

Sustainable Construction and Environmental Challenges



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Green Accredited Professional
Green Building Council of Sri Lanka

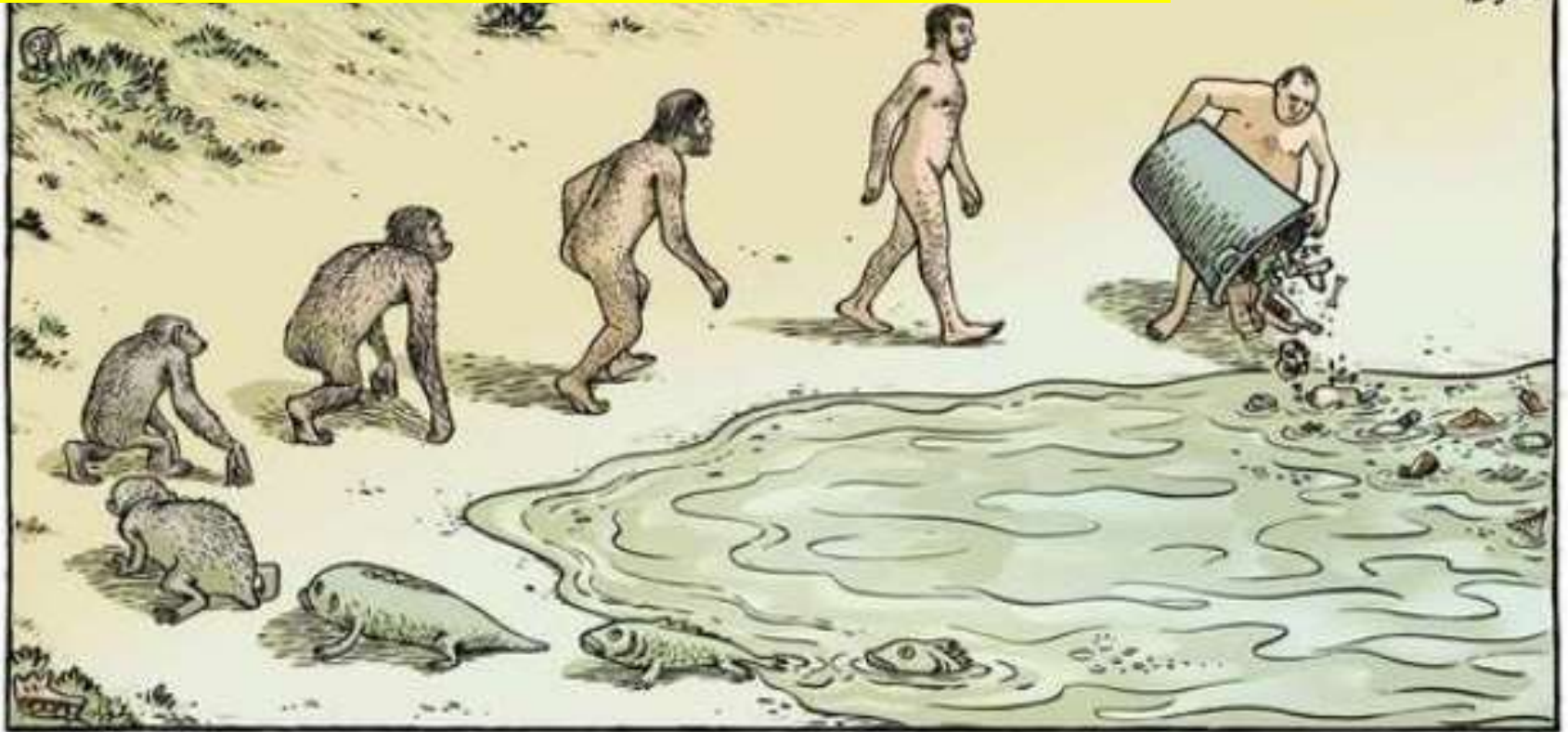
Content

- Global Environmental Issues
 - High consumptions and emissions, climate change and related impact
- Construction Trends and the Environment
 - Green/smart cities, green/smart buildings and infrastructure

A solid green vertical bar is on the left side of the slide. The background features faint, light green outlines of several houses, some of which are overlapping each other.

Global Environmental Issues: High consumptions and emissions, climate change and related impact

High Consumptions & Emissions

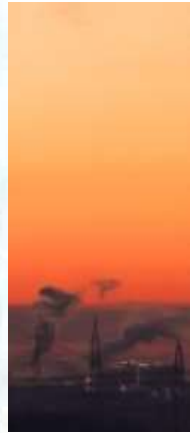
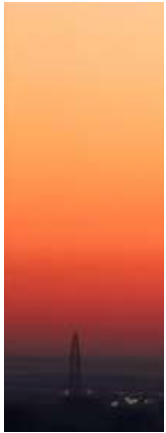


Welcome to the Anthropocene

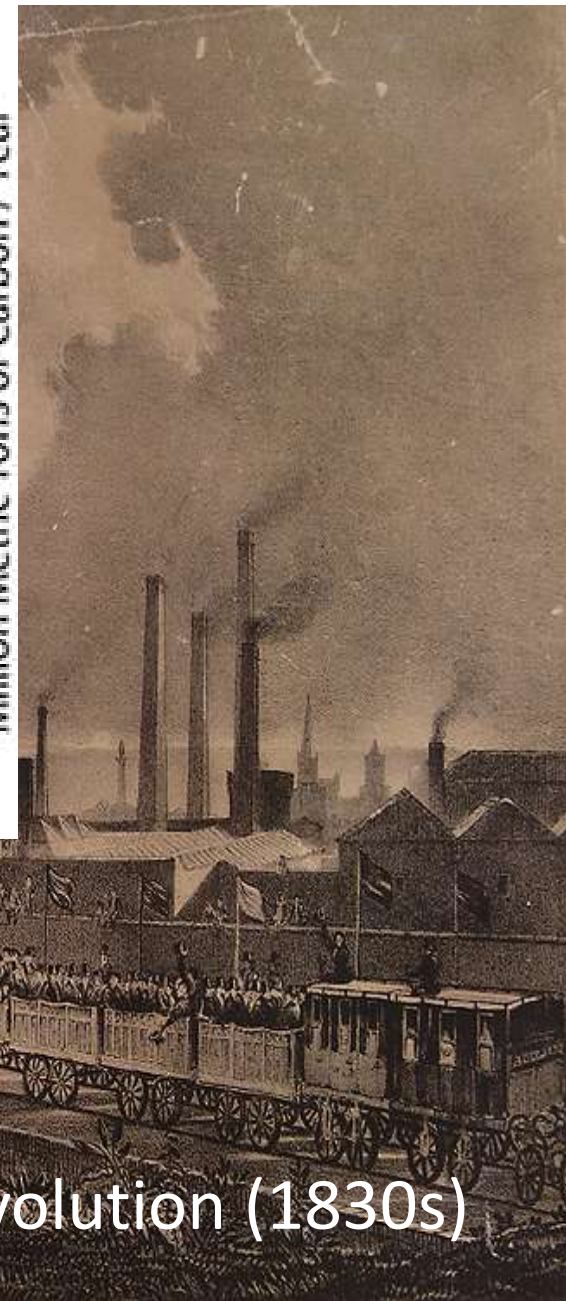
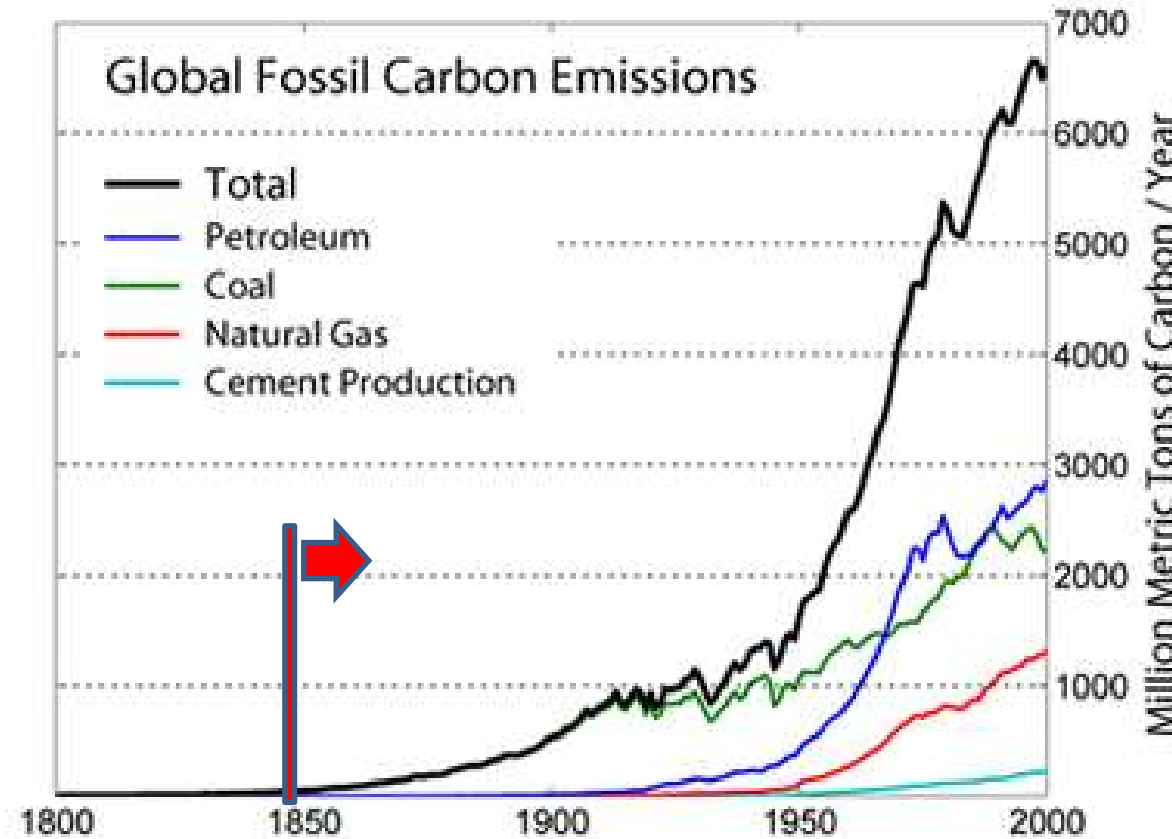
the current geological age, viewed as the period during which human activity has been the dominant influence on climate and the environment.

<https://www.slideshare.net/jembwilliams/climate-resilience-how-forwardlooking-organisations-are-taking-action-to-mitigate-the-impactof-climate-change/5-httpwwwanthropoceneinfohttpsvimeocom39048998>

• Global Environmental Issues



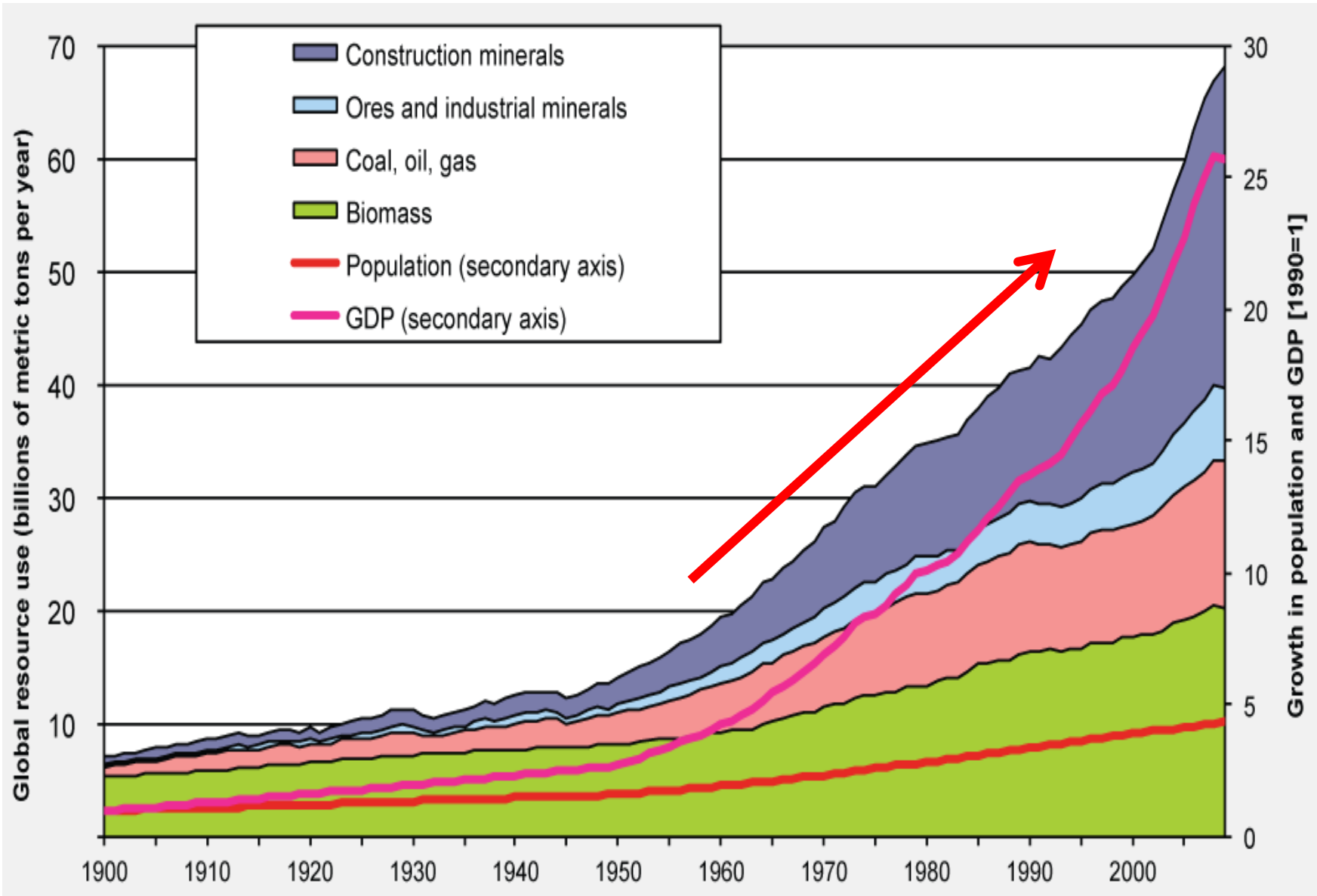
Resource, environment exploitation and economic growth



Industrial Revolution (1830s)

