

Disruption And Transformation In The Built Environment

PAQS CONGRESS 2022

9 TO 13 SEPTEMBER 2022
SINGAPORE



A nighttime photograph of the Kuala Lumpur skyline, dominated by the illuminated Petronas Twin Towers. The city lights are visible in the background and foreground, creating a vibrant urban scene.

CONSTRUCTING A SUSTAINABLE FUTURE FOR THE QS PROFESSION AND BUILT ENVIRONMENT

Sr. Dr. Ong See Lian

The Strategic Questions:

- **How should the built environment profession plan and prepare for the future towards 2030 and beyond?**
- **What will be the global context?**
- **What are the driving forces of change for the built environment?**
- **What future might emerge?**

The Writing On the Wall



- In the sixth century B.C., a mysterious hand appeared, writing on the wall of King Belshazzar's palace.
- The king called upon Daniel, who interpreted it to mean that God intended the king and his kingdom to fall.
- It is a prediction or a wakeup call...

The Writings On The Wall

- 1. Financial Market and New Economics**
- 2. The Impact of Pandemic on the Economy and Supply Chain**
- 3. Global Governance and Economic Disparity**
- 4. Planetary Stewardship in an Age of Scarcity**
- 5. Creative Cities with Connected Communities**
- 6. Productivity, Partnership and People**

1. FINACIAL MARKET & NEW ECONOMICS

- “The Depletion of the West” and “The Great Rebalancing”.

Emerging markets will dominate the world’s top 10 economies in 2050 (GDP at PPPs)

Shift in global economic power



Source: PwC Analysis, PwC Publication: *The World in 2050*, The BRICs and beyond: prospects, challenges and opportunities, January 2013

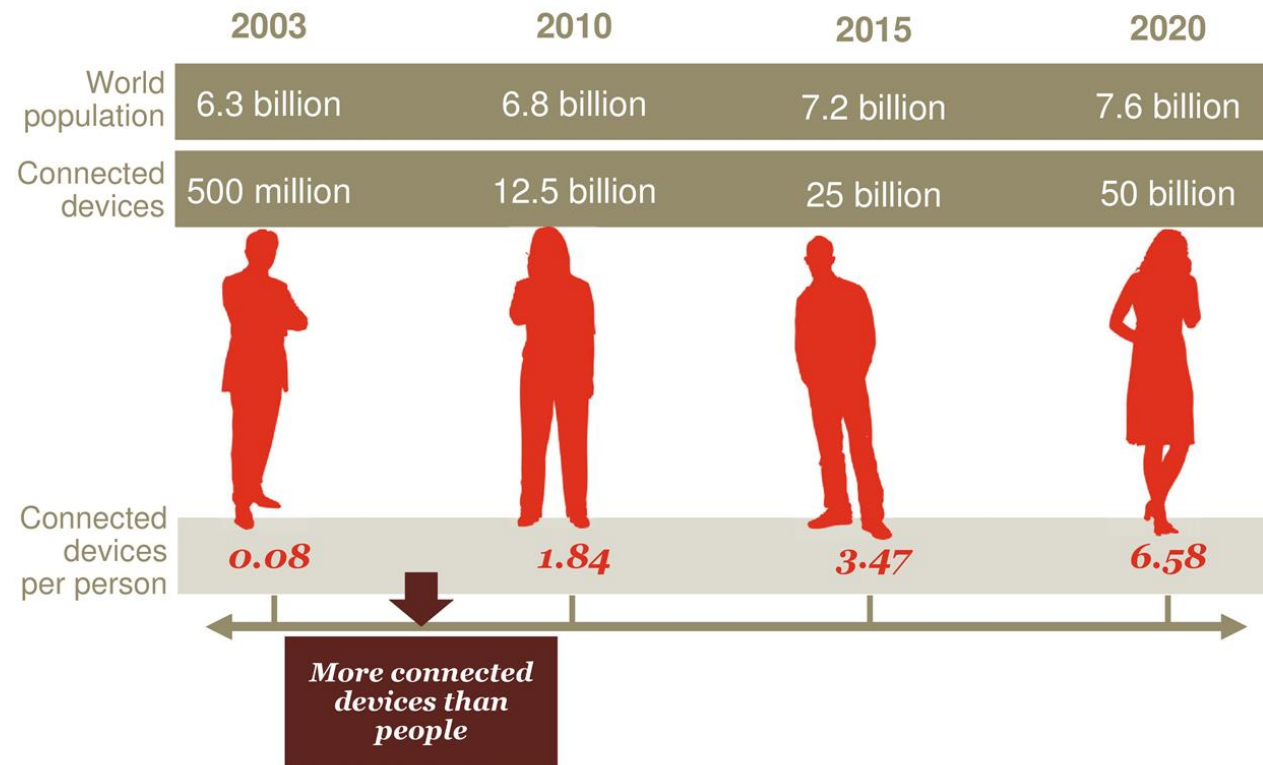
	2016	2050	
China	1	1	China
US	2	2	India
India	3	3	US
Japan	4	4	Indonesia
Germany	5	5	Brazil
Russia	6	6	Russia
Brazil	7	7	Mexico
Indonesia	8	8	Japan
UK	9	9	Germany
France	10	10	UK

