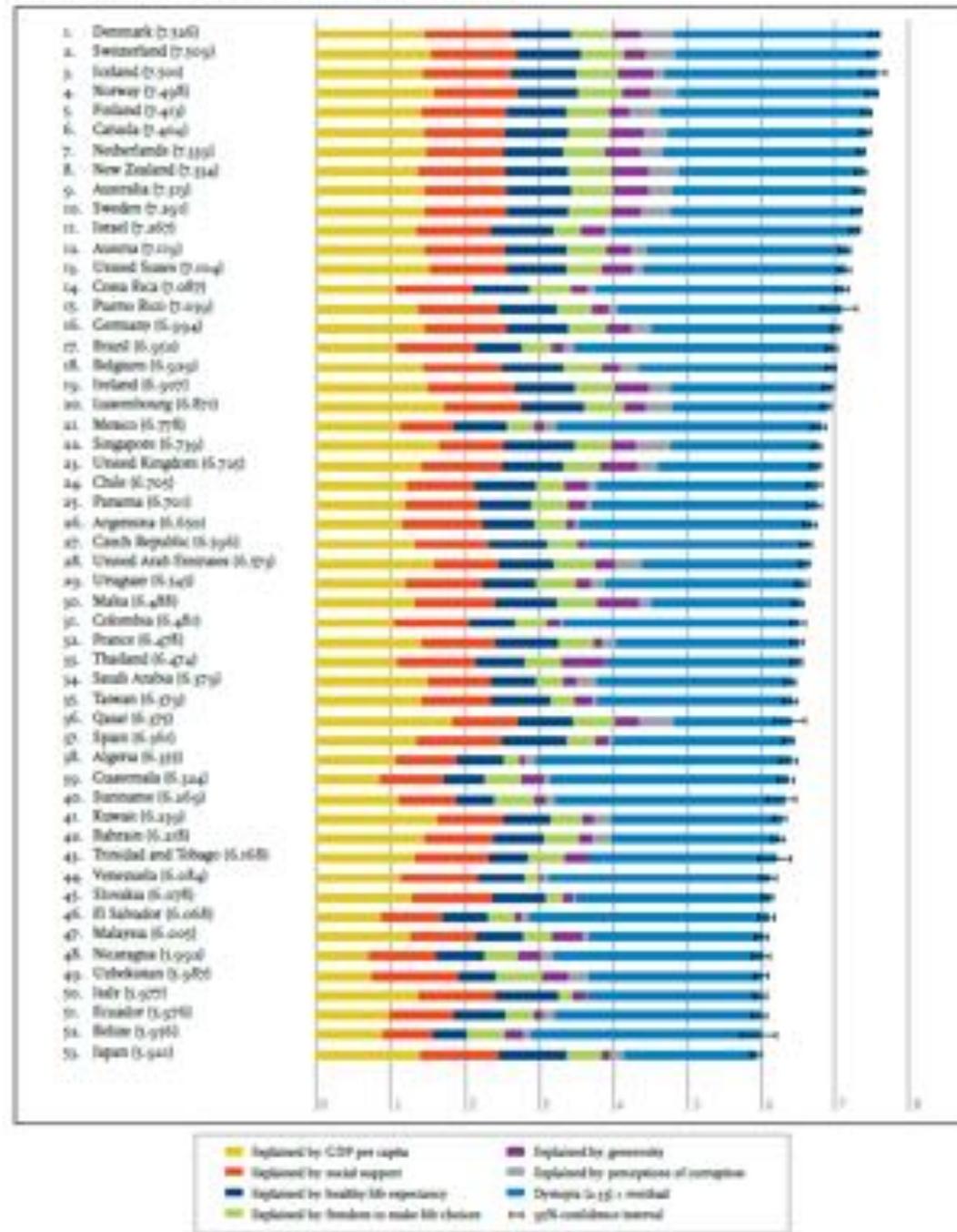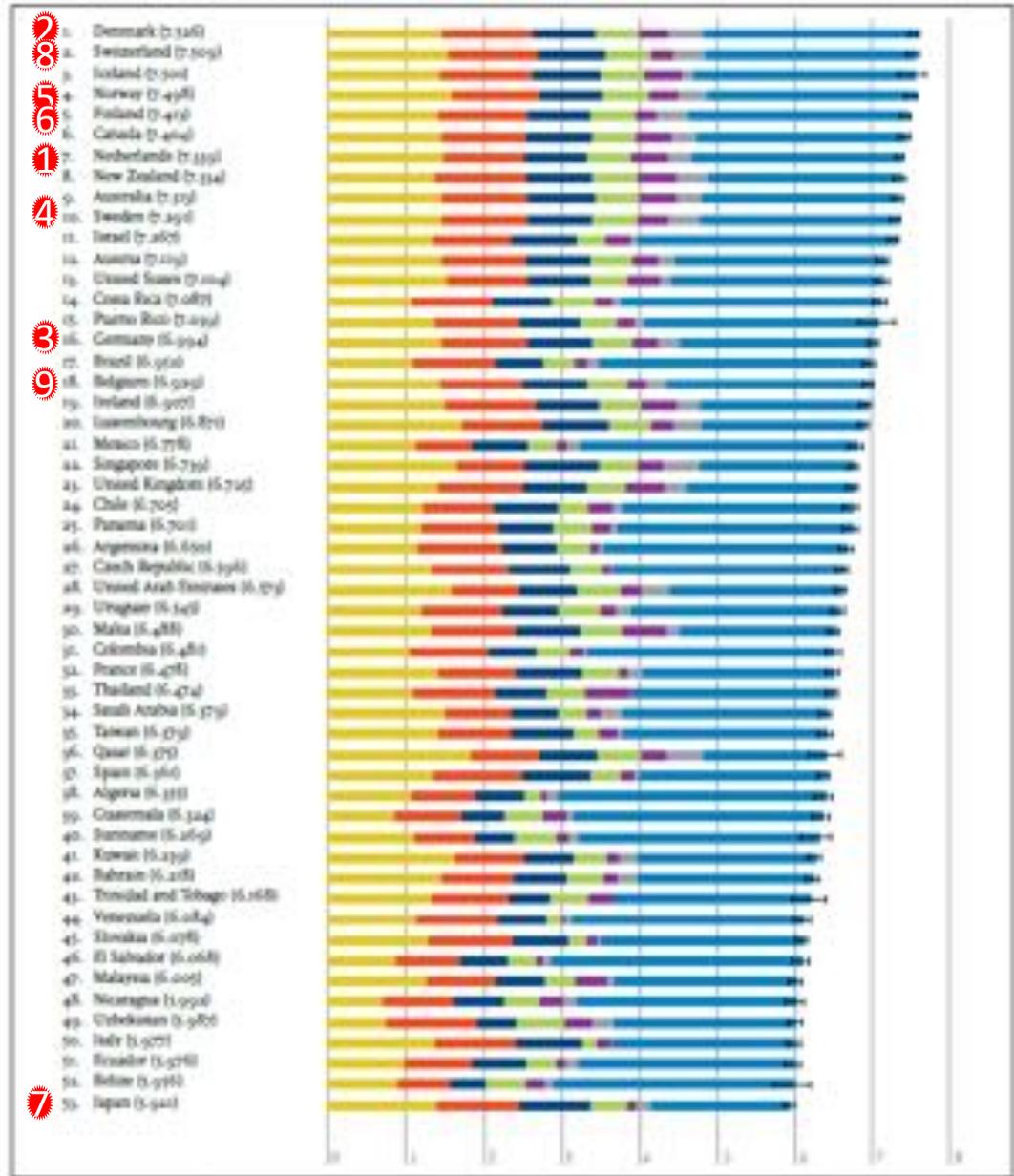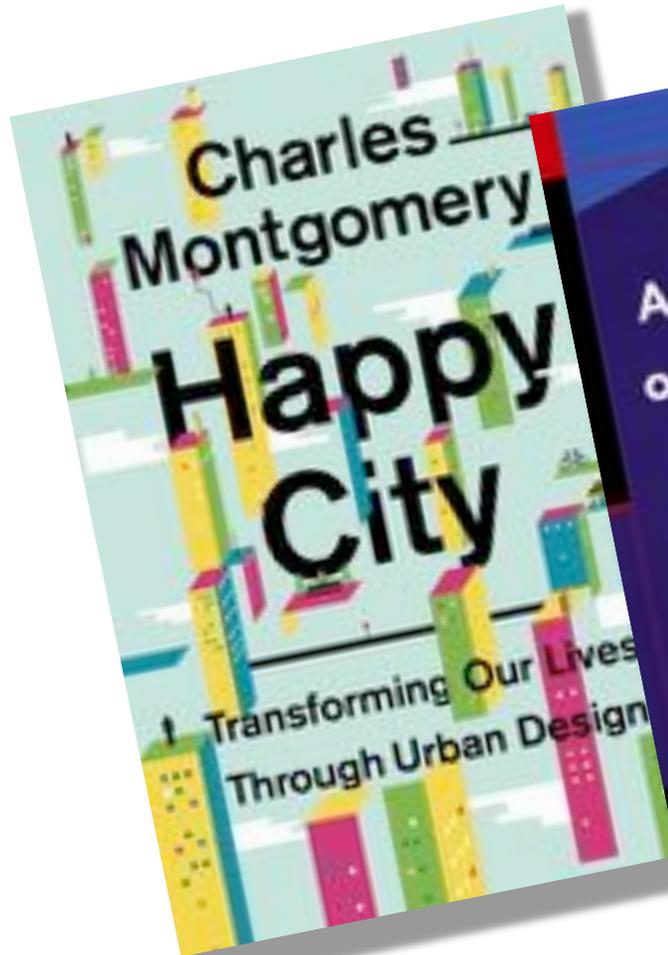
Designing urban habitat for happy humans

 Clean air

 Quiet

 Beauty

 Equity

 Fun

 Routine physical activity

 Short commutes

 Social spaces ("third places")

 Good housing

 Nature contact

Our Planet, Our Health, Our Cities

- We live on a different planet than our grandparents did.
- That poses immediate challenges for cities:
  - Building resilience
  - Preparing for big changes
- Good design can achieve health and sustainability
- Happiness as an organizing design principle