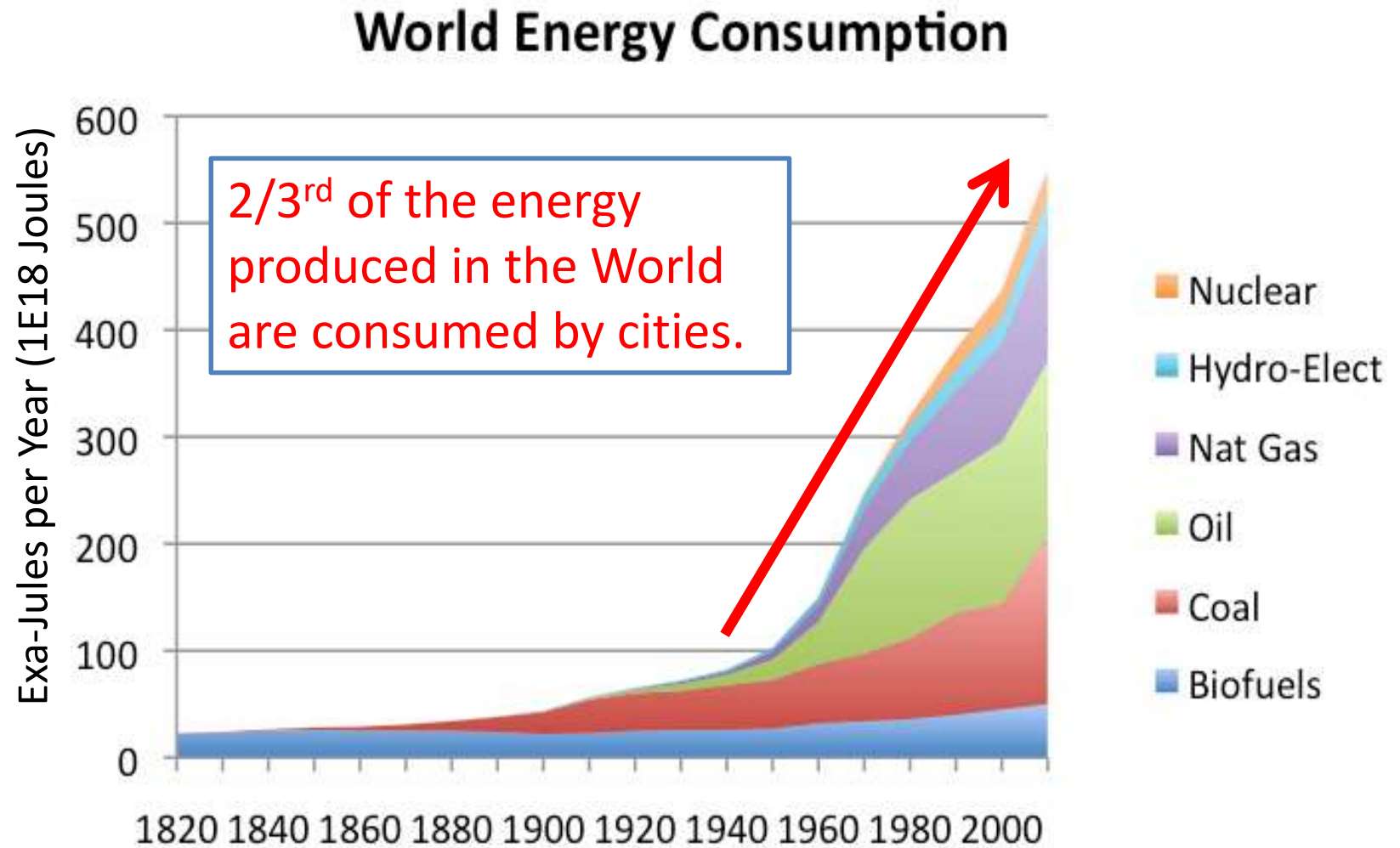
• Global Environmental Issues

High Consumptions



• Global Environmental Issues

High Consumptions

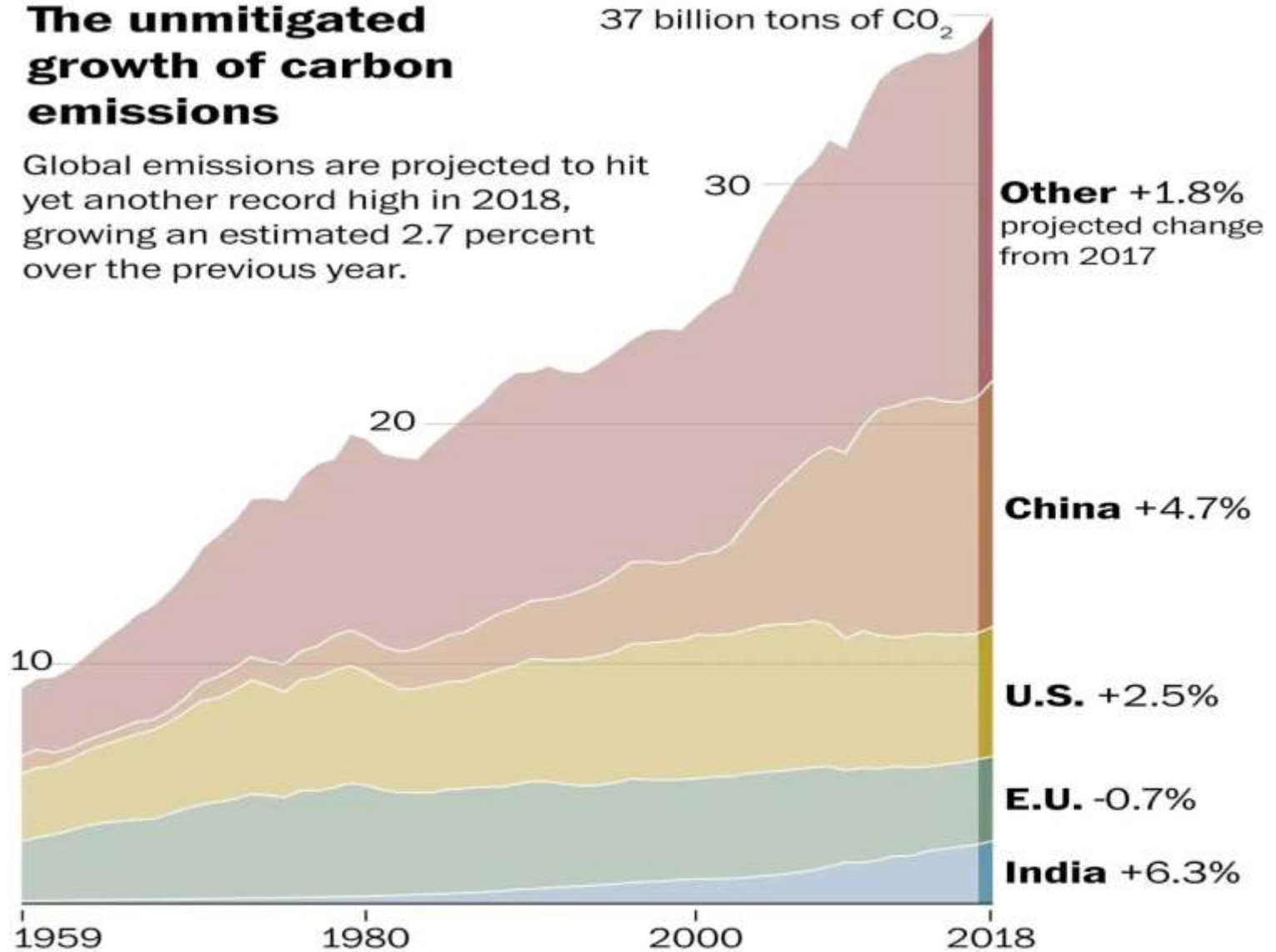


• Global Environmental Issues

High Emissions

The unmitigated growth of carbon emissions

Global emissions are projected to hit yet another record high in 2018, growing an estimated 2.7 percent over the previous year.



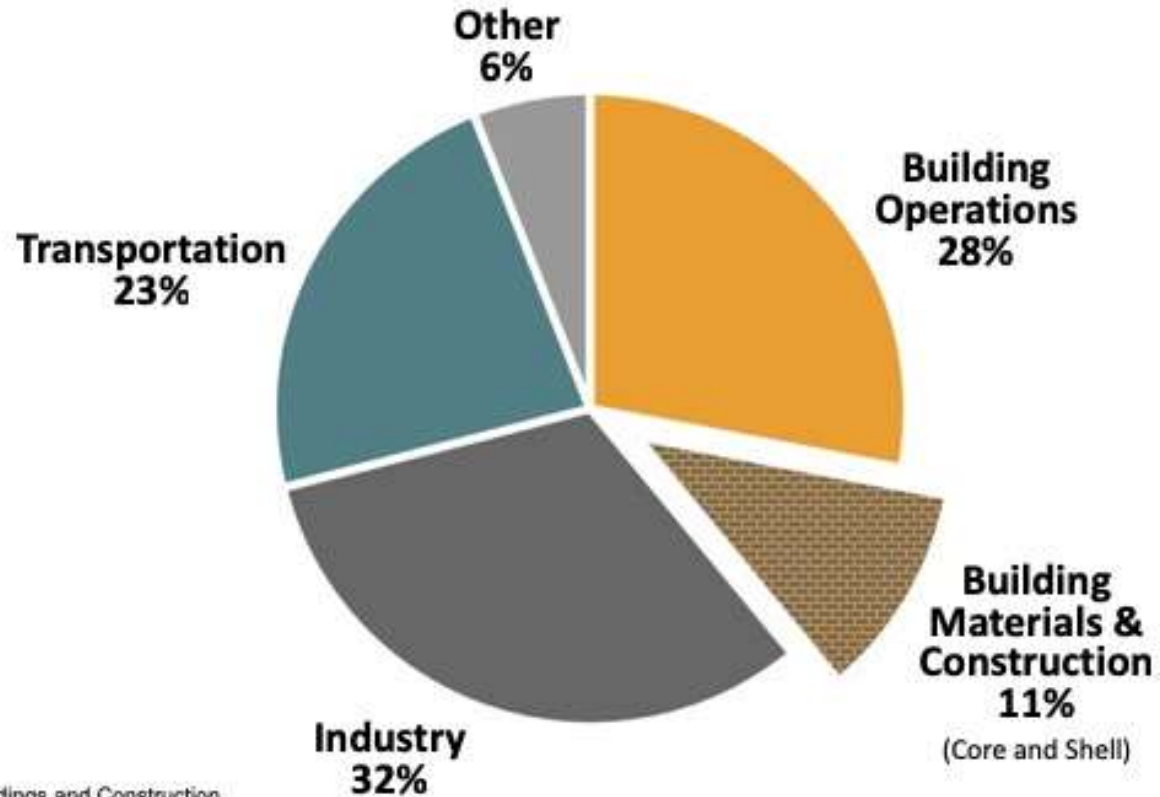
Figures show emissions from fossil fuels and industry, which includes cement manufacturing but not deforestation.

Source: Global Carbon Project

JOHN MUYSKENS/THE WASHINGTON POST

High Emissions

Global CO₂ Emissions by Sector

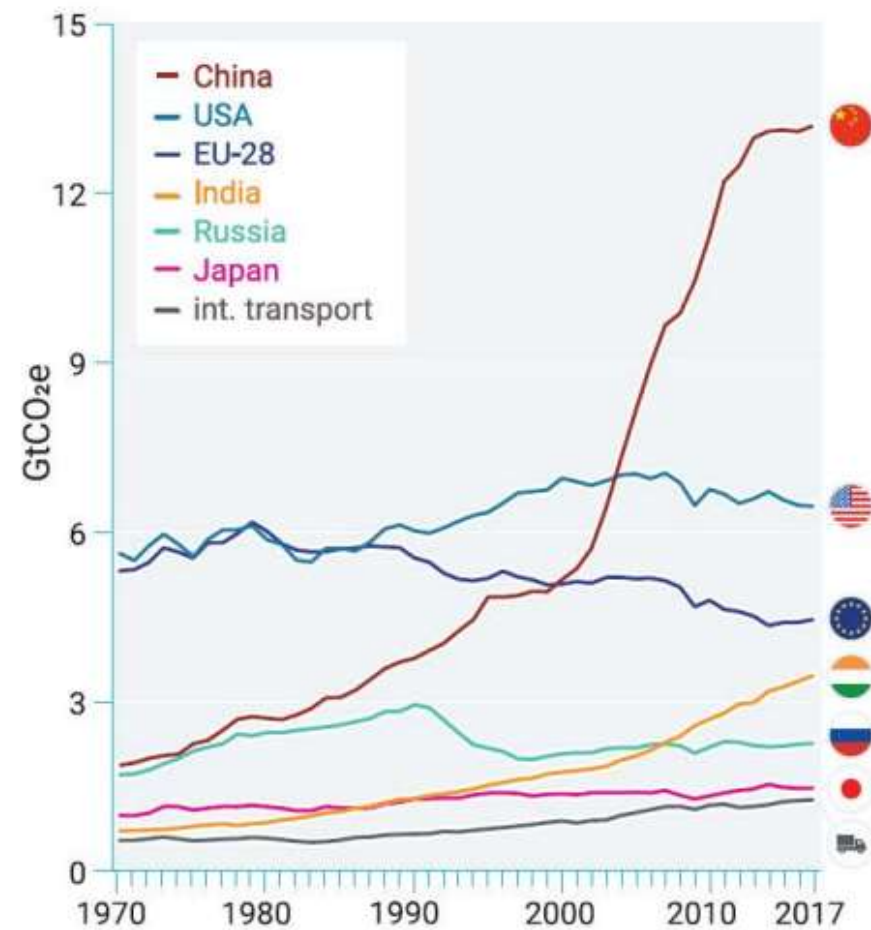
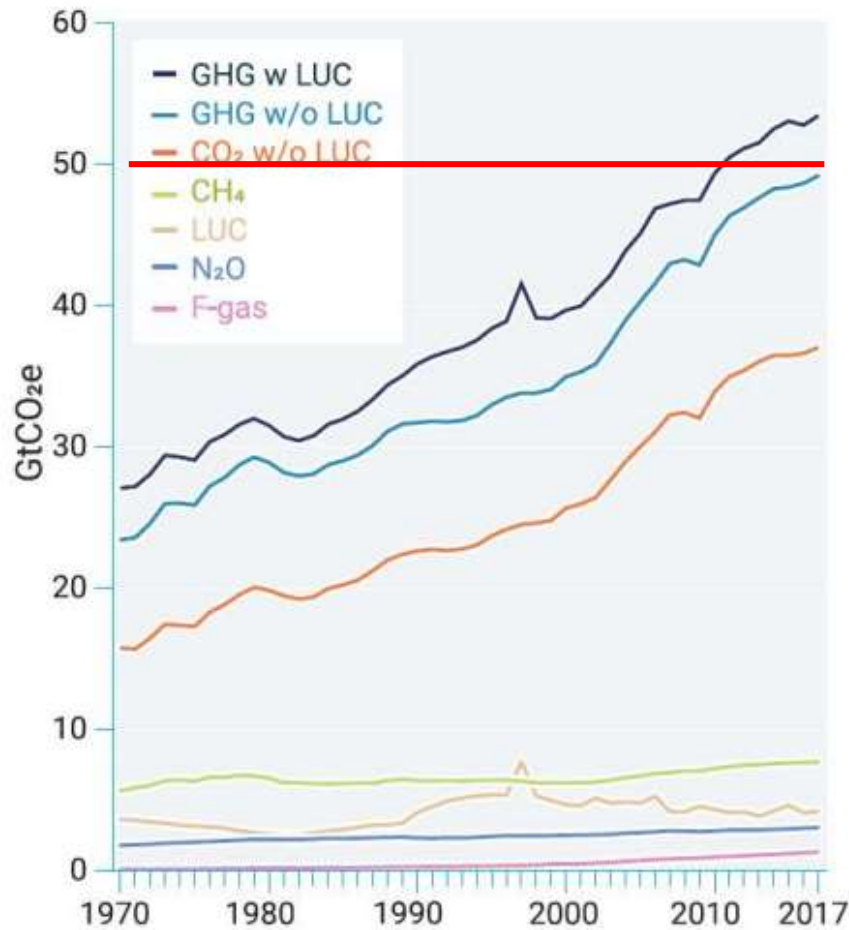


Source:
Global Alliance for Buildings and Construction,
2018 GLOBAL STATUS REPORT.

The contributor for about 40% of CO₂ emission is buildings

• Global Environmental Issues

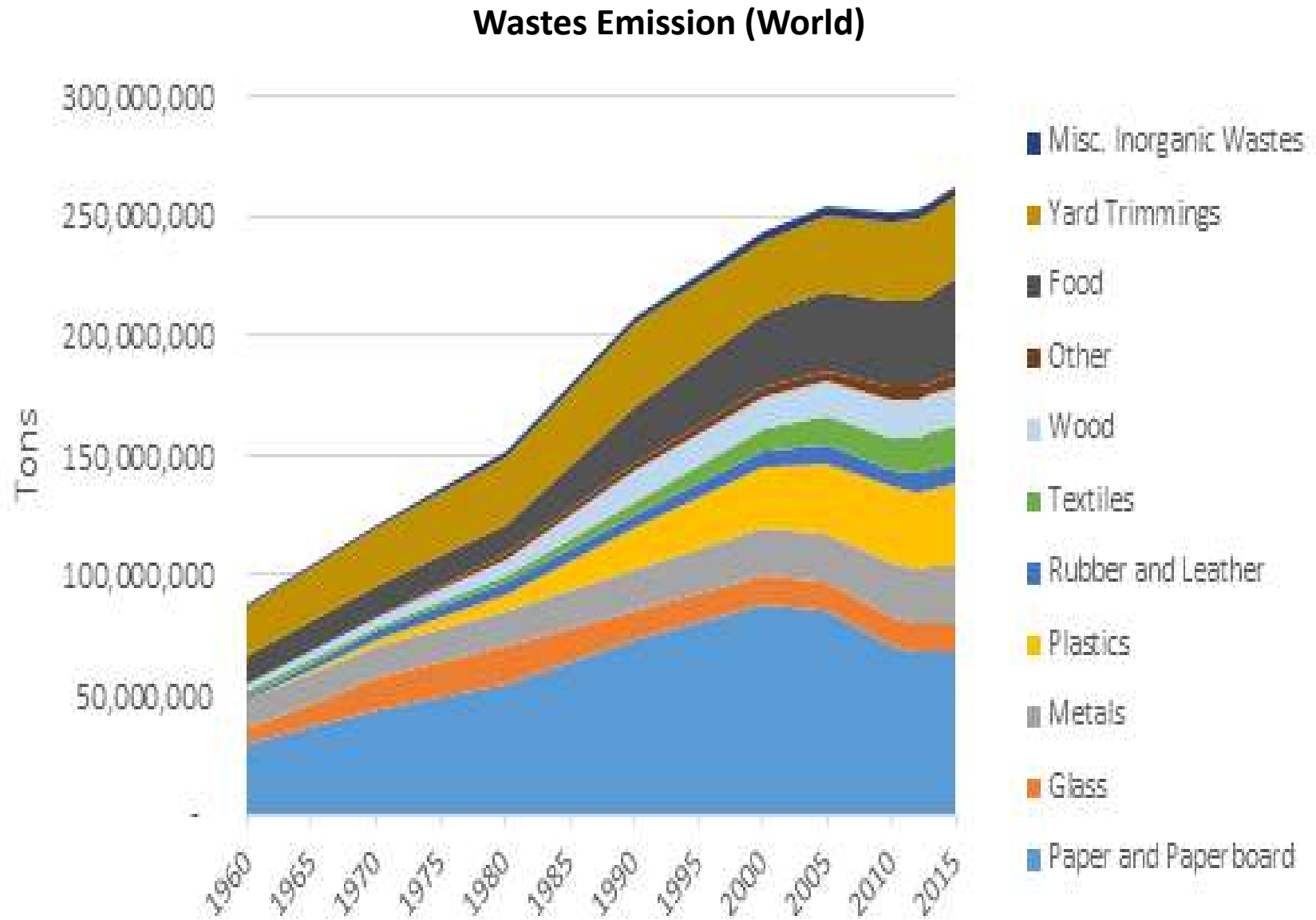
Global greenhouse gas emission levels for majors emitters and per type of gas (CO₂e – CO₂ Equivalent value of all GHGs)



Total annual greenhouse gases emissions, including from land-use change (LUC) , reached a record high of 53.5 GtCO₂e in 2017, an increase of 0.7 GtCO₂e compared with 2016.