E7 economies
 G7 economies

1. FINACIAL MARKET & NEW ECONOMICS

- The challenges in moving from an energy to an information/digital economy

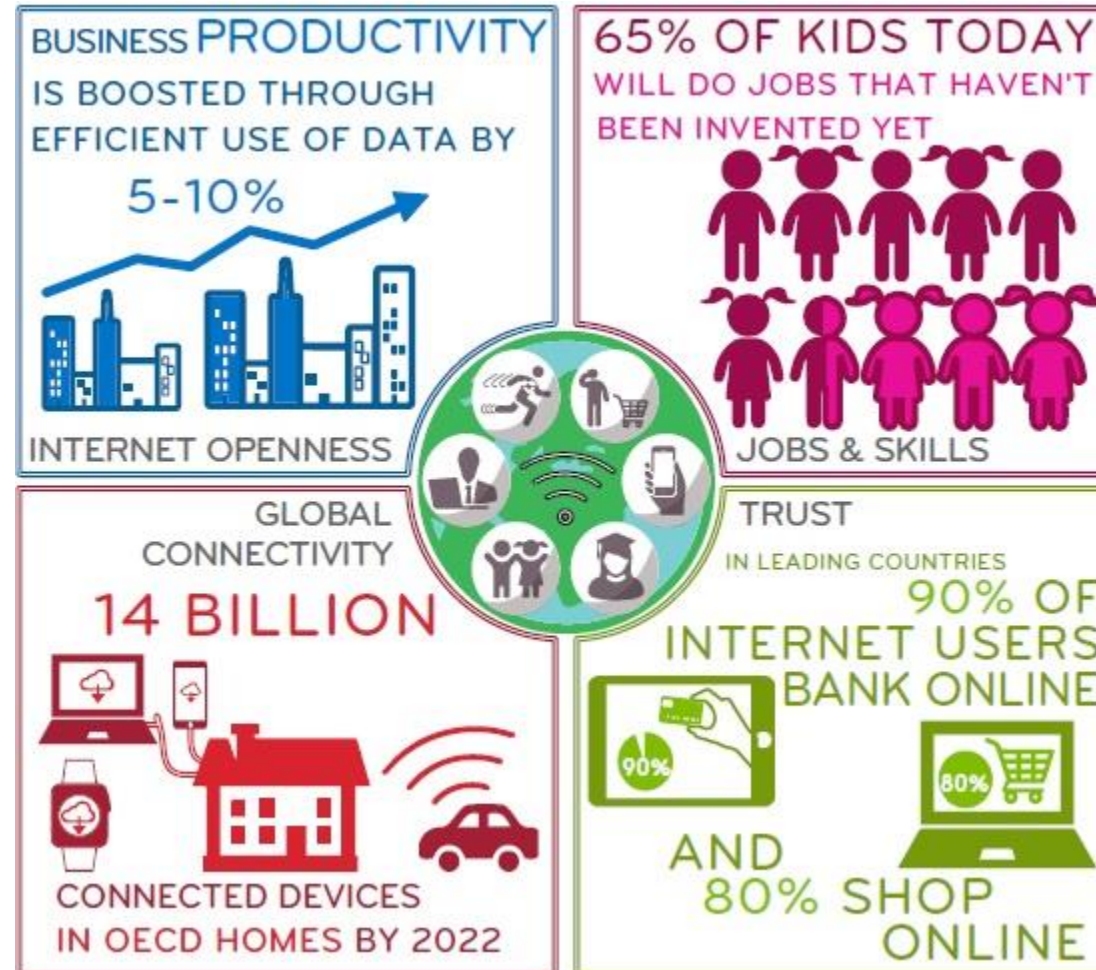
Technological breakthroughs



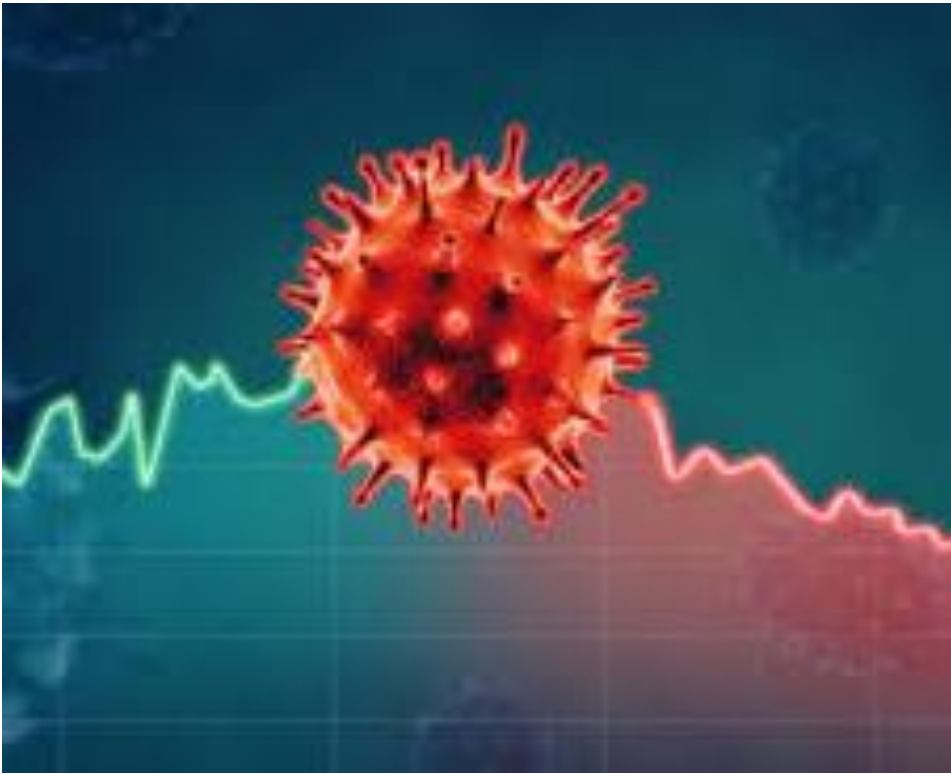
Source: Cisco Internet Business Solutions Group, April 2011.

1. FINANCIAL MARKET & NEW ECONOMICS

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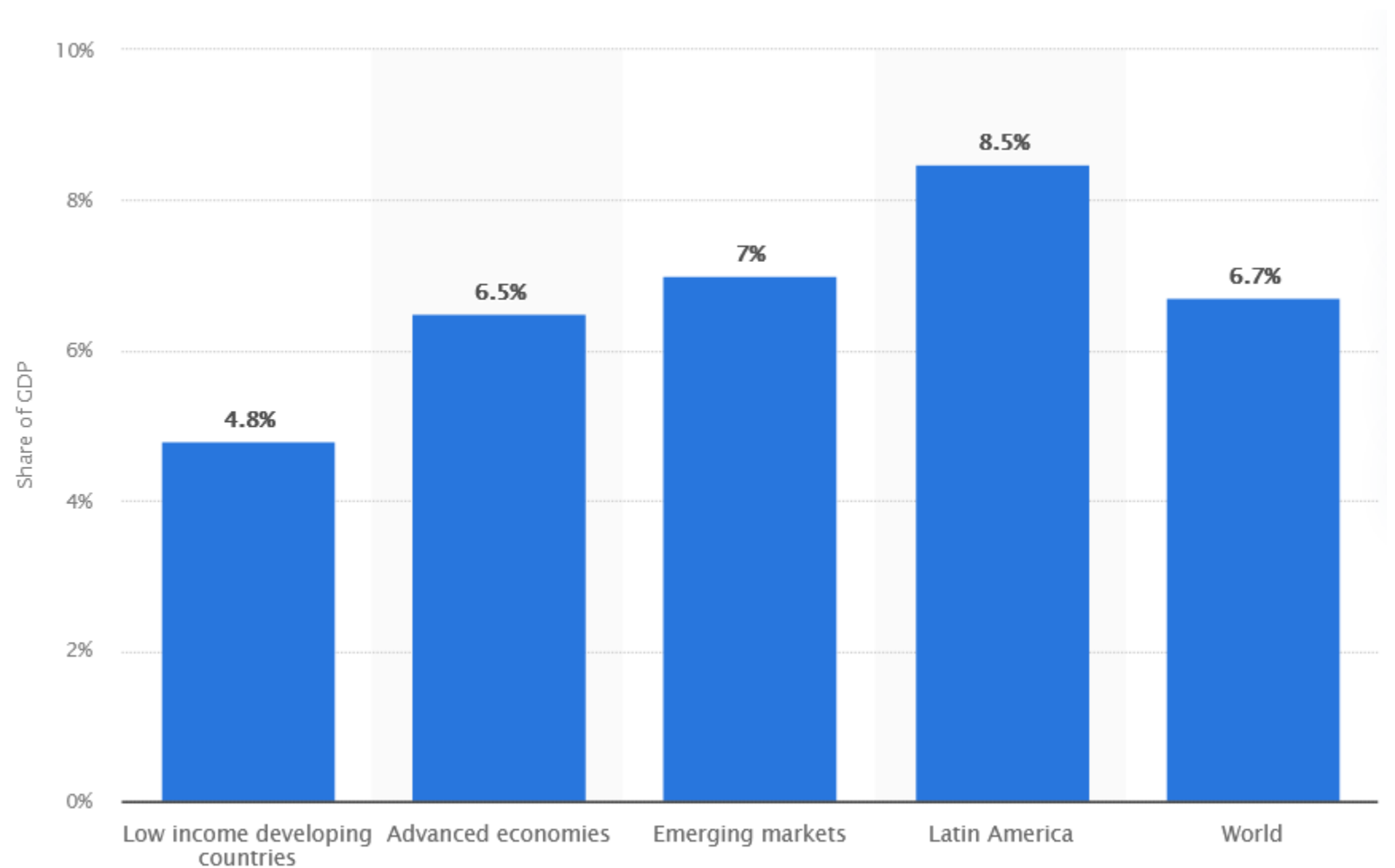
2. THE IMPACT OF PANDEMIC ON ECONOMY & SUPPLY CHAIN