Source: UN Environment /
Emission Gap Report - 2018

High Emissions

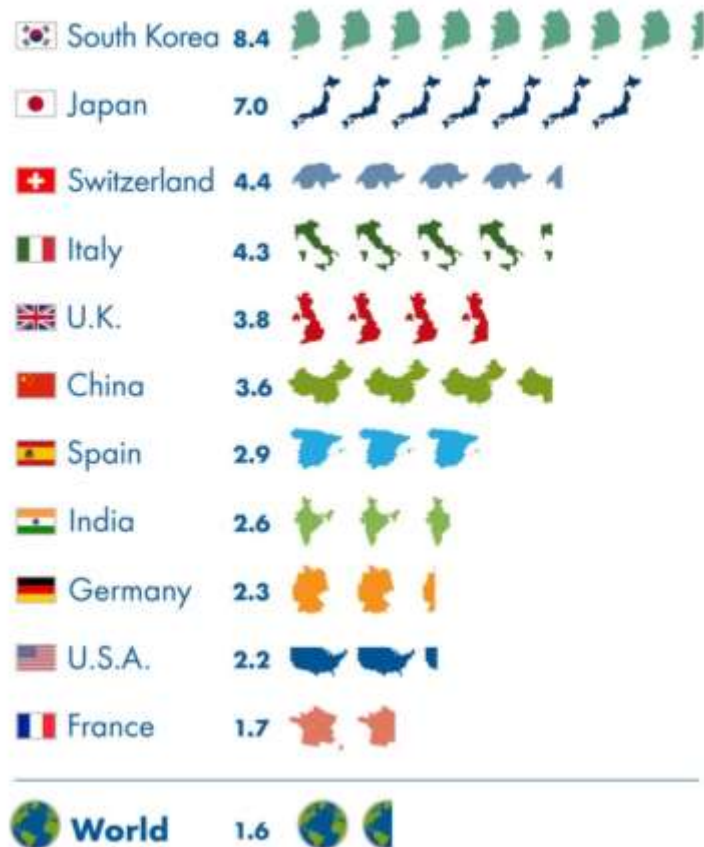


Ecological footprint:

Measure of human impact on Earth's ecosystems.

Measured in the amount of natural capital (resources) consumed each year.

How many countries are required to meet the demand of its citizens...



Source: Global Footprint Network National Footprint Accounts 2016

<https://www.footprintnetwork.org/our-work/ecological-footprint/>

It is a measure of how much biologically productive land and water an individual, population or activity requires to produce all the resources it consumes, and to absorb the waste it generates.

The Ecological Footprint is usually measured in global hectares (gha)

Carbon

Represents the amount of forest land that could sequester CO₂ emissions from the burning of fossil fuels, excluding the fraction absorbed by the oceans which leads to acidification



Cropland

Represents the amount of cropland used to grow crops for food and fibre for human consumption as well as for animal feed, oil crops and rubber



Grazing land

Represents the amount of grazing land used to raise livestock for meat, dairy, hide and wool products



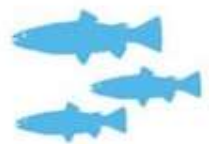
Forest

Represents the amount of forest required to supply timber products, pulp and fuel wood



Built-up land

Represents the amount of land covered by human infrastructure, including transportation, housing industrial structures and reservoirs for hydropower

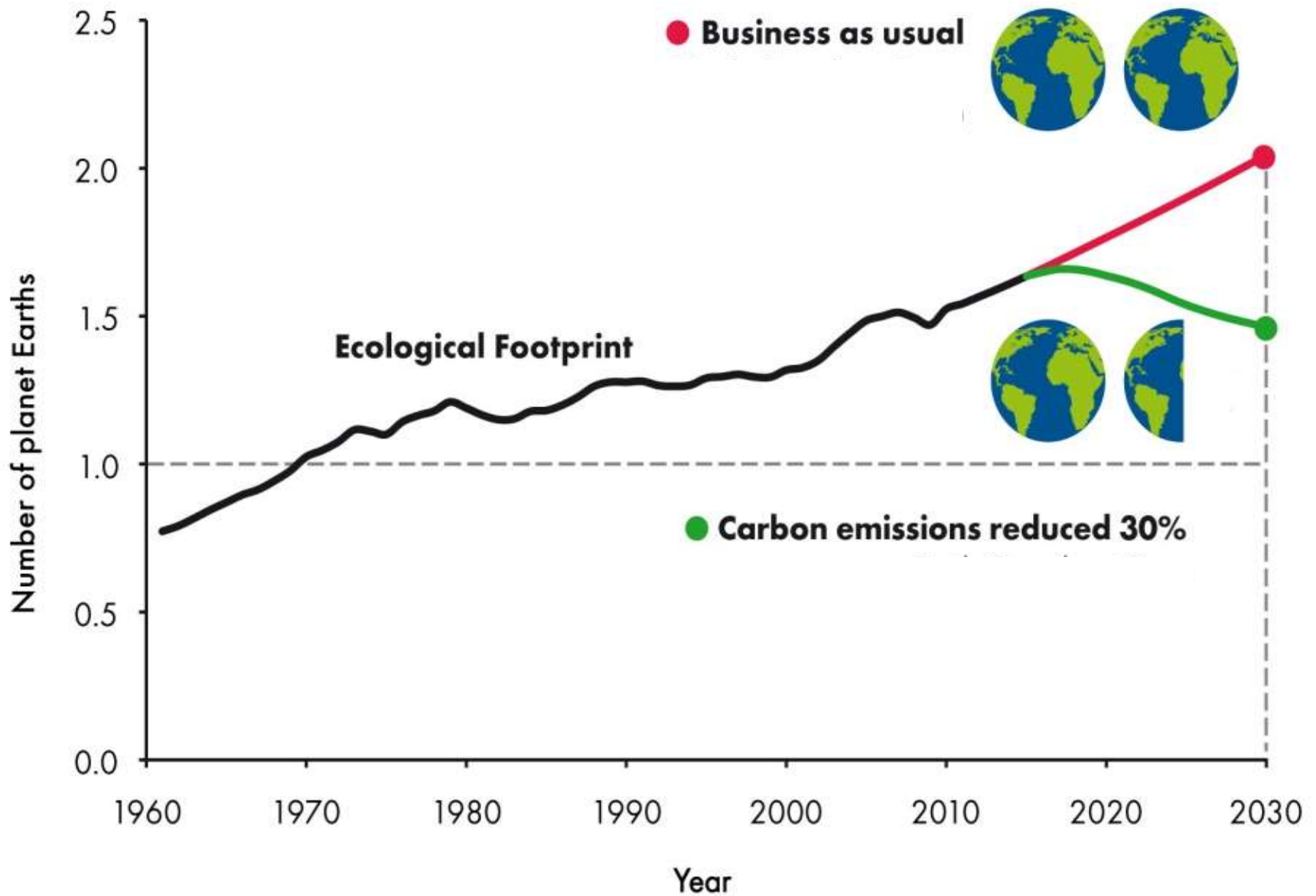


Fishing grounds

Calculated from the estimated primary production required to support the fish and seafood caught, based on catch data for marine and freshwater species

- Global Environmental Issues

High Consumptions

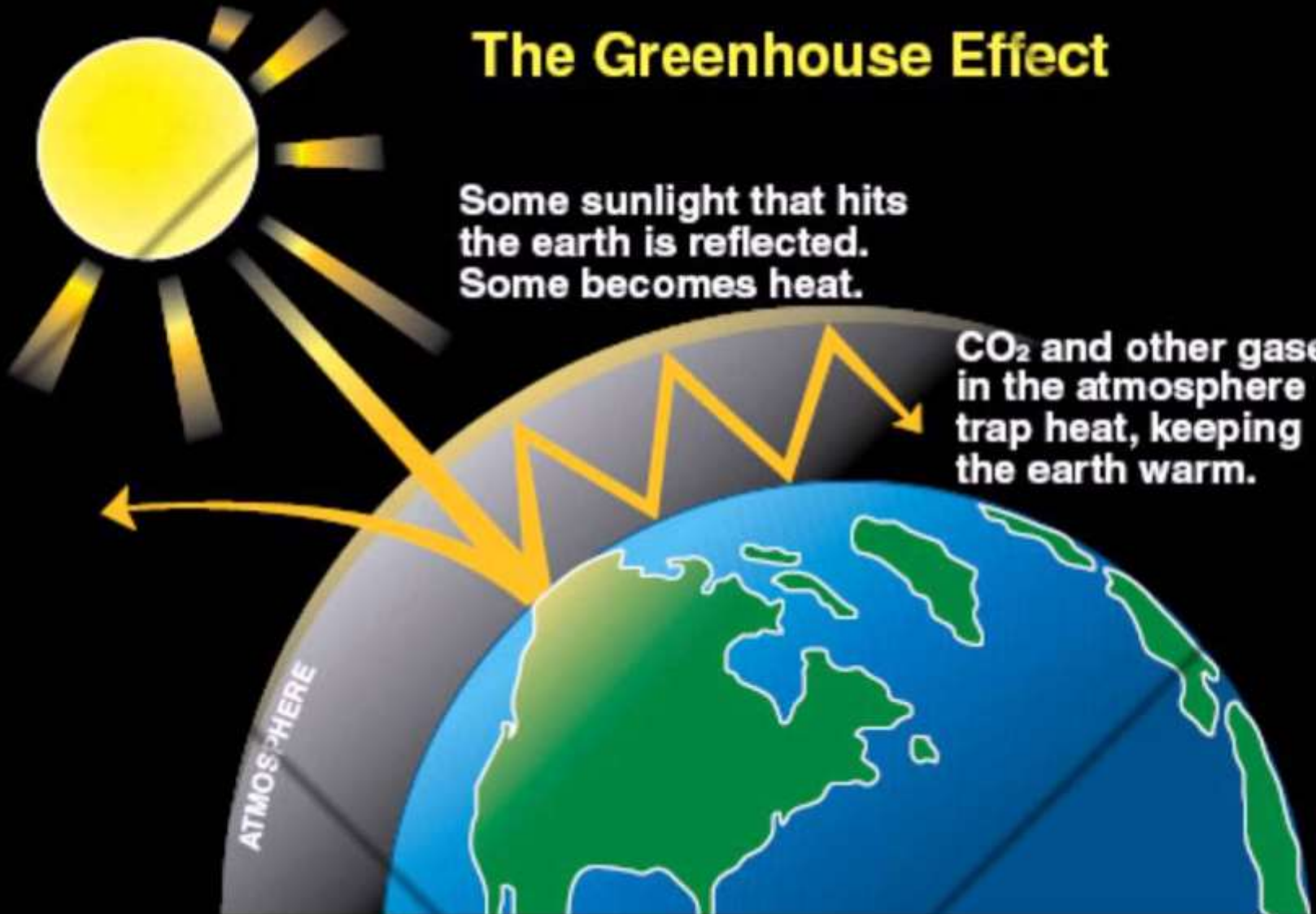


The Greenhouse Effect

Some sunlight that hits the earth is reflected. Some becomes heat.

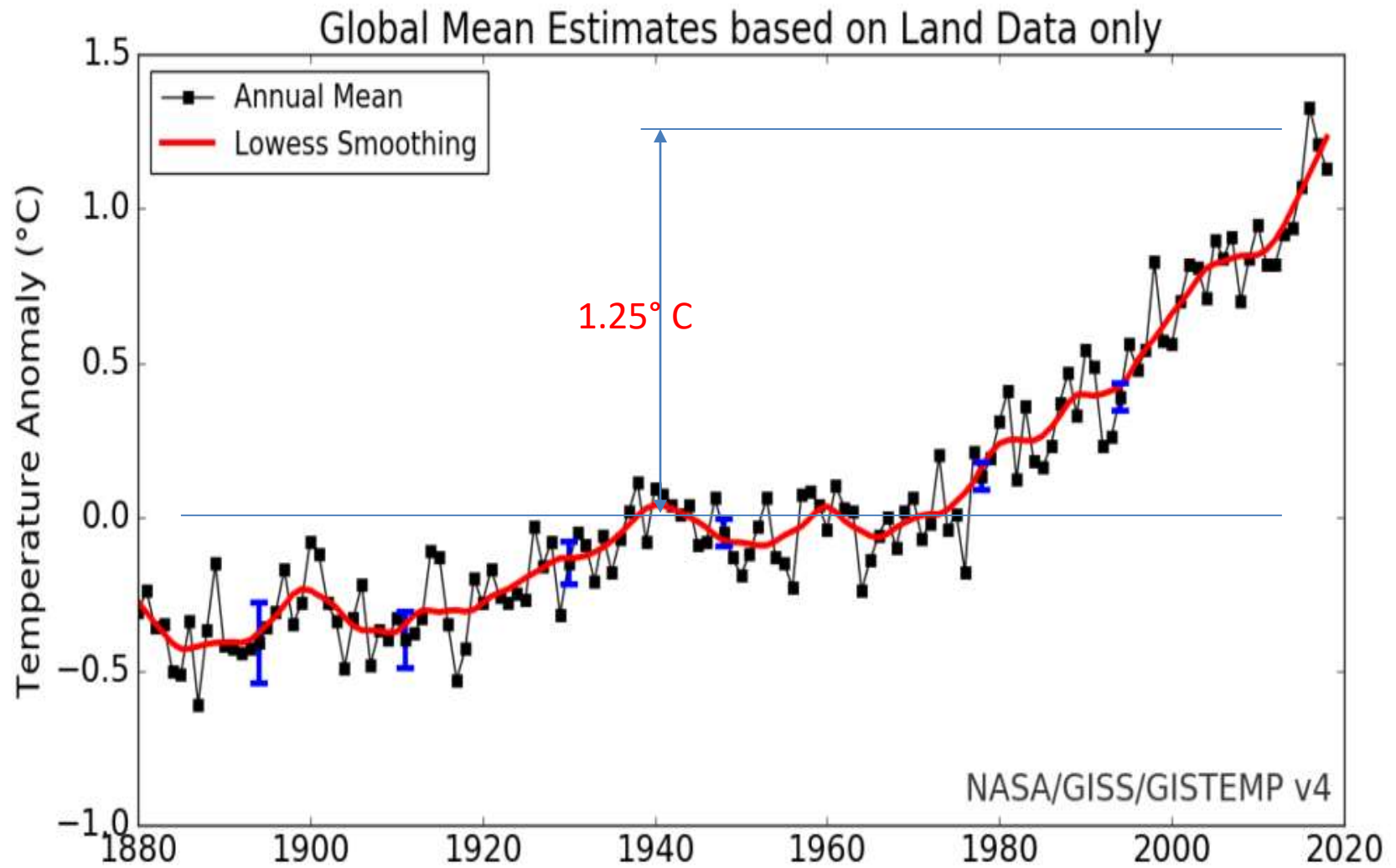
CO₂ and other gases in the atmosphere trap heat, keeping the earth warm.

ATMOSPHERE

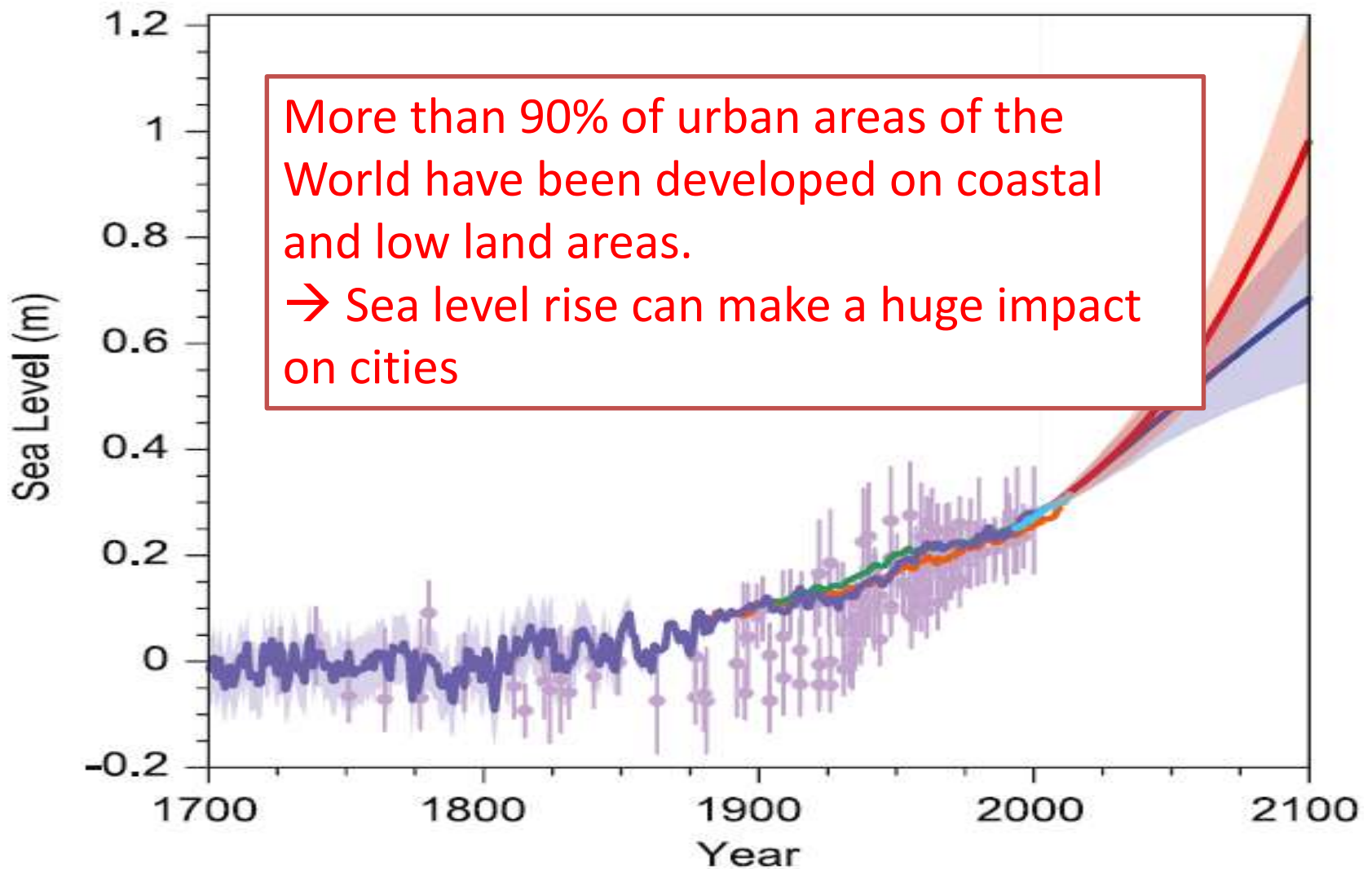


- Global Environmental Issues

Global Warming



- Global Environmental Issues

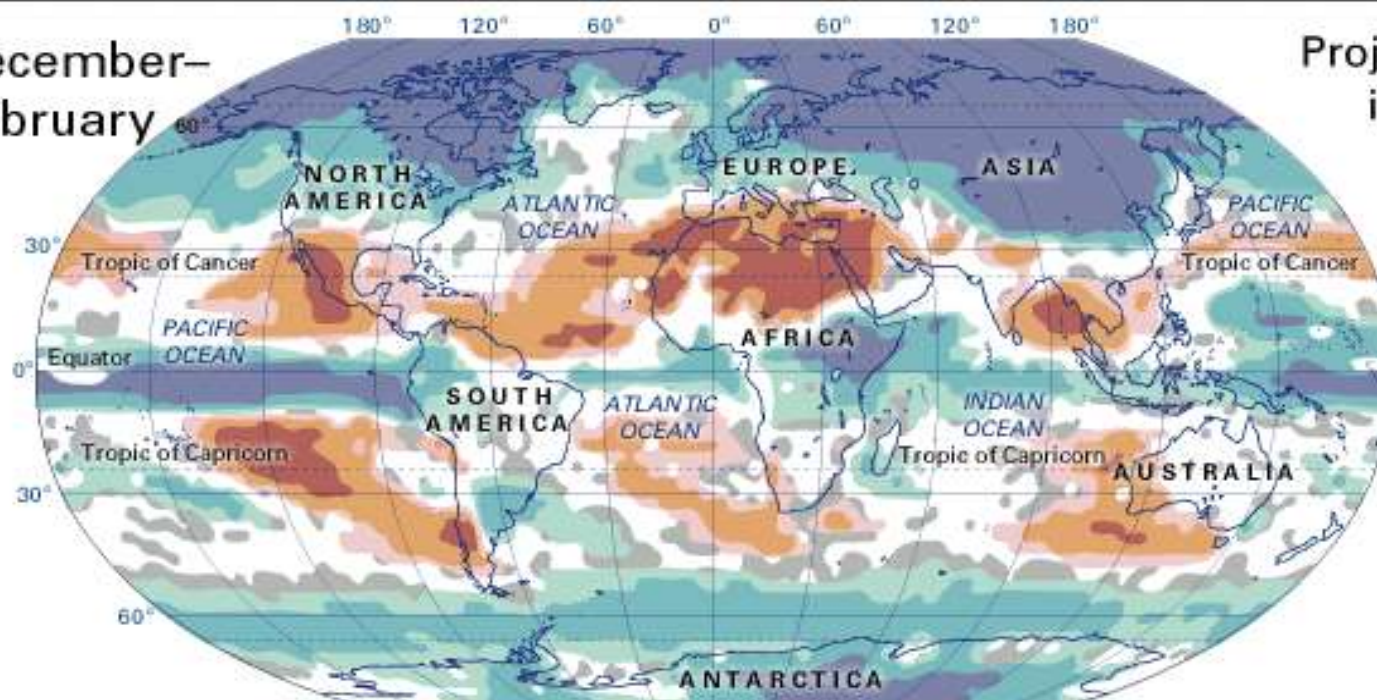


Past and future sea-level rise. For the past, proxy data are shown in light purple and tide gauge data in blue. For the future, the IPCC projections for very high emissions (red, RCP8.5 scenario) and very low emissions (blue, RCP2.6 scenario) are shown. Source: IPCC AR5 Fig. 13.27.

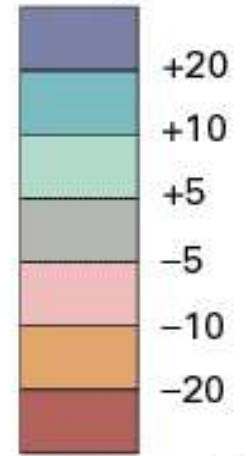
• Global Environmental Issues

December–
February

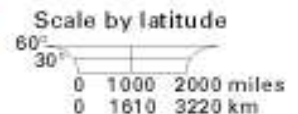
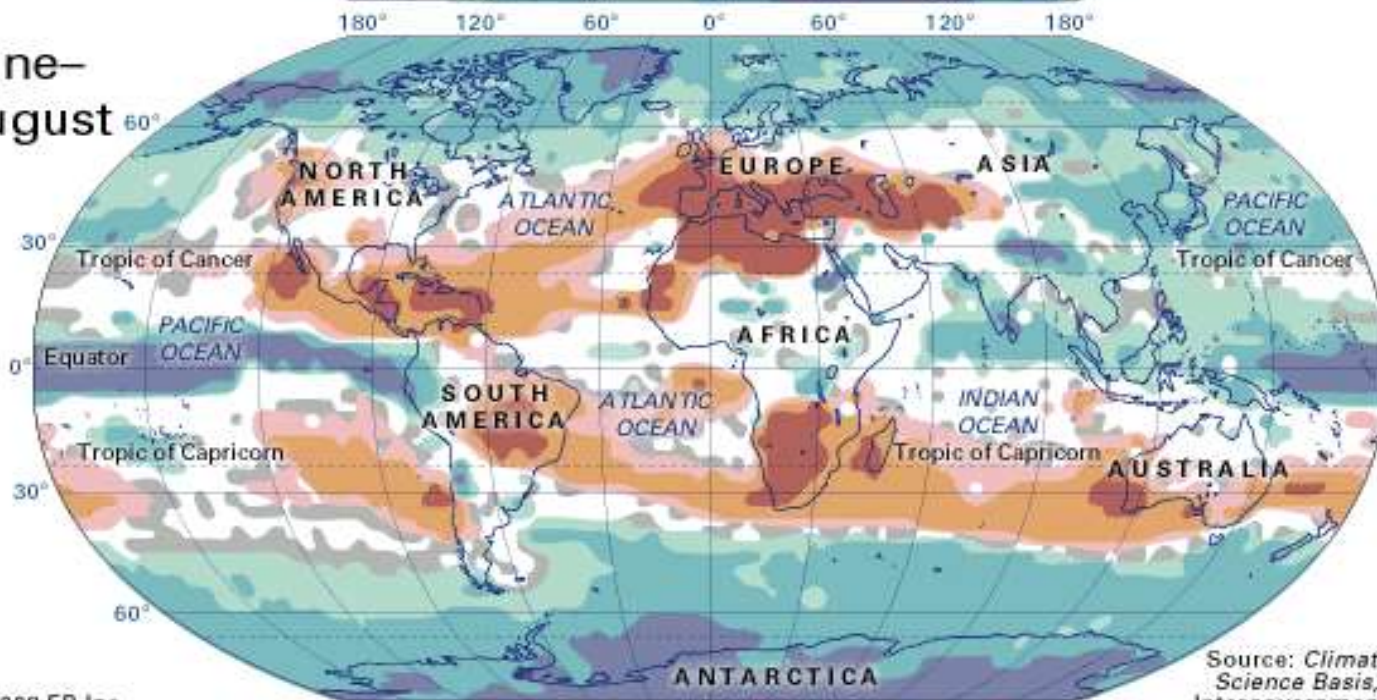
Projected changes
in precipitation
from 1980–99
to 2090–99



Percent
Change



June–
August



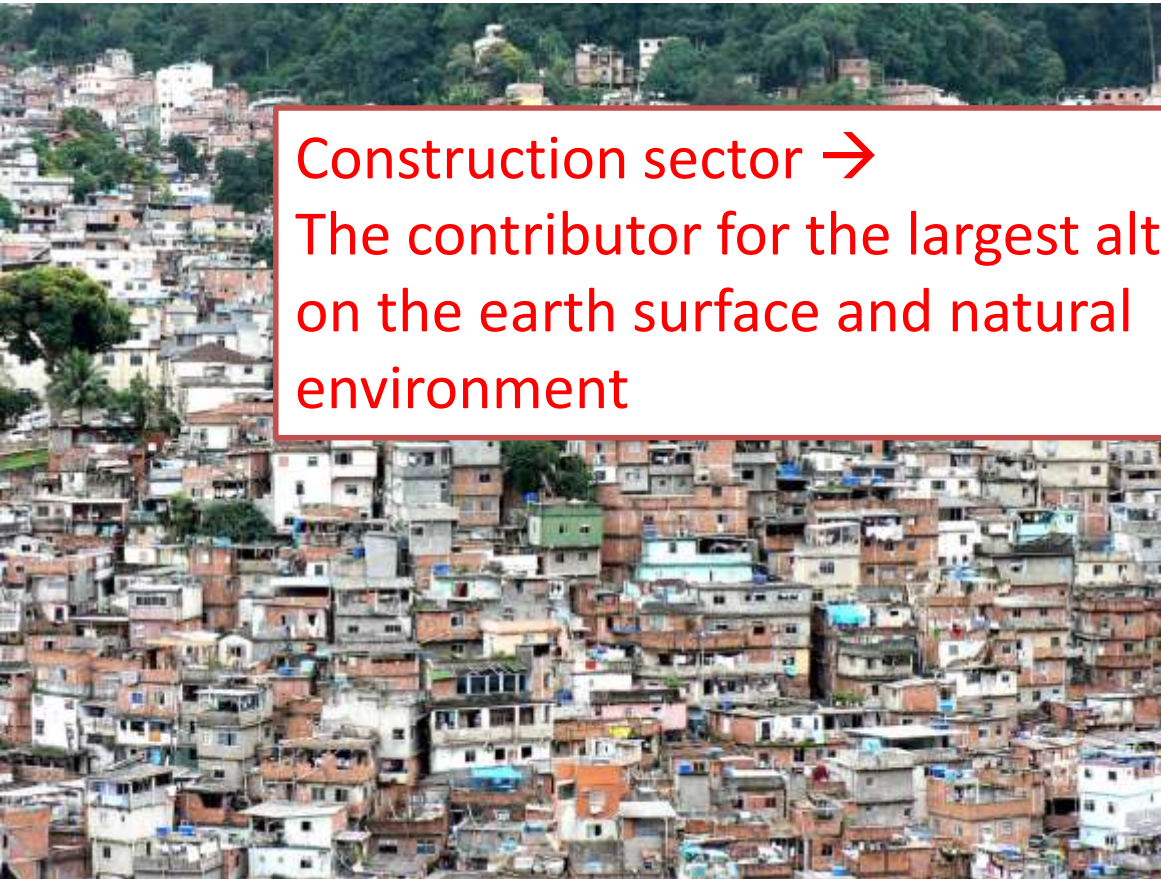
Source: *Climate Change 2007: The Physical Science Basis, Summary for Policymakers*, Intergovernmental Panel on Climate Change

• Global Environmental Issues

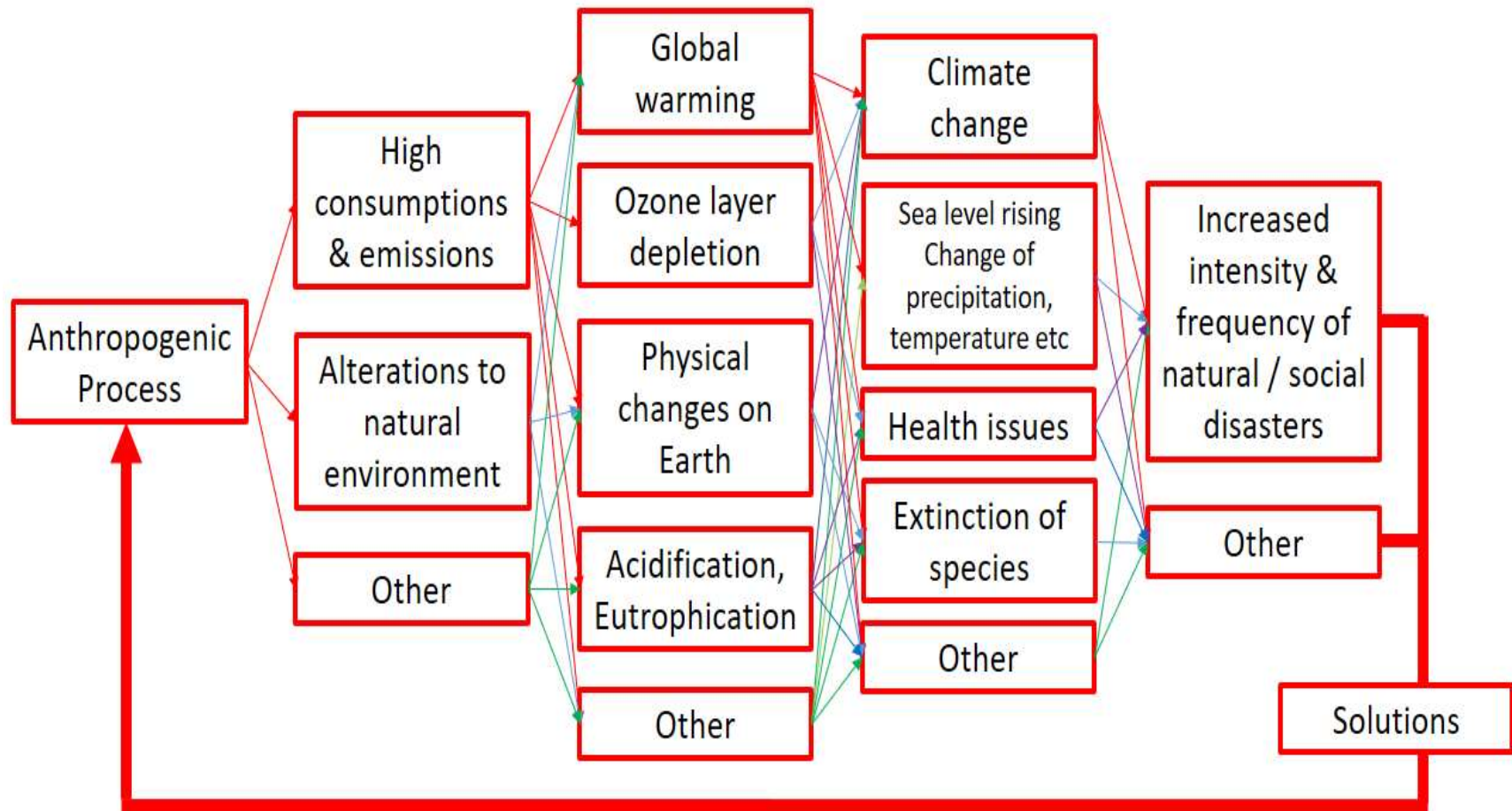
Alterations to Natural Environment



Construction sector →
The contributor for the largest alteration
on the earth surface and natural
environment

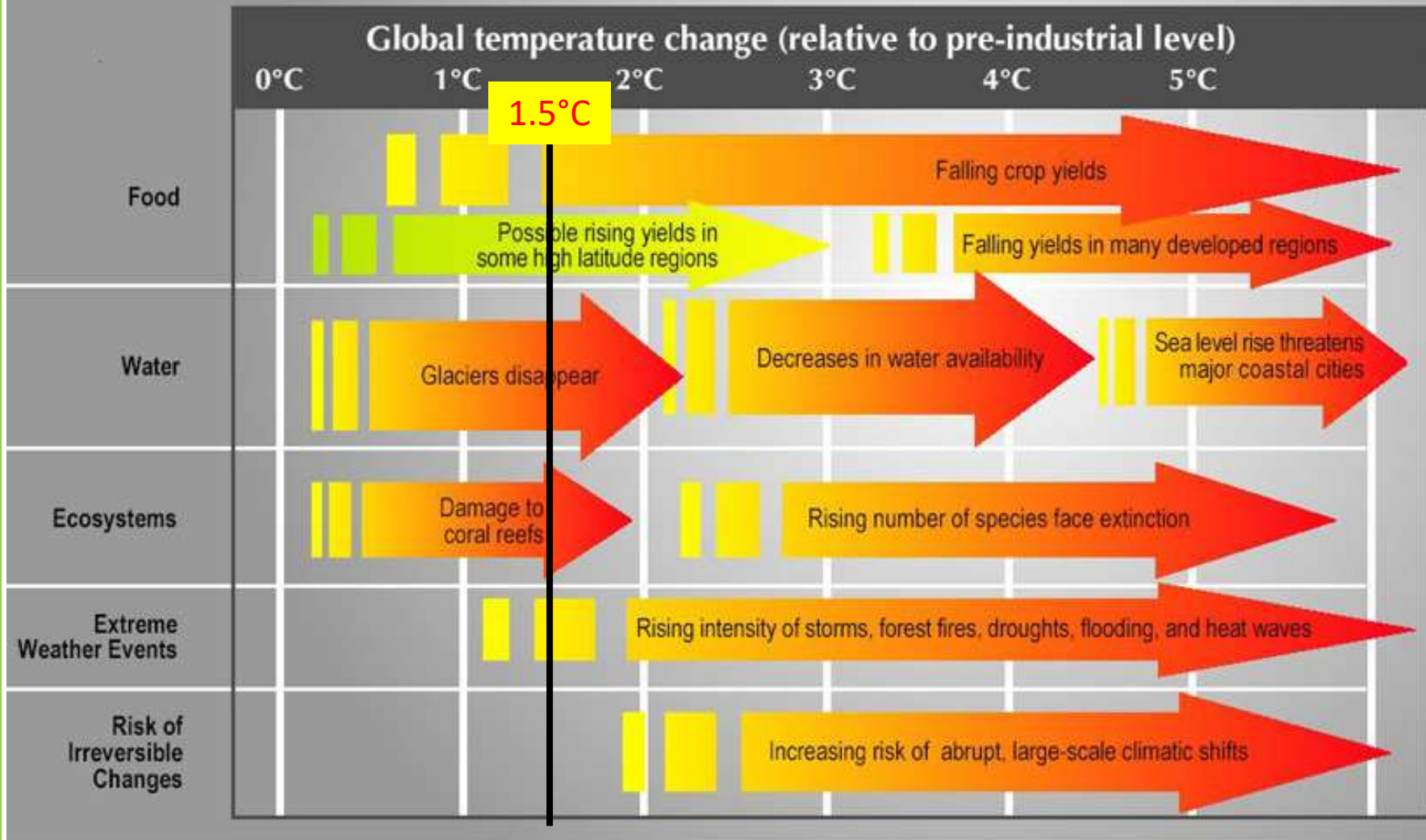


Anthropogenic Processes and, “Global Warming & Climate Change”