- **The COVID-19 pandemic was a global disruption across trade, finance, health and education systems, businesses and societies like no others in the past 100 years.**
- **The Covid-19 outbreak has generated both demand and supply shocks reverberating across the global economy.**
- **At the sectoral level, tourism and travel-related industries are among the hardest hit.**

2. THE IMPACT OF PANDEMIC ON ECONOMY & SUPPLY CHAIN

Share of Gross Domestic Product (GDP) lost as a result of COVID-19 in 2020, by economy

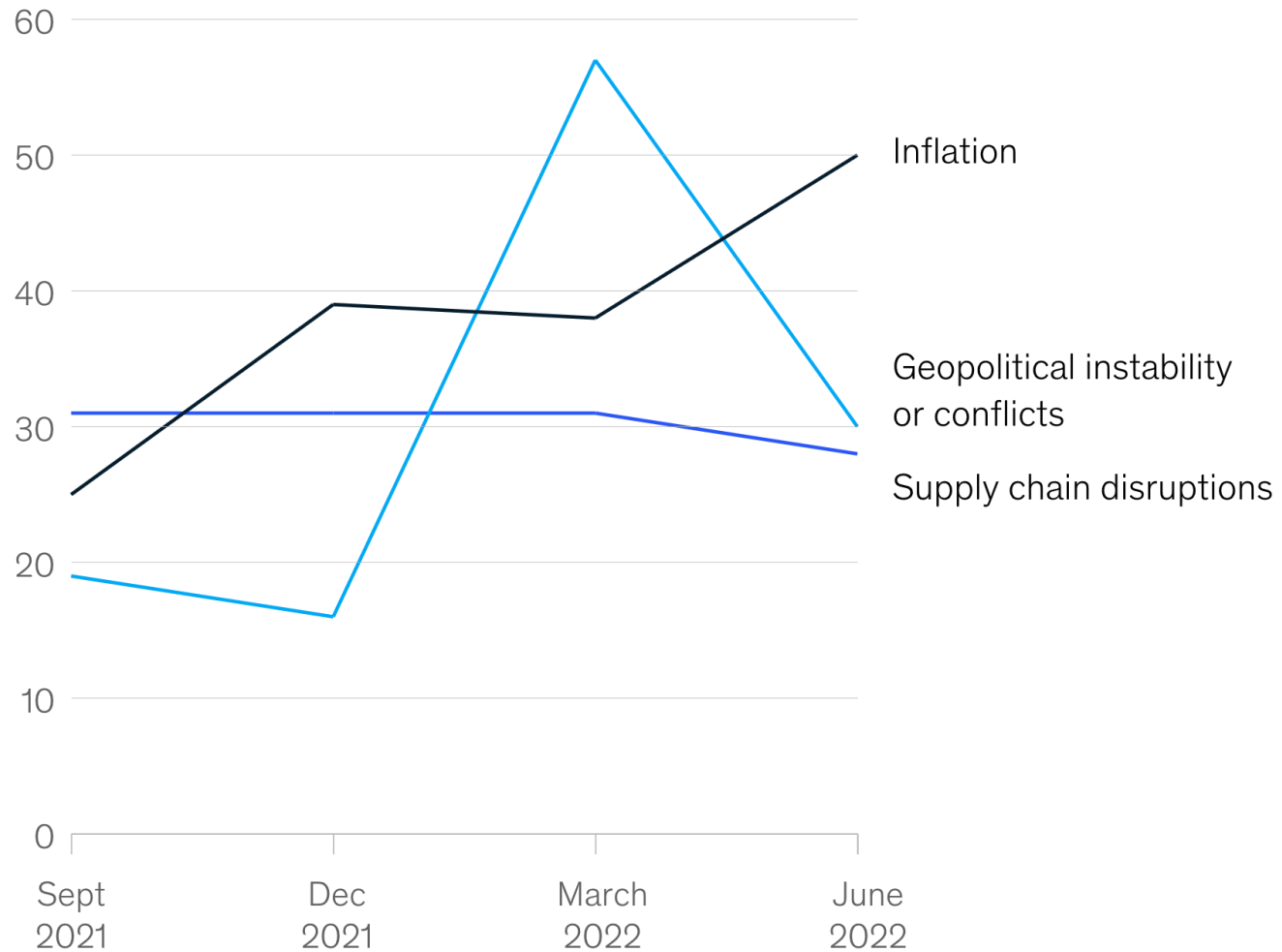


2. THE IMPACT OF PANDEMIC ON ECONOMY & SUPPLY CHAIN



- The pandemic has also posed significant challenges for supply chains globally.
- Multiple national lockdowns continue to slow or even temporarily stop the flow of raw materials and finished goods, disrupting manufacturing as a result.
- WFH becomes the norm and online shopping has become a boom.
- This has created opportunities for new start-ups and innovations.

2. THE IMPACT OF PANDEMIC ON ECONOMY & SUPPLY CHAIN



Potential risks to economic growth:

- **Geopolitical instability.**
- **Inflation**
- **Volatile energy prices**
- **Supply chain disruptions**
- **Rising interest rates**

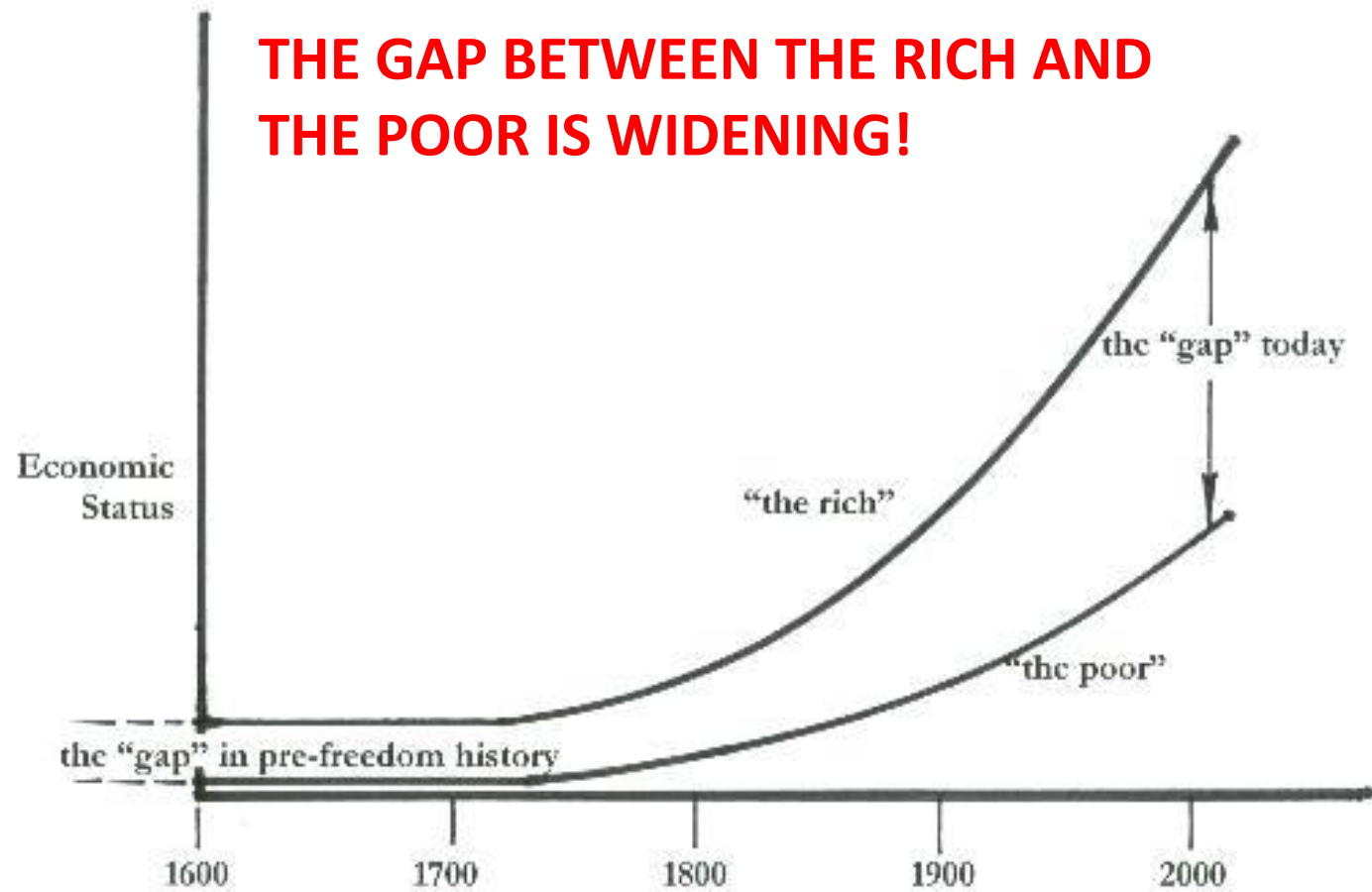
3. GLOBAL GOVERNANCE AND ECONOMIC DISPARITY

- The need to restore trust – in governments, in banks and financial institutions, in companies and in institutions of all kind



3. GLOBAL GOVERNANCE AND ECONOMIC DISPARITY

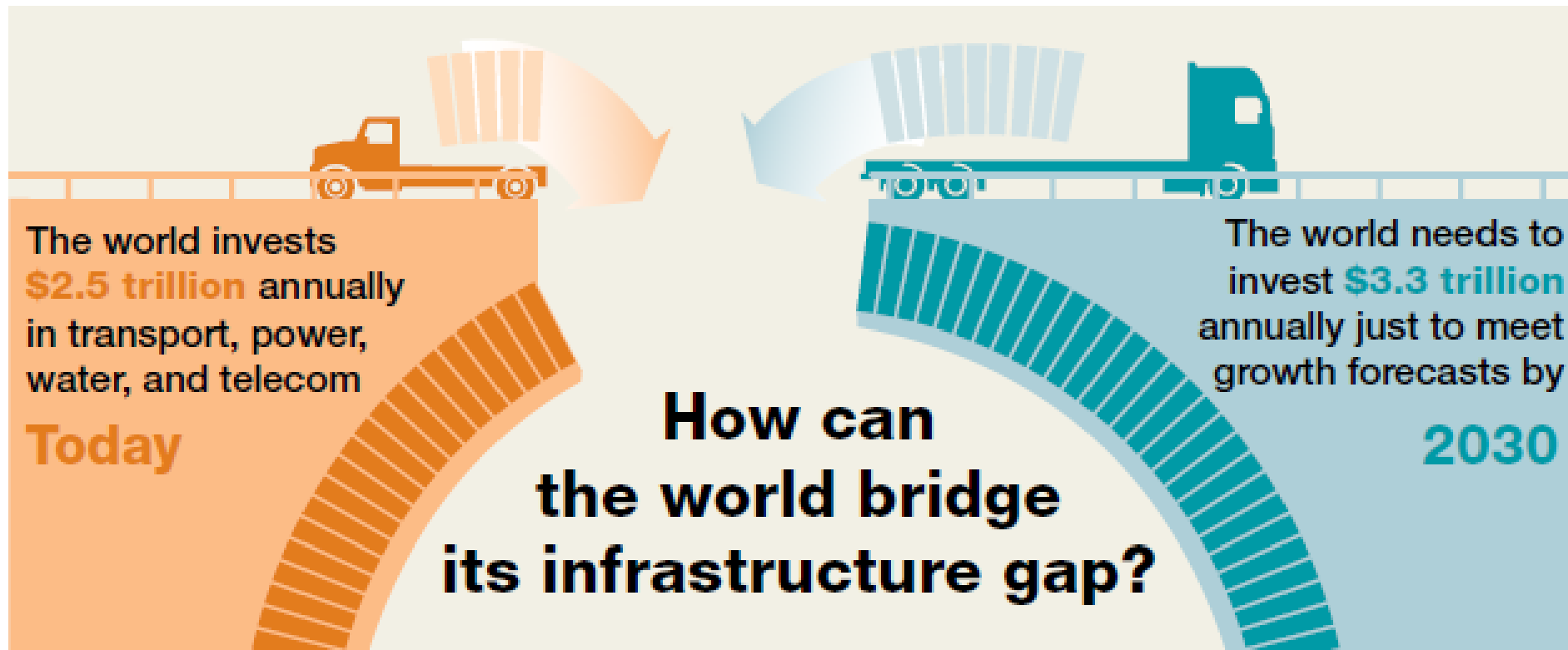
The widening gap between the world's rich and the poor