• Global Environmental Issues

Projected Impacts of Climate Change



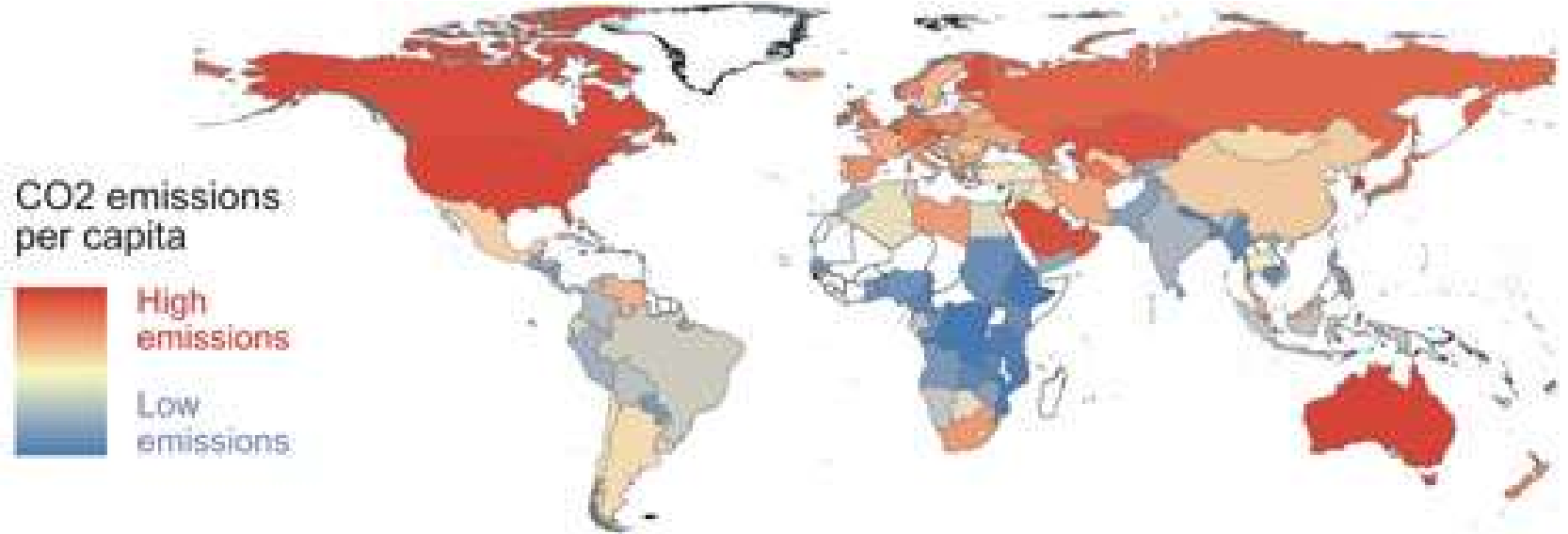
C = Celsius; CO₂ = Carbon Dioxide

Source: Adapted from the *Stern Review on the Economics of Climate Change*.

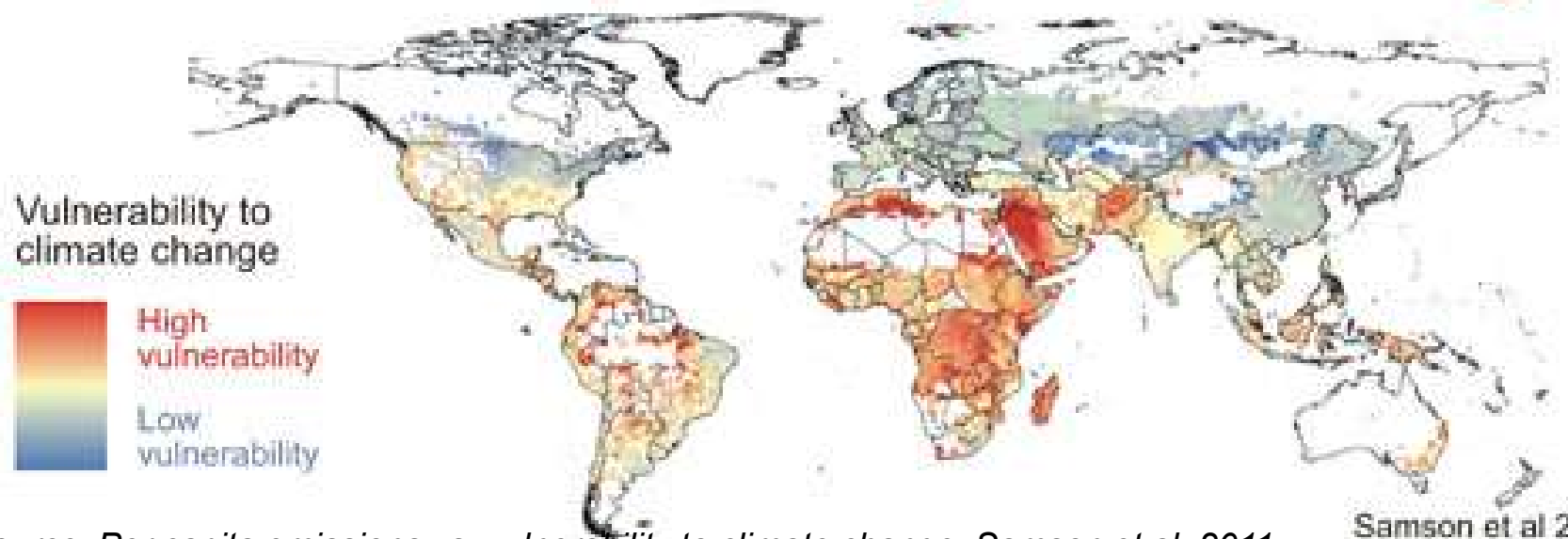
Number of global environmental and disastrous issues have been predicted if the global temperature rise exceeds 1.5°C

Source: Stern N. 2006. *The Stern Review on the Economics of Climate Change*. HM Treasury , UK . Cambridge University Press.

• Global Environmental Issues



Those who contribute the least greenhouse gases
will be most impacted by climate change



Source: *Per capita emissions vs. vulnerability to climate change*, Samson et al. 2011;
<https://doi.org/10.1111/j.1466-8238.2010.00632.x>

Samson et al 2011

Which Asian country has suffered **most financial loss** due to climate change?

Climate Risk Index for 1996–2015 reveals that China has suffered most financial loss.



Losses in million US\$ (PPP)

Compiled by: ANN/DataLEADS

Source: Germanwatch, Germany

Attempt of limiting the global warming below 1.5°C

GLOBAL WARMING TARGET

+1.5° C

INCREASE PER
PARIS CLIMATE ACCORD

REMAINING GLOBAL CARBON BUDGET

420

GT CO₂

CURRENT EMISSION RATE

42

GT CO₂ / YEAR

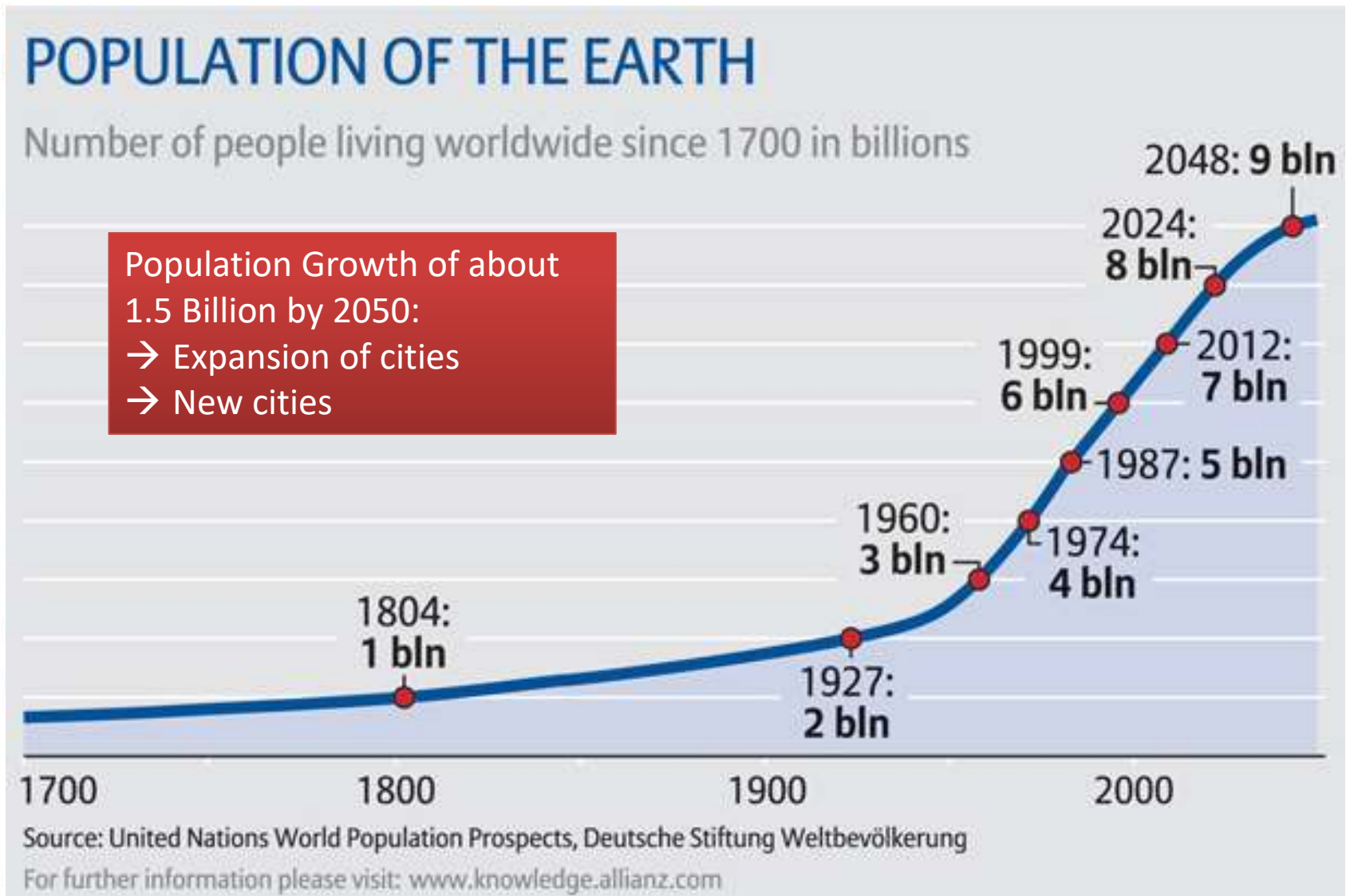
EXCEED 1.5C BY

2030

A solid green vertical bar is positioned on the left side of the slide. The background features several light green, stylized outlines of houses and buildings, some of which are overlapping. The text is centered in the upper half of the slide.

Construction trends and the environment: sustainable cities, green buildings and infrastructure

Demand for construction

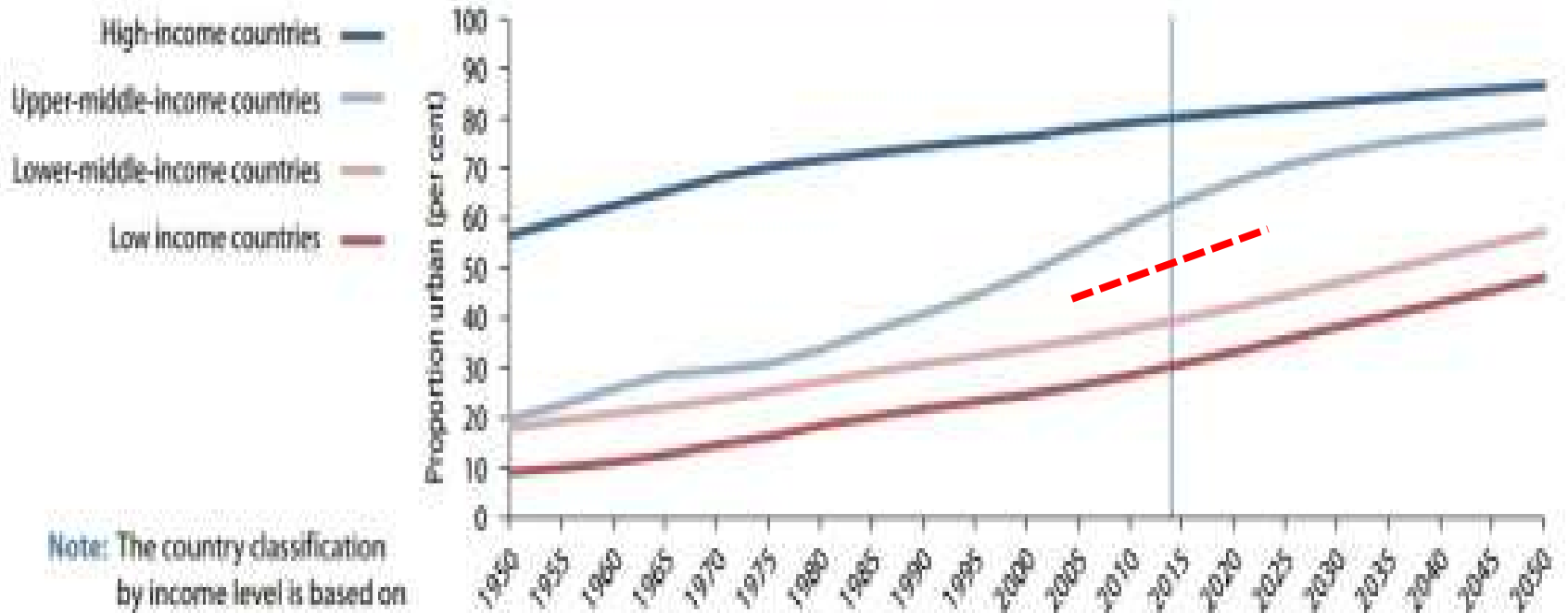


Demand for construction

Upper-middle-income countries have experienced the fastest pace of urbanization

URBANISATION

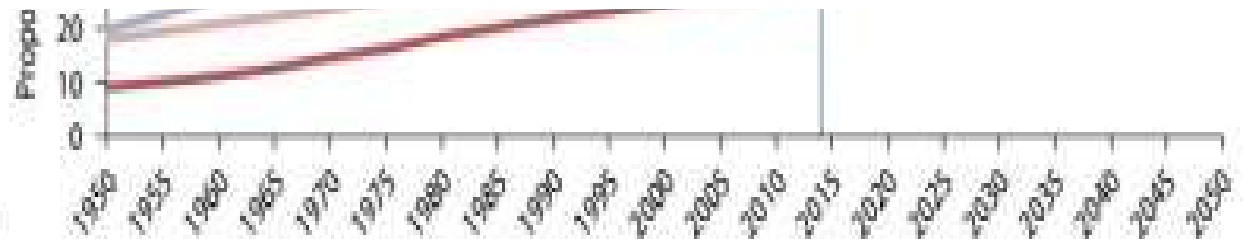
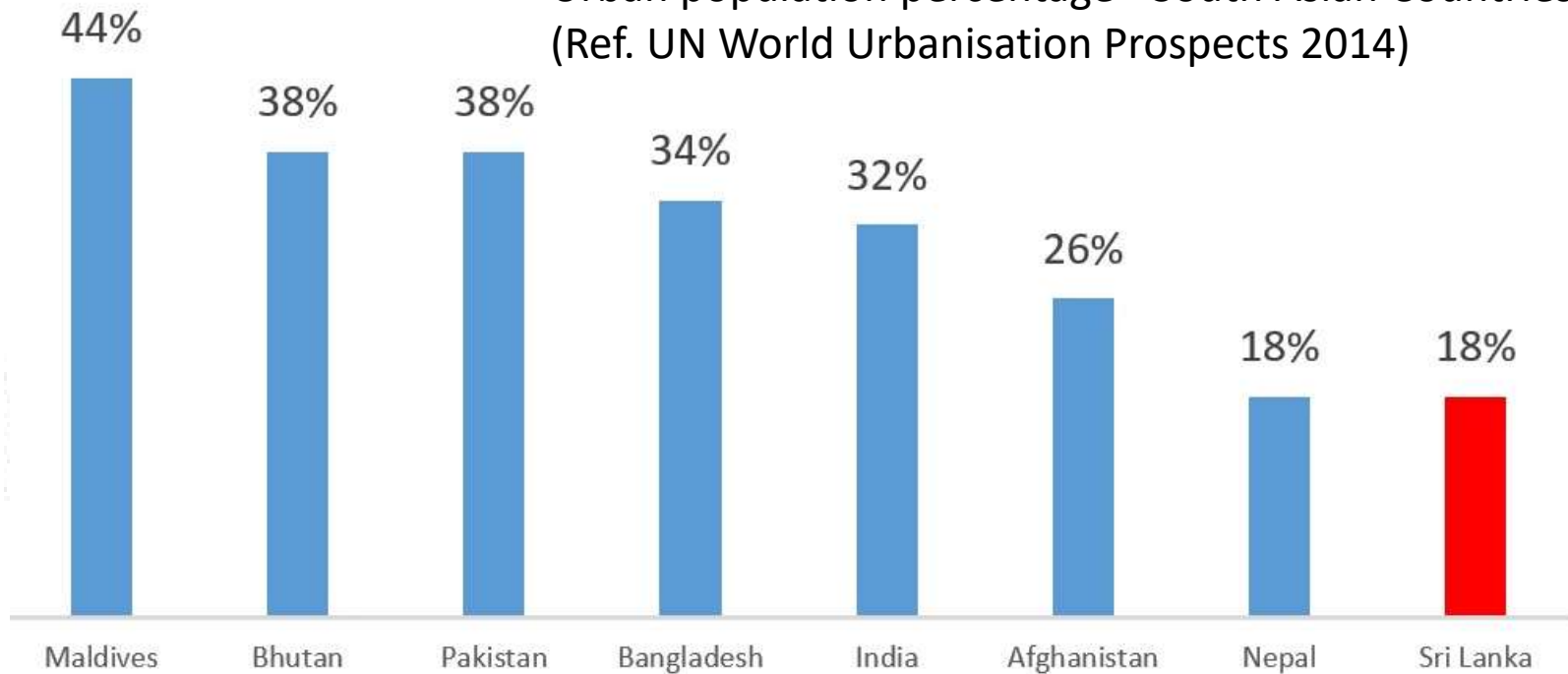
Proportion urban by income groups, 1950-2050



Note: The country classification by income level is based on 2012 GNI per capita from the World Bank and it is kept unchanged throughout the estimates and projections.