...from www.FreedomKeys.com/gap.htm

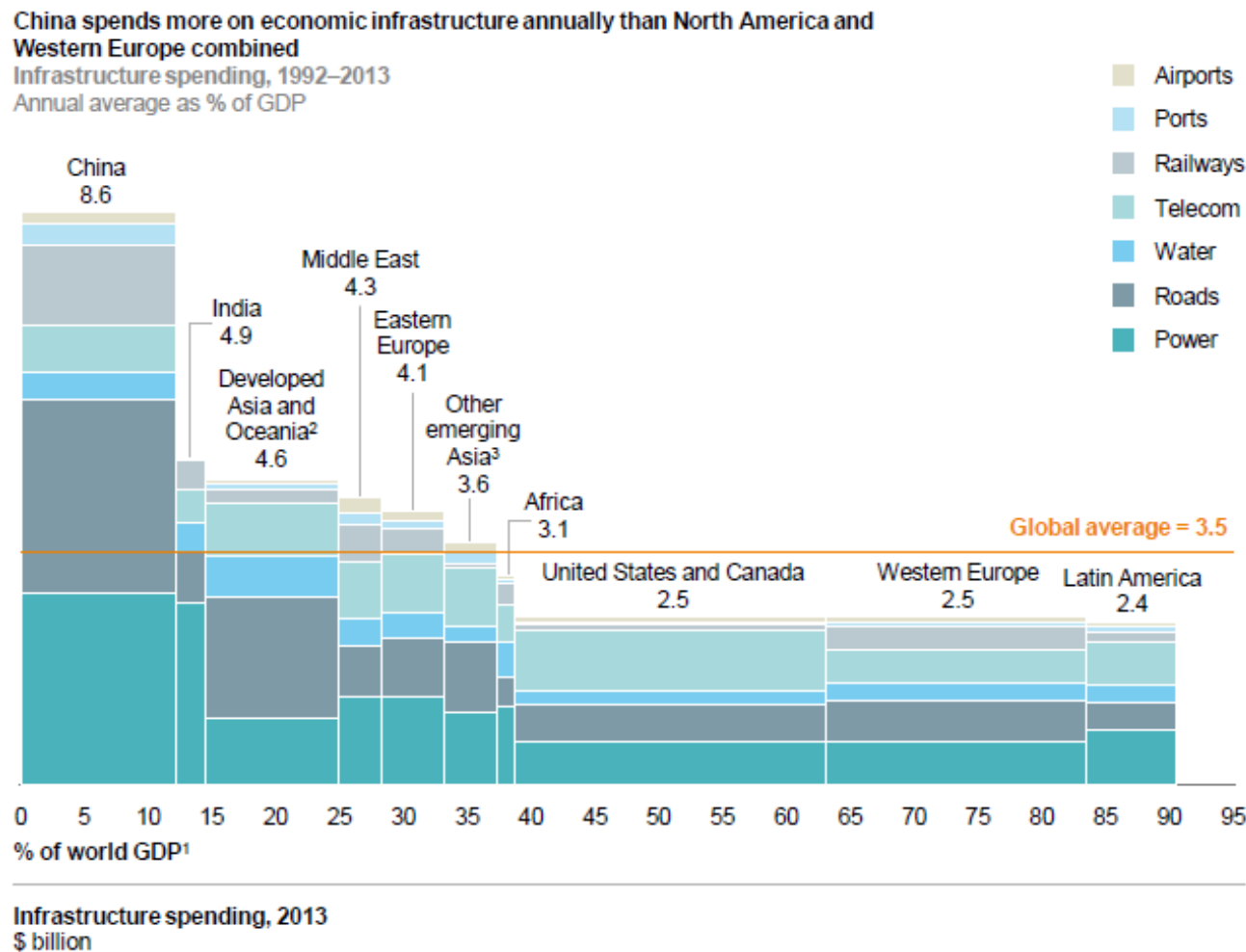
3. GLOBAL GOVERNANCE AND ECONOMIC DISPARITY

Infrastructure – both in its capacity and its quality – is extremely deficient in most of the developing and developed world



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3. GLOBAL GOVERNANCE AND ECONOMIC DISPARITY

Globalisation - We now live and work in a “decentralised” or “multi-polar” world



4. PLANETARY STEWARDSHIP IN AN AGE OF SCARCITY

- The age of Sustainable Living in a resource constrained world

Table 1: Timber sector⁵³⁻⁵⁶



In vulnerable climates, even a small temperature change (1-2 degree Celcius) could reduce crop productivity and increase risk of hunger.

Current rates of degradation and impact

- 90% of the global trade sits outside any form of guarantee of either legality or sustainability.
- Reliable estimates indicate that more than half of all logging activities in particularly vulnerable regions – the Amazon Basin, central Africa, southeast Asia, the Russian Federation – are illegal.⁵⁸
- Each year, 13 million hectares are deforested – that's around 36 football fields every minute.
- Deforestation is responsible for 17% of global greenhouse gas emissions.⁵⁹
- Deforestation is responsible for 75% of Brazilian carbon emissions: in 2009 the Brazilian Amazon lost 17,600km² of forest.⁶⁰

4. PLANETARY STEWARDSHIP IN AN AGE OF SCARCITY

• The age of Sustainable Living in a resource constrained world

Table 2 – Food Sector

Economic value

- Global food retail sales are about US\$4tn annually.⁴⁵
- 2.6 billion people rely on agricultural production systems for their livelihoods.⁴⁶
- Between 60-80% of working adults in Africa depend on growing crops or grazing cattle to earn a living.⁴⁷
- Agriculture is the principal source of livelihood for more than 58% of the population of India.⁴⁸

Current rates of degradation and impact

- Currently around 925 million people are at risk of hunger (about 12% of the world's population).⁴⁹
- Up to 2 billion people lack food intermittently due to varying degrees of poverty.
- 75% of the genetic diversity of agricultural crops has been lost in the past century.
- 75% of farmland on the African continent is severely degraded.
- Humans now use some 171 million tons of nitrogen as fertiliser every year, polluting lakes, rivers, streams and even the ocean.⁵⁰
- One-third of food is lost in developing countries because it cannot get to market on time; one-third of food in rich countries is wasted because it is thrown away.⁵¹

Predicted impact of climate change over the current century

- In vulnerable climates, even a small temperature change (1-2°C) could reduce crop productivity and increase risk of hunger.
- 11% reduction in rain-fed agriculture by 2080.
- In Africa: area suitable for agriculture, length of growing season and yield all reduced (see text box, p11).
- In Asia: 20% increase of yield in east and southeast Asia, but a 30% drop in yield in central and south Asia by 2050.
- India could lose 125 million tons of rain-fed cereal production (18% of its total).
- In Latin America: drier areas will have significant drop in yields of crops and livestock; temperate zones' soya bean yields will rise. Overall yield production of wheat, rice, maize, and soya bean is estimated to decrease by 2.5 to 5% in the region by 2020.⁵²

4. PLANETARY STEWARDSHIP IN AN AGE OF SCARCITY

- The age of Sustainable Living in a resource constrained world

Table 3 – Fresh Water

Economic value

- Essential for human health, food production, economic development and industry.
- 54% of accessible fresh water is diverted for human consumption.
- Approximately 70% of all fresh water used worldwide is for agricultural purposes.
- Water inputs.⁶⁶ To produce:
 - 1kg of beef uses 16,000 litres of water
 - 1 cup of coffee uses 140 litres of water
 - 1kg of maize uses 900 litres of water.

Current rates of degradation and impact

- 80% of the world's population lives in areas with high levels of threat to water security, with the most severe threat category affecting 3.4 billion people, almost all in developing countries.⁶⁷
- Tropical glaciers in Latin America have already lost one-third of their surface area.⁶⁸
- It is estimated that one-quarter of the population in Africa (about 200 million people) experience water stress.⁶⁹
- 1 billion people worldwide are without access to clean fresh water.
- Water scarcity and declining access to fresh water are accelerating problems for 1-2 billion people worldwide.
- Demand for fresh water is increasing, particularly in emerging economies of Asia.
- Flooding may pose additional risks to human health. In Bangladesh, where arsenic contamination of groundwater is heavy, flooding increases the rate of exposure among rural populations.⁷⁰
- Changing precipitation patterns have already affected water supplies and agricultural productivity.⁷¹

Predicted impact of climate change over the current century

- The OECD has estimated that by 2030 nearly half the world's population (3.9 billion people) will be living under conditions of severe water stress.⁷²
- In the Andes region, studies predict that, long term, there will be a dramatic decline in water availability in the dry season in areas fed by glaciers.
- In Africa, by 2020, 75-250 million people will be affected by water stress.
- In Asia, fresh water in large river basins to decrease, affecting over 1 billion people by 2050.
- Droughts and floods to increase diarrhoeal diseases across Asia.
- In locations experiencing increased access to fresh water, there is an increased risk that this will cause flooding.
- Water demand is projected to overshoot supply by 40% in 20 years' time.⁷³

4. PLANETARY STEWARDSHIP IN AN AGE OF SCARCITY

- The age of Sustainable Living in a resource constrained world

Table 4 – Marine Fishing Sector

Economic value

- Global economic output of marine fishing is estimated to amount to some US\$235bn per year.⁷⁷
- Number of people dependent on marine fish globally: over 1 billion.
- Coral reefs provide fish and seafood for 1 billion people in Asia.
- 86% of the fishers and fish farmers worldwide are located in Asia.⁷⁸

Current rates of degradation and impact

- 80% of the world's fish stocks are fully exploited, over-exploited or depleted.⁷⁹
- 75% of reefs are at risk from coastal development, fishing-related pressures and climate change.⁸⁰
- Annual market in illegal, unreported and unregulated fishing (IUU) fisheries worldwide: US\$4bn (of which US\$1bn is in sub-Saharan Africa).
- Between US\$10bn and US\$24bn worth of fish is caught illegally worldwide every year.⁸¹

Predicted impact of climate change over the current century

- Regional changes to distribution and production of particular fish species, adversely affecting fisheries.
- Over 2°C – stocks will diminish due to acidification and decline in coral reefs.
- Coral reefs have low adaptive capacity. Change in sea surface temperatures of 1-3°C could bleach or kill large areas of coral reef.
- Climate change may lead to significant losses in revenues, profits, and/or household incomes, although estimates are considered preliminary.⁸²

4. PLANETARY STEWARDSHIP IN AN AGE OF SCARCITY

- The age of Sustainable Living in a resource constrained world

Table 5 – Energy Sector

Number of people without electricity and numbers cooking with traditional biomass in developing countries

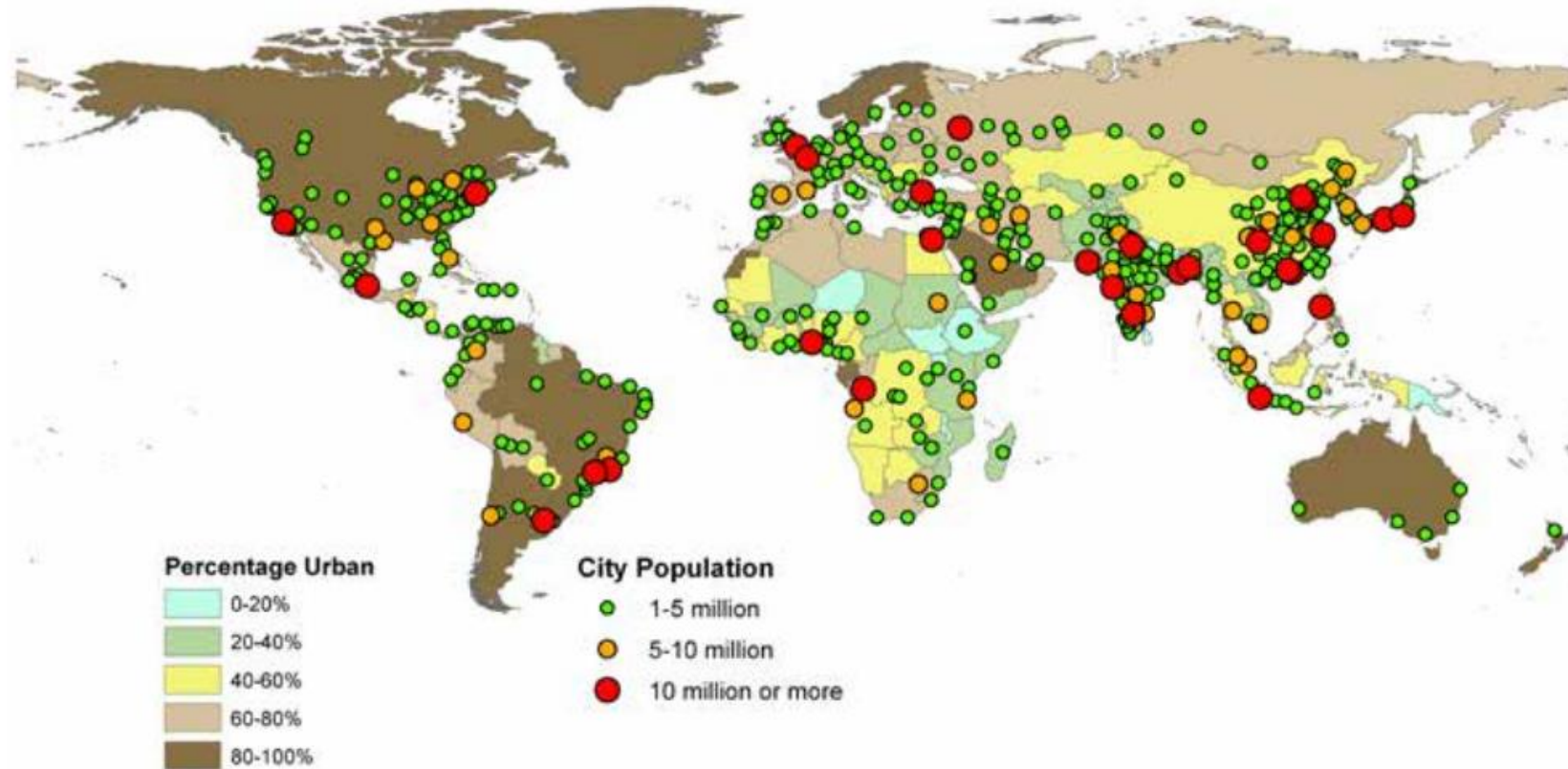
	No electricity (million)	Cooking on traditional biomass (million)
Africa	587	657
Developing Asia	675	1,921 (836 India)
Latin America	31	85
Middle East	21	0
World total	1,317 million	2,663 million