Demand for construction

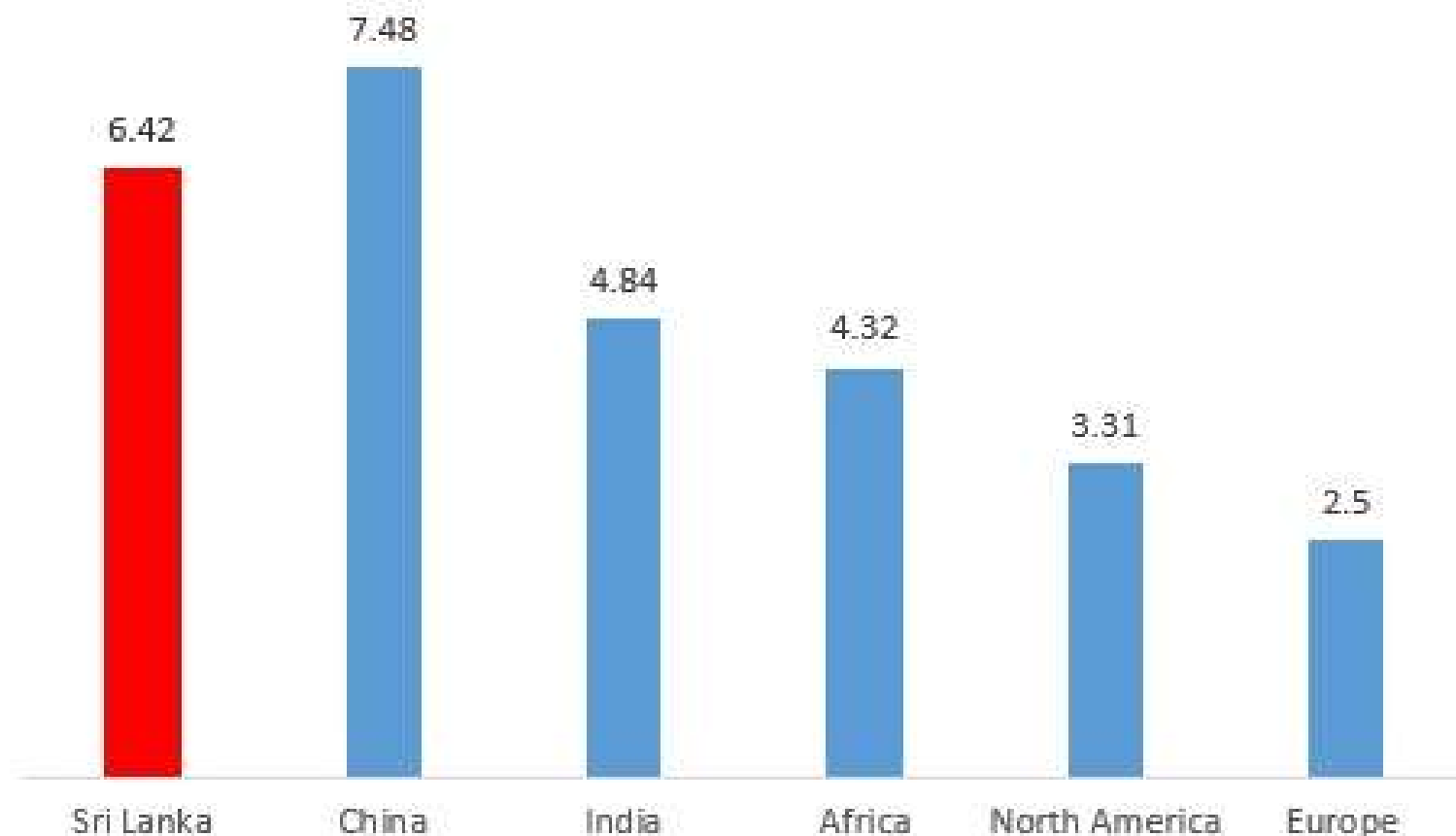
Urban population percentage - South Asian Countries
(Ref. UN World Urbanisation Prospects 2014)



Note: The country classification by income level is based on 2012 GNI per capita from the World Bank and it is kept unchanged throughout the estimates and projections.

Demand for construction

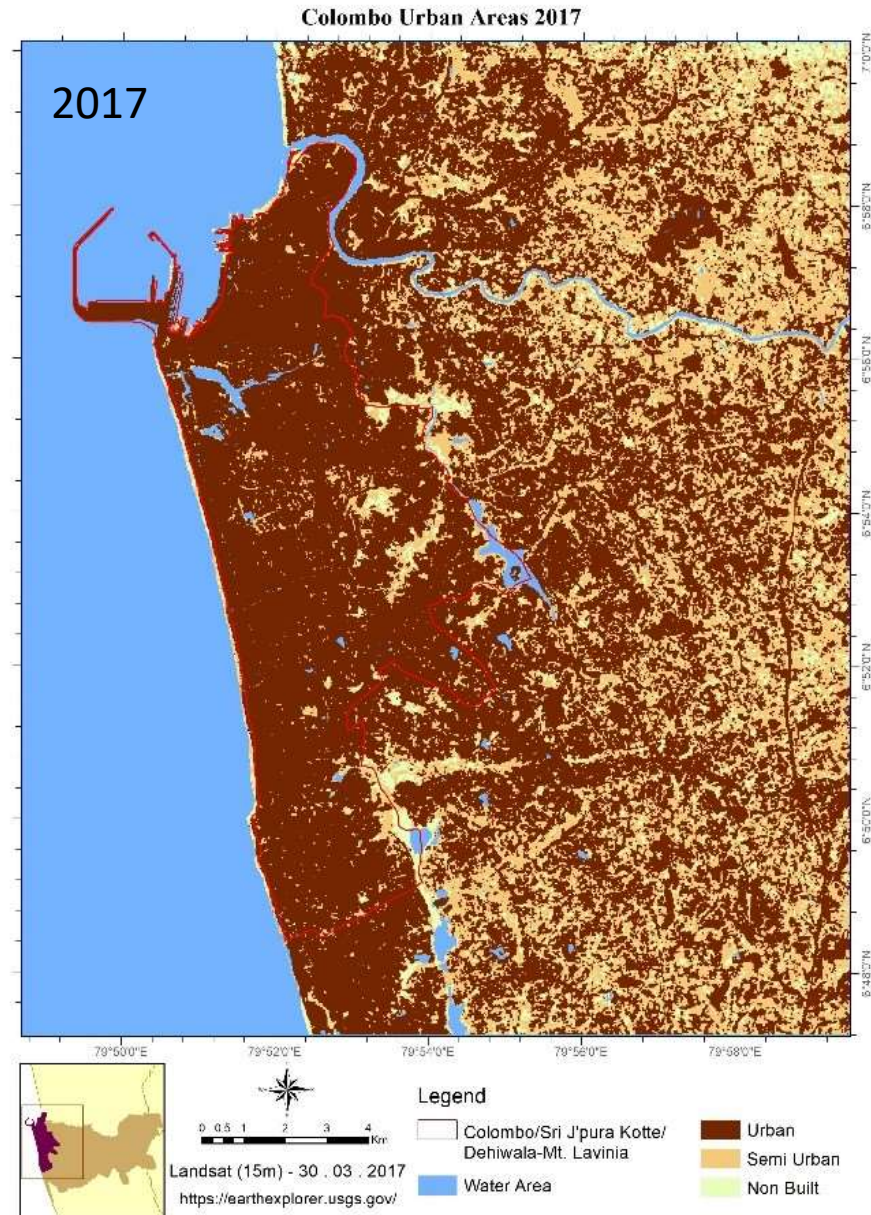
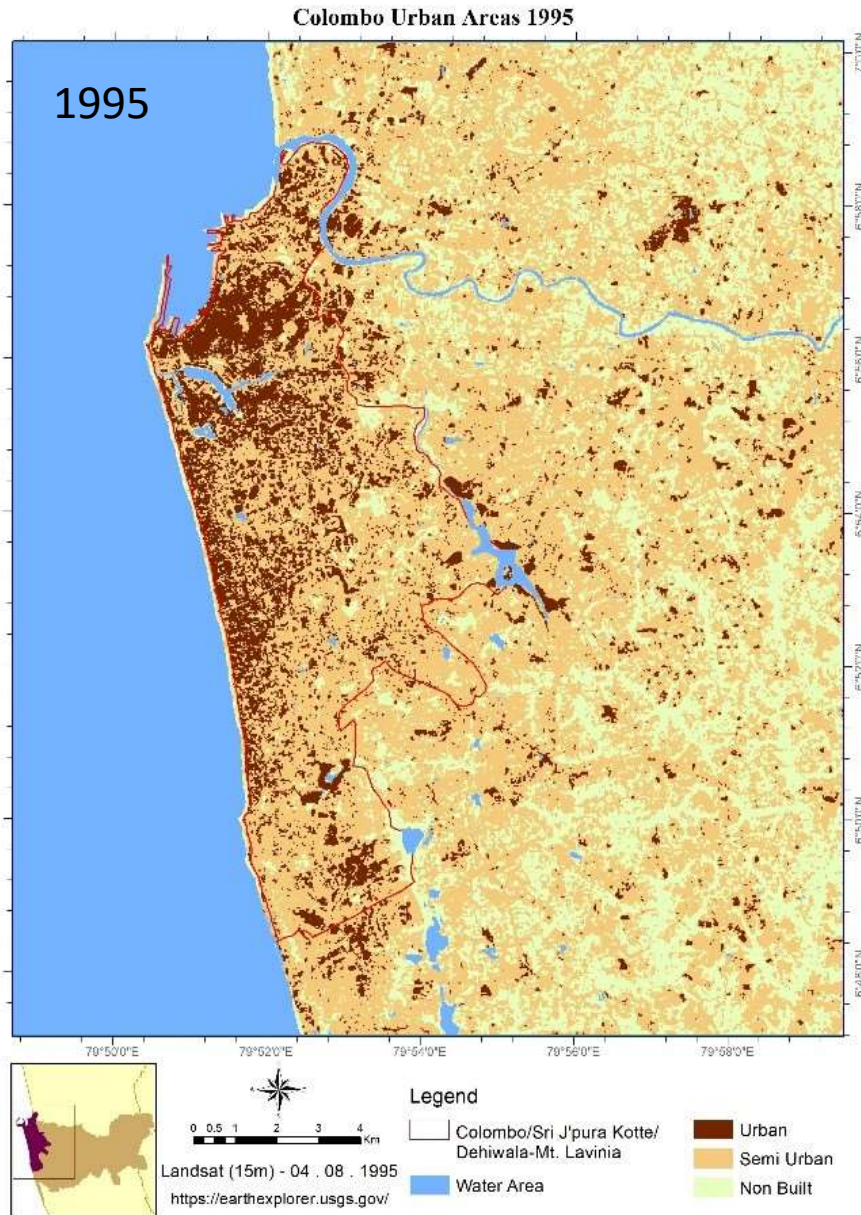
Average annual rates of urban expansion (per cent) across the globe*



Sources: Sri Lanka, SoSLC Project ; Others, Seto et al. (2014)

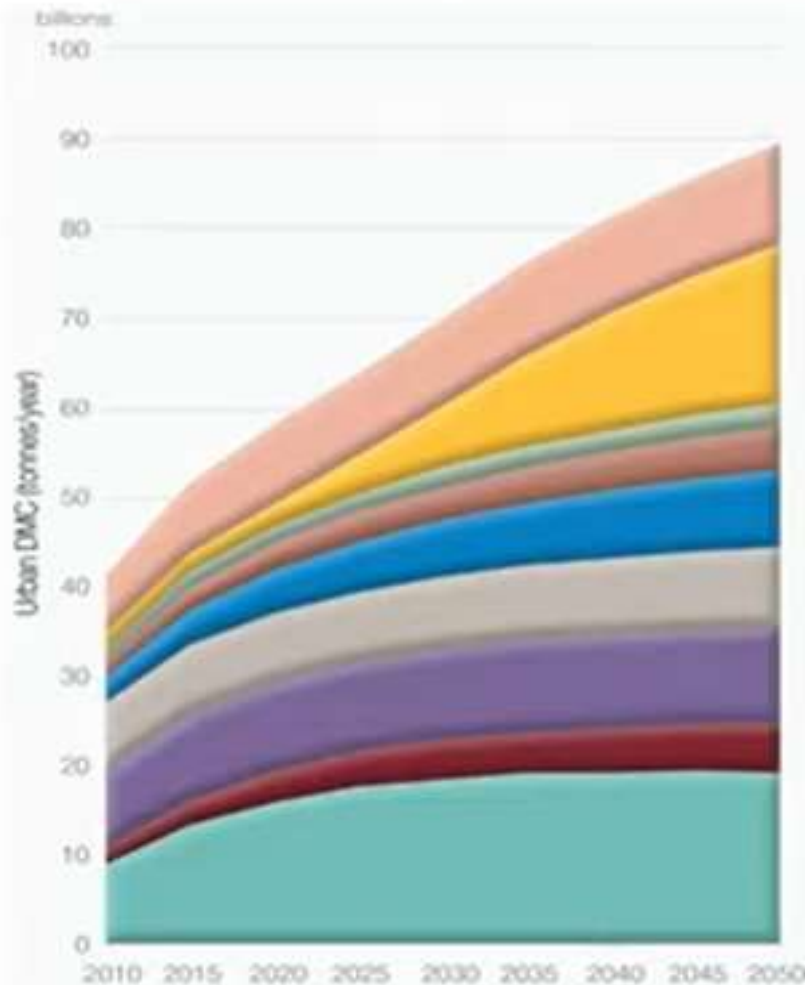
* Sri Lanka reference period 1995-2017 for 9 provincial capitals; others, 1970-2000

Demand for construction



Consumptions and emissions

**Building future cities requires raw materials that
“far exceed what the planet can sustainably provide.”**



**Urban raw materials
consumption:**

**2010: 40 bil. t/yr
2050: 90 bil. t/yr**



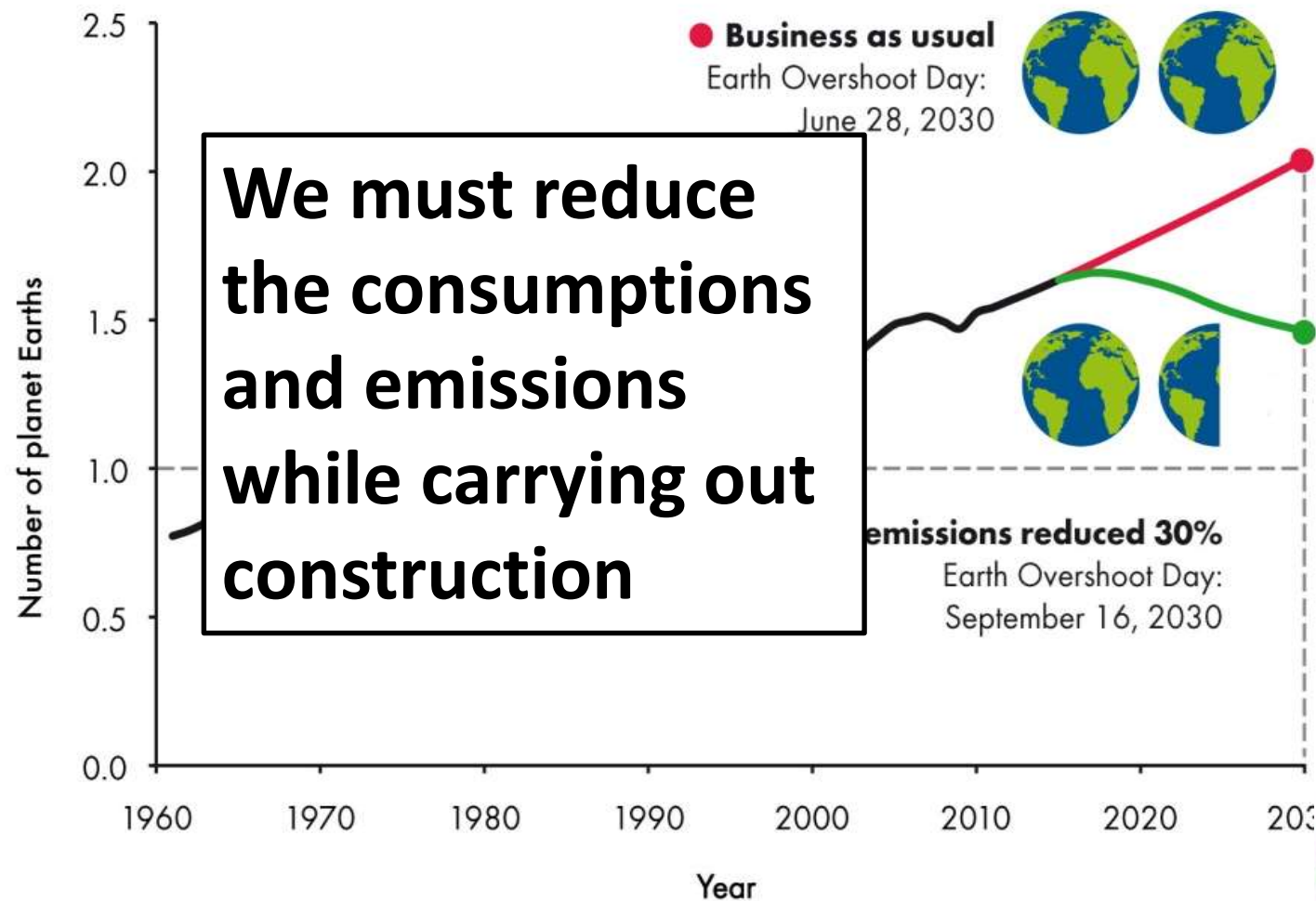
(UN International Resource Panel, 2018)

Consumptions and emissions

Urban Expansion is Reducing Global Carbon Sinks (~22 million tons C/year)



Consumption and emissions



Sustainable Development



"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

International Institute for Sustainable Development
(<https://www.iisd.org/topic/sustainable-development>)

Sustainable Development Goals (SDGs)

The Sustainable Development Goals (SDGs) are a part of a global agenda, adopted by countries in 2015, with a vision of ending poverty, protecting the planet and ensuring that all people enjoy peace and prosperity.