5. CREATIVE CITIES WITH CONNECTED COMMUNITIES

- 21st Century is set to be the century of cities – rapid urbanisation

Figure 1.3: Global patterns of urbanization, 2015

Source: Based on United Nations, 2014b.



Today -
55% live in cities
2050-
68% live in cities

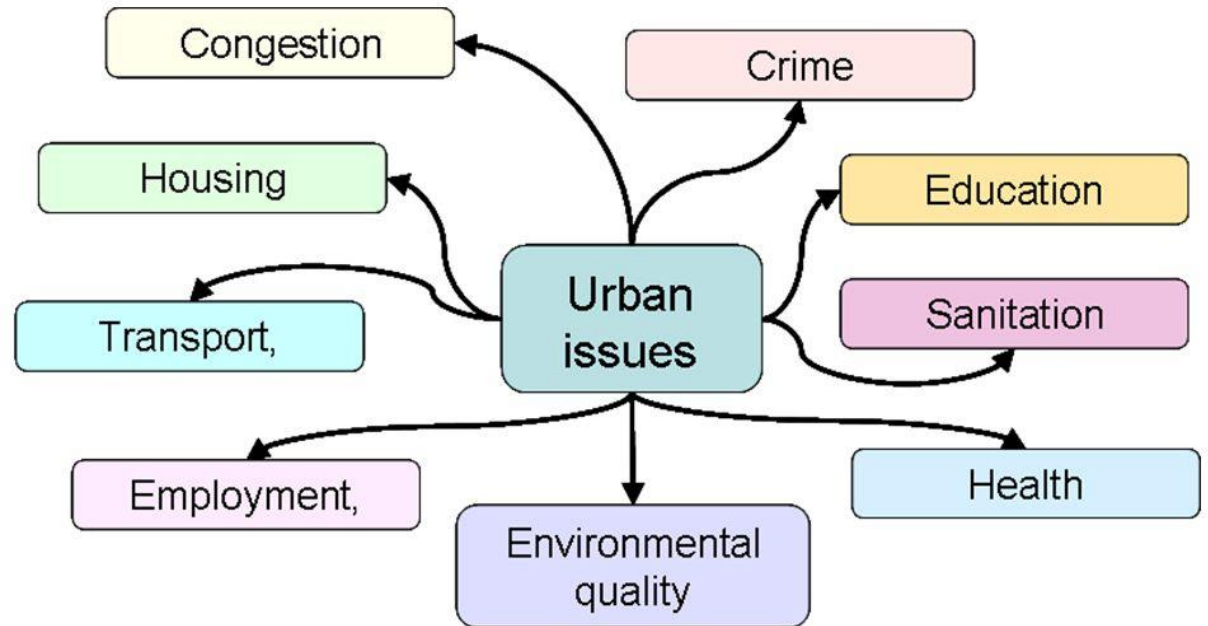
Mega Cities (>10 M):
2017- 37
2030 - 43

5. CREATIVE CITIES WITH CONNECTED COMMUNITIES

- **21st Century is set to be the century of cities – rapid urbanisation**



The problems associated with rapid urbanisation