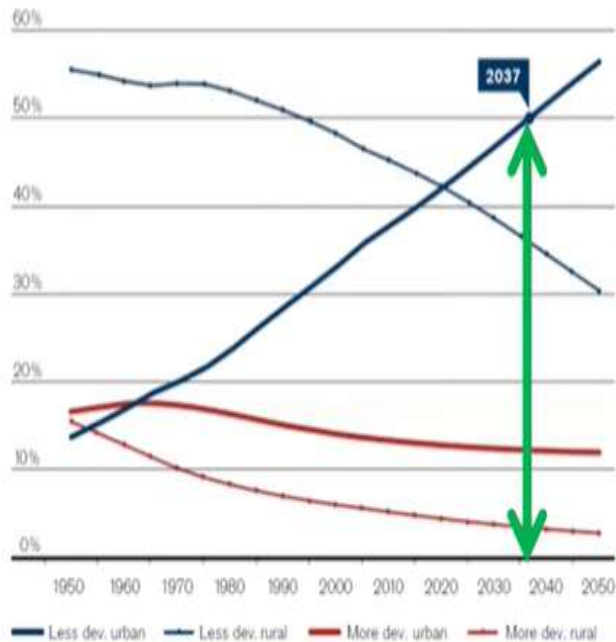
The Health and Equity Challenge

Global Demographic Transition

Figure 1

World urban and rural population for developed and developing regions (% of total)

Source: Population Division of Department of Economic and Social Affairs of the United Nations Secretariat, Credit Suisse



Social Inequity



Unhealthy Communities

Pau da Lima, Salvador, Brazil



Processes and Diseases Whose Impacts are Amplified by Urbanization

- Rural to urban migration
 - Leprosy & other neglected diseases
- Changing ecosystem
 - Mosquito-borne Zika and Dengue
 - Peri-urban deforestation & leishmaniasis
- Over-crowding and movement
 - Ebola, COVID-19
 - Tuberculosis and minibus taxis in South Africa
- Increased yet inadequate access to health services
 - Antimicrobial resistance
- Aging population and unhealthy cities
 - Projected NCD epidemic

Plastics, Refuse and Mosquito-Borne



Processes and Diseases Whose Impacts are Amplified by Urbanization

Plastics, Refuse and Mosquito-Borne



Healthy world \leftrightarrow Healthy people



- Rural to urban migration

- Climate change

- Overpopulation

- Increasing

se

➤ Antimicrobial resistance

- Aging population and unhealthy cities

➤ Projected NCD epidemic



Disasters



NEWS

News Front Page

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Asia-Pacific
Europe
Middle East
South Asia
UK
Business
Health
Science & Technology

One Minute World News

Last Updated: Sunday, 26 December, 2004, 06:52 GMT

E-mail this to a friend Printable version

Eyewitness: Sri Lanka tsunami

By Roland Buerk
BBC News, Sri Lanka

I'm in a town called Unawatuna, which is on the south coast of Sri Lanka.

We didn't feel the earthquake here so there was no warning at

Tuesday, 30 May 2017

UPDATE: Landslide in Sri Lanka KILLS 180 people with more than a 100 missing and 75,000 displaced the flooding affecting 500,000 people



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FloodList

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BREAKING NEWS 3 days ago - Indonesia - 4 Dead, 1 Missing, 60,000 Displaced After Floods Across Java Island

Sri Lanka – Deadly Storm Dumps 350mm of Rain in 24 Hours

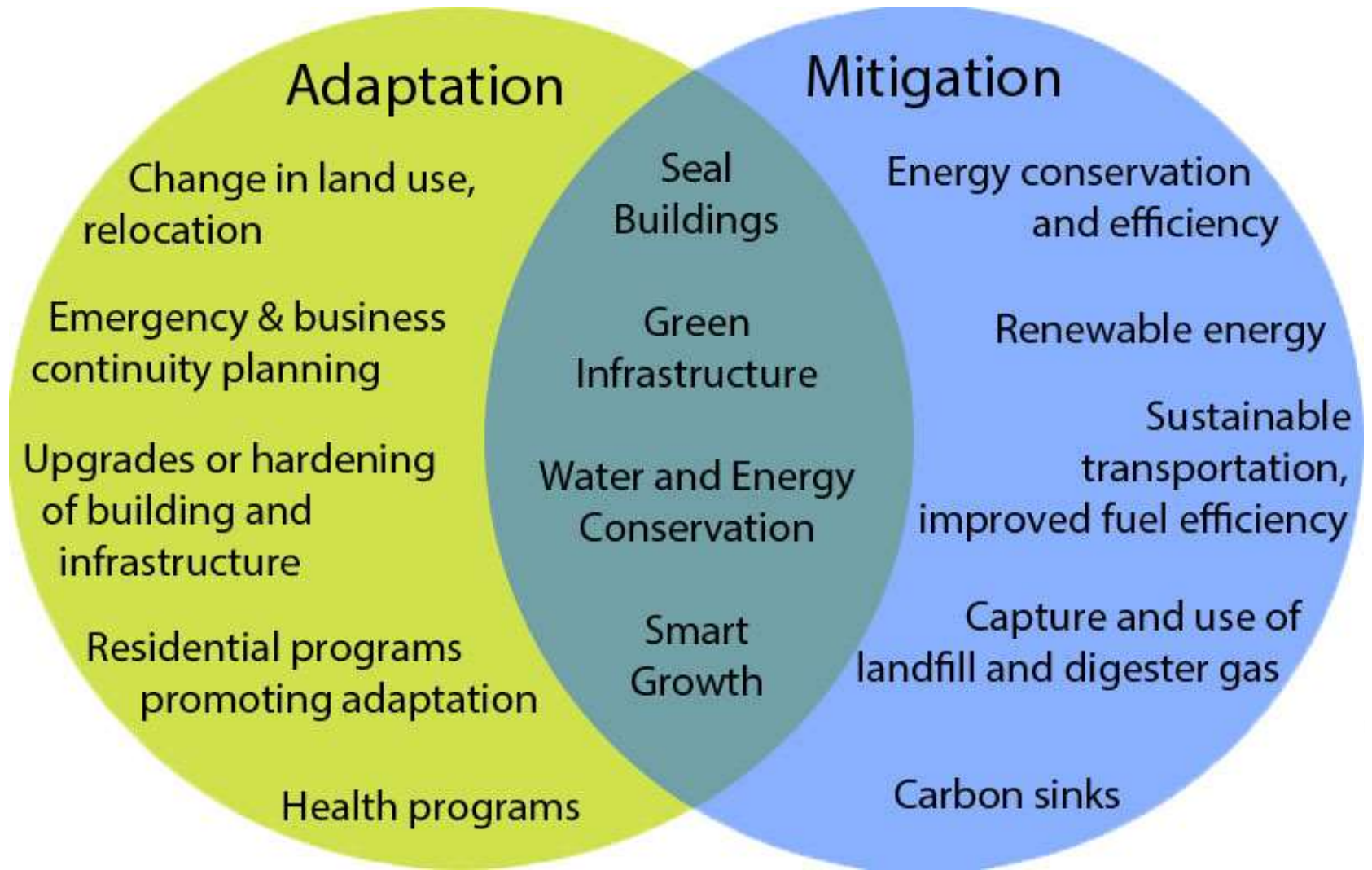
21 MAY, 2018 BY [RICHARD DAVIES](#) IN [ASIA](#), [NEWS](#)

A storm that swept across several parts of **Sri Lanka** between 20 and 21 May, 2018, caused flash floods in several areas, with Southern, Western and Sabaragamuwa Provinces the worst affected. Parts of North Western Province also recorded heavy rainfall.

Climate Change



• Construction Trends and the Environment



- Construction Trends and the Environment



Environment friendly way of living



Green Buildings

Cambridge Dictionary:

A building that protects the natural environment

World Green Building Council:

A building that reduces or eliminates negative impacts and creates positive impacts on climate and natural environment

Green SL Rating System:

Green building aims: **increasing the efficiency of resources (energy, water and materials), reducing the impact on human health and its surrounding environment** (during its lifecycle: construction, operation, maintenance and removal and recycling of waste).

Green buildings

Efficiency of resources (energy, water and materials)
Reduced negative impact on human health
Increased positive impact on climate and natural environment.

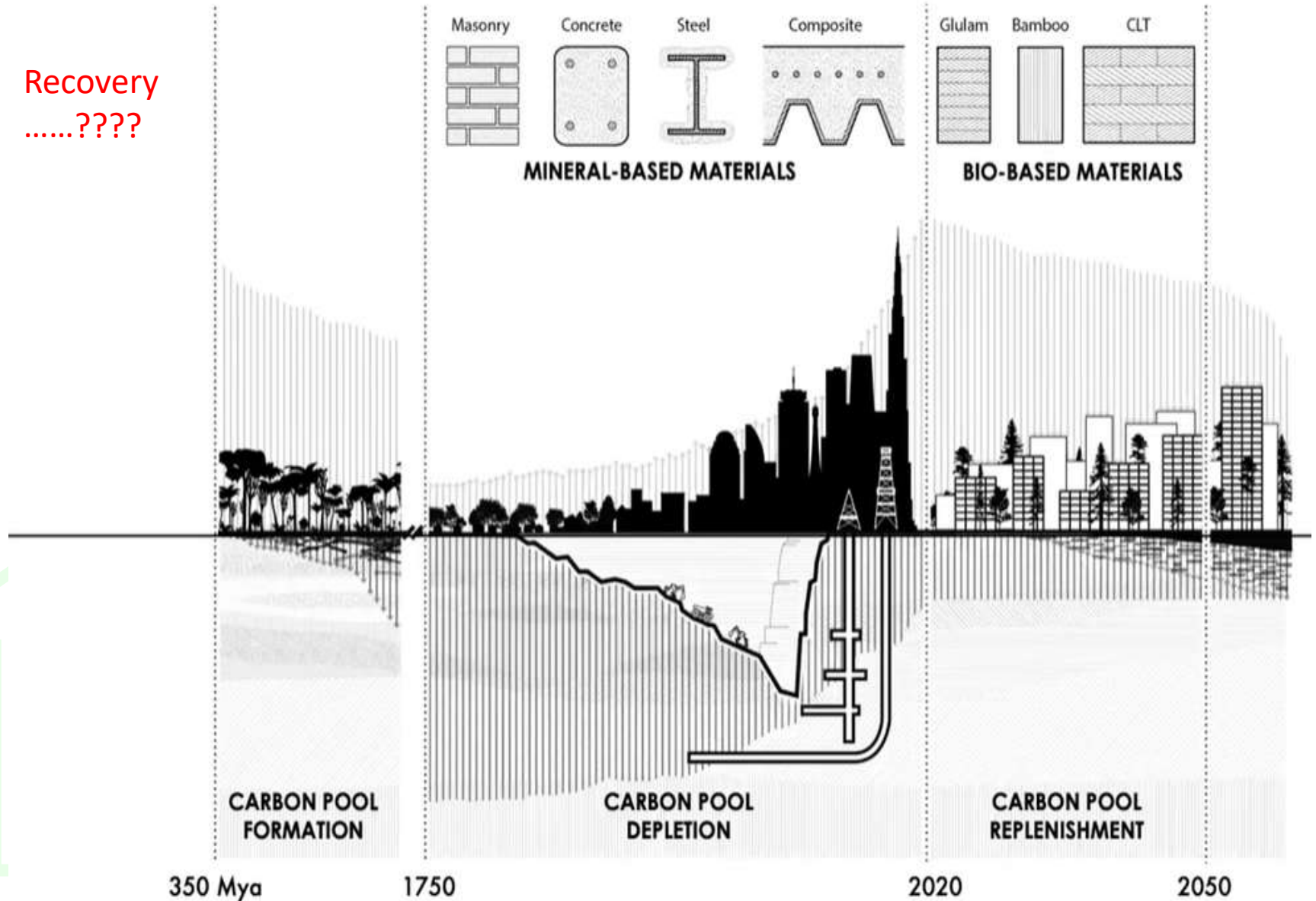
Sustainable Design

Environmental dimension
Socio cultural dimension
Economic dimension

• Construction Trends and the Environment

Past and Future History of Carbon, "Buildings as a Global Carbon Sink," in *Nature Sustainability*, Churkina, et.al.

Recovery
.....????



Green SL Rating System

Management

Sustainable Sites

Water Efficiency

Energy &
Atmosphere

Materials, Resources &
Waste Management

Indoor Environmental
Quality

Innovations &
Design Process

Social & Cultural
Awareness

Green buildings

GREEN^{SL} RATING SYSTEM
FOR BUILT ENVIRONMENT
January 2015
Green Building Council Sri Lanka

Green buildings: the best place to live & work

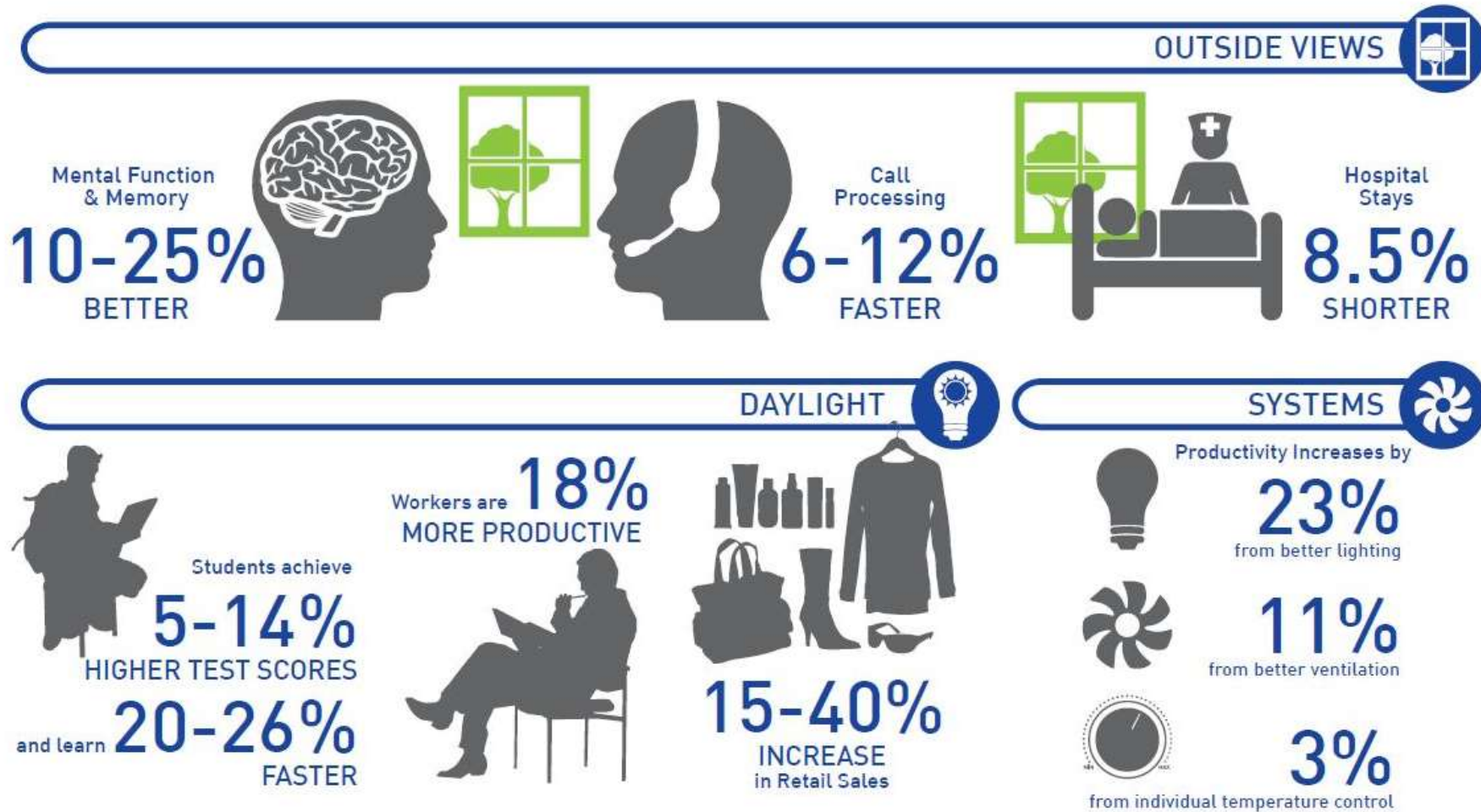


Figure 11

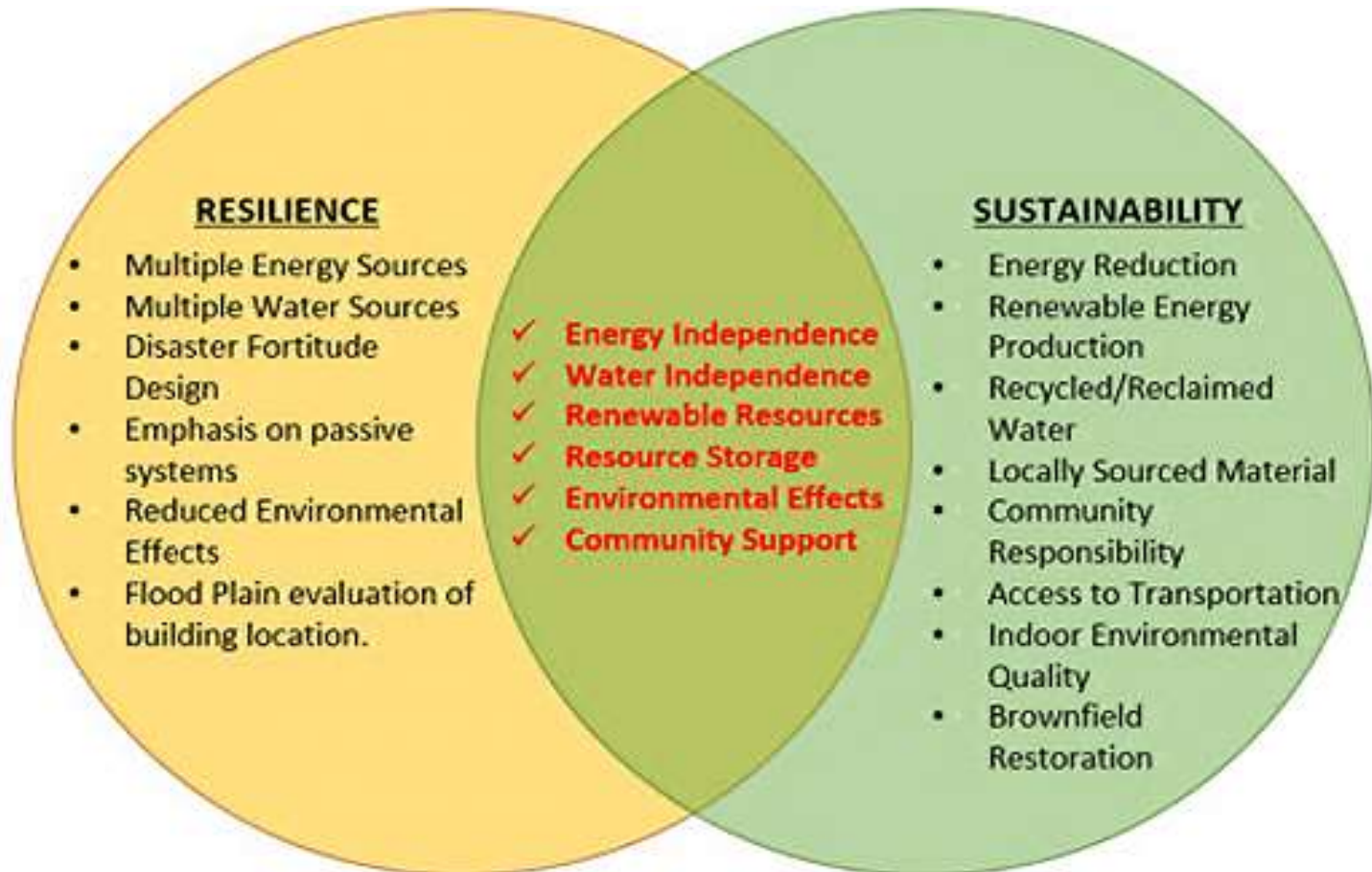
Net present value analysis of the operational cost and productivity and health benefits of LEED certified buildings

Source: Productivity & Health Benefits, The Business Case for Green Building 2013, pg. 67

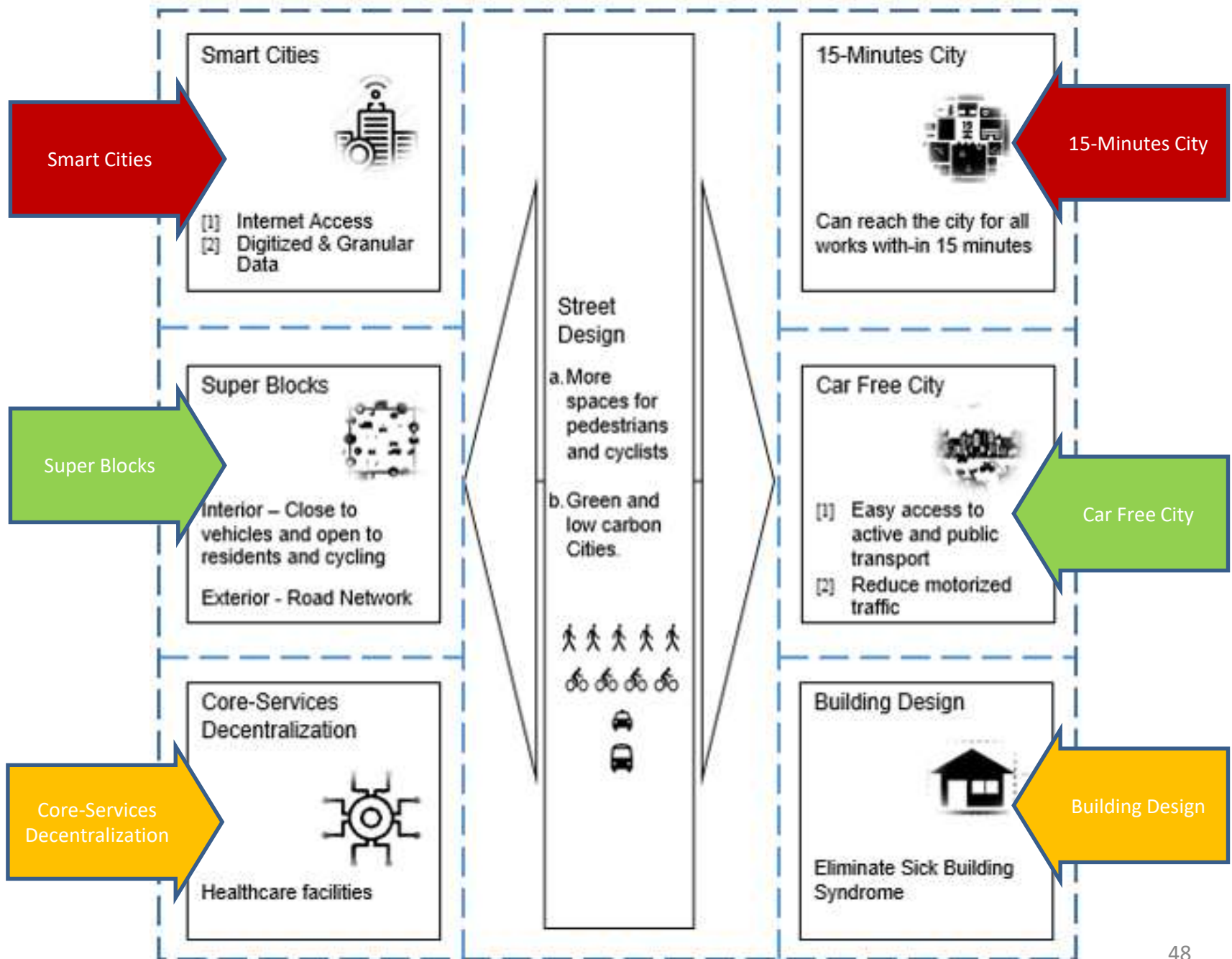
Green Cities

Sustainable cities are those that are dedicated to achieving green sustainability, social sustainability and economic sustainability. (UN Sustainable Development Goal 11)

A city that promotes energy efficiency and renewable energy in all its activities, extensively promotes green solutions, applies land compactness with mixed land use and social mix practices in its planning systems, and anchors its local development in the principles of green growth and equity. (Brilhante & Jannes, 2018)



• Construction Trends and the Environment



Concepts for city planning

RESILIENT CITY FOODBOWL

A vision for Melbourne

Self sustained cities



ecoinnovationlab.com/project_content/foodprint-melbourne



Concepts for city planning

SMARTER SMART CITIES

The "smart cities" agenda is mainly focused on top down technological initiatives (embedded sensors, data integration and analytics).

The real smart cities of the future will mobilise human intelligence as well as artificial intelligence, bottom up creativity as well as top down control.

1. TOP DOWN SMART CITIES

City planners and corporations use IT infrastructure to optimise the flows of people and goods and deliver public services more efficiently



Barcelona
Has embedded sensors in the city's infrastructure to monitor and manage water use



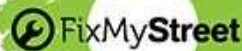
IBM
Has designed a centralised Intelligent Operations Centre to coordinate and manage all of a city's services



PlanIT's Urban Operating System
Is marketed as a way to manage the entire urban landscape

2. CONNECTING TOP AND BOTTOM

People use open data released by local authorities and companies to create services, and local authorities collect data from citizens to improve their services



Fixmystreet
Allows citizens to map local issues from potholes to confusing signage and bring it to the attention of local authorities



Streetbump
An app that identifies potholes by recording "bump" data, providing the city with real-time data on road conditions



Betri Reykjavik
A platform which crowdsources opinions on city legislation, with the most popular ideas debated by the council

3. BOTTOM UP SMART CITIES

Citizens generate and share data to improve the way their city works, they act collectively and connect with each other to share resources



Smart Citizen Kit
The Smart Citizen project uses low cost sensors and a web platform to enable citizens to capture, share and make sense of environmental data about their city



Changebyus
A place for citizens to put ideas into action to make their city a better place to live



Blindsquare
Uses crowdsourced information and GPS to help blind people navigate the city



Peerby
Promotes collaborative consumption by allowing neighbours to share or rent their possessions

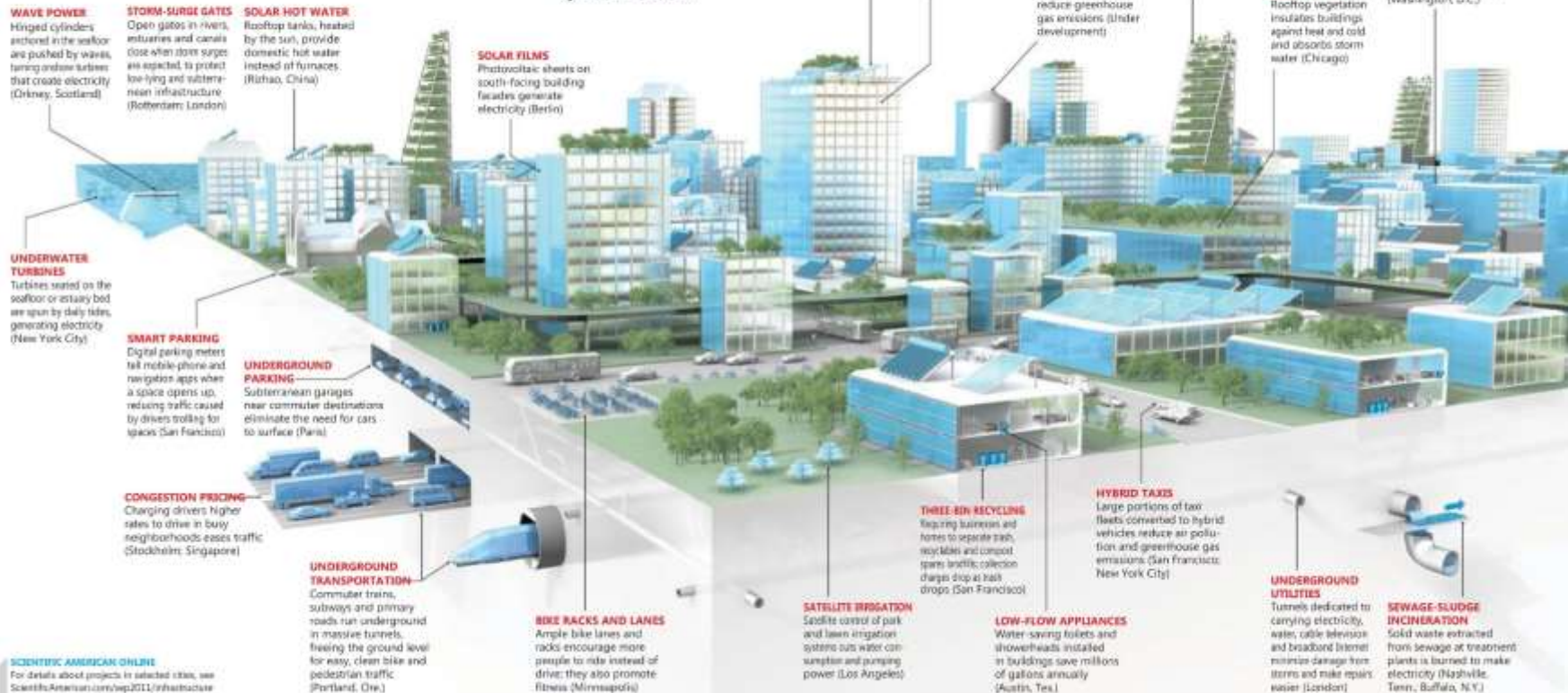
Concepts for city planning

CITIES

The Efficient City

Municipalities worldwide are exploiting a host of creative solutions to reduce energy consumption, water use, waste and emissions, while also making it easier for people to get around

By Mark Fischetti



SCIENTIFIC AMERICAN ONLINE
For details about projects in selected cities, see
ScientificAmerican.com/sep2011/infrastructure

74 Scientific American, September 2011

© 2011 Scientific American

WIDE CAMPAIGN CITIES WINDUP IN PHOTOGRAPH

Illustration by Bryan Choo

© 2011 Scientific American

September 2011 ScientificAmerican.com 75

Concepts for city planning



For more information and report:
ameniteits.universiteit.nl or
kennis.circulairereis.nl

ECN
Your energy. Our passion

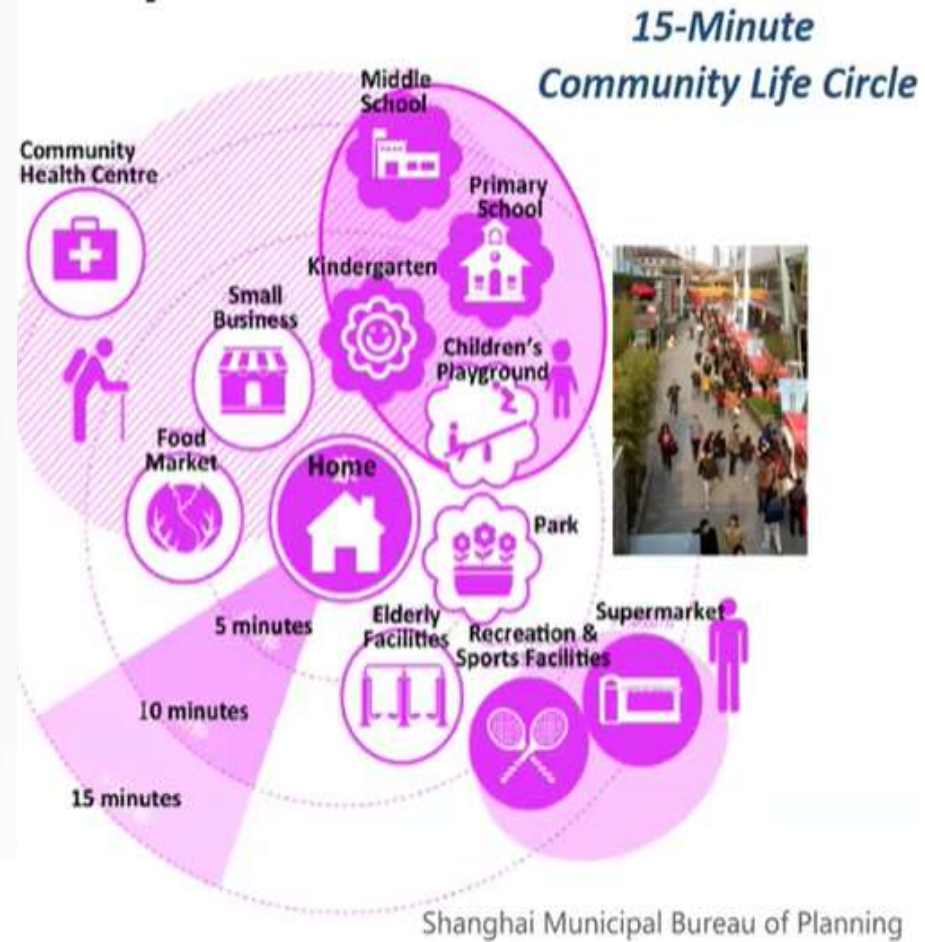
TNO
Innovation for life

Deltares

ALTERRA
WAGeningen UR

This poster is developed within
the Adaptive Circular Cities project.

Concepts for city planning



Green Buildings and cities fulfil 9 SDGs out of 17



The vision of the Sustainable Development Goals (SDGs) is: ending poverty, protecting the planet and ensuring that all people enjoy peace and prosperity.



GO GREEN

1. You get a happy, healthy and productive built environment
2. You save the mother earth

Thank you