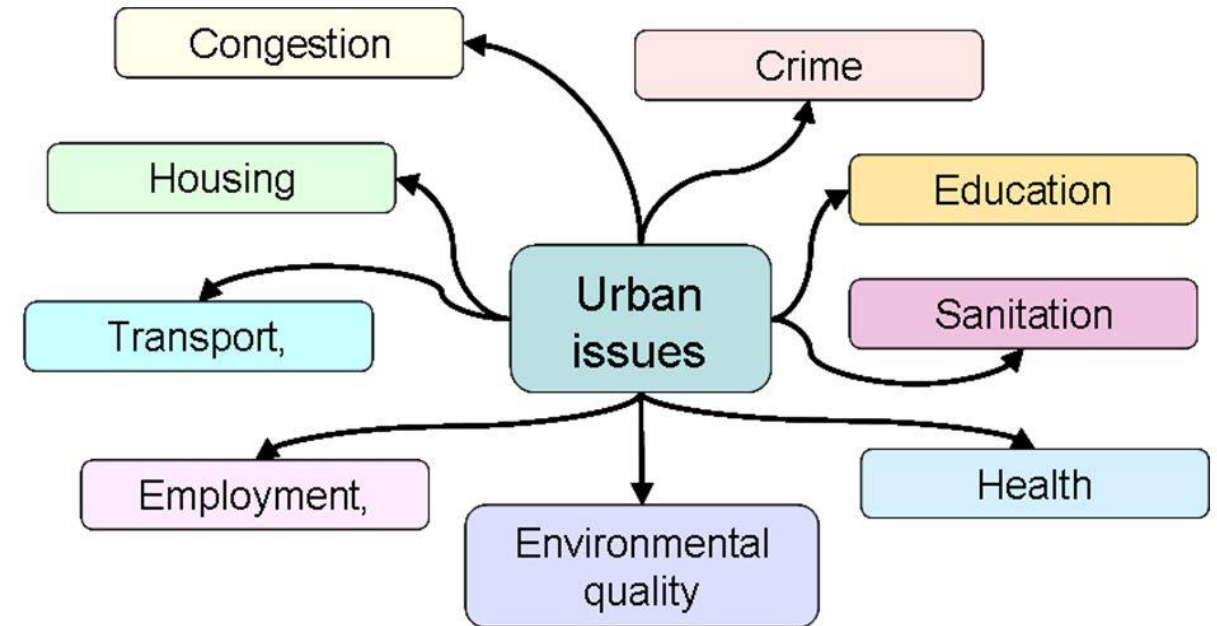


5. CREATIVE CITIES WITH CONNECTED COMMUNITIES

- **21st Century is set to be the century of cities – rapid urbanisation**

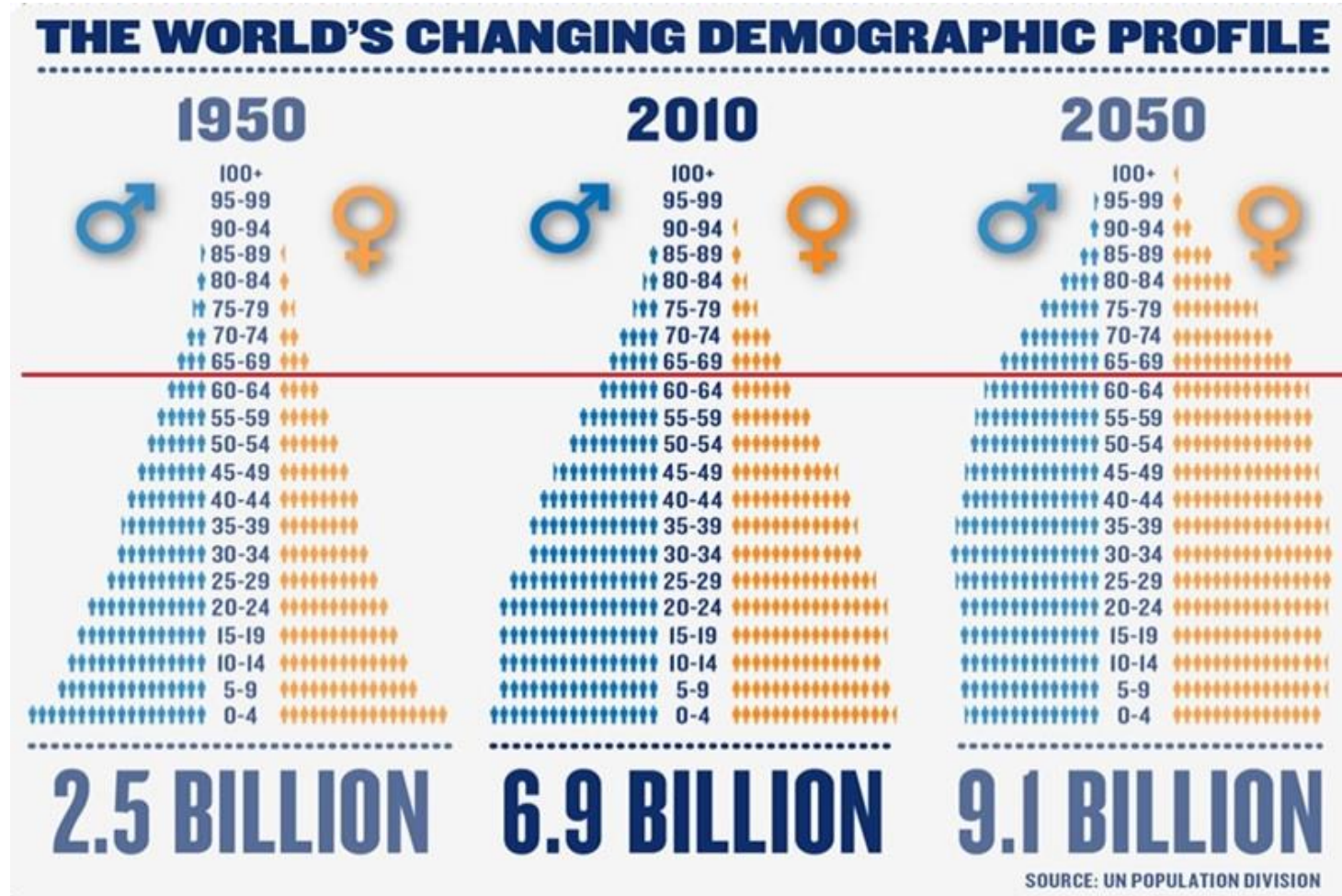


The problems associated with rapid urbanisation



6. PRODUCTIVITY, PARTNERSHIP & PEOPLE

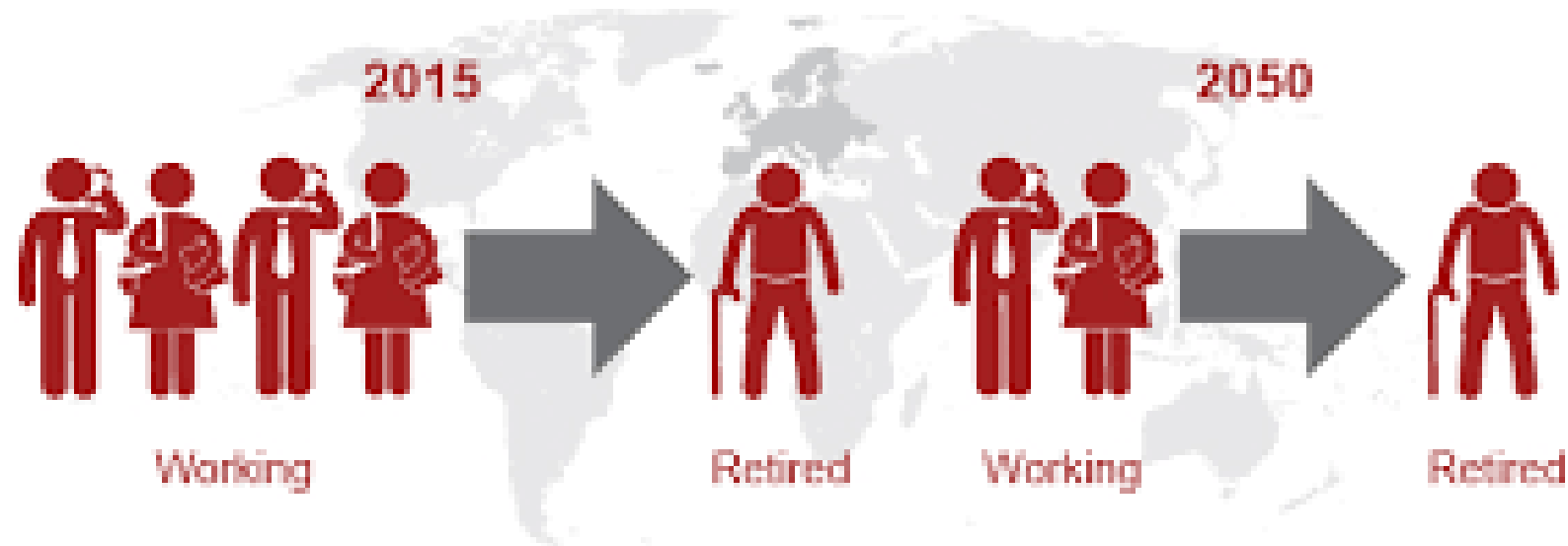
- Developed economies, with reduction of birth rates, need to find ways of boosting productivity and promoting innovations



6. PRODUCTIVITY, PARTNERSHIP & PEOPLE

- Developed economies, with reduction of birth rates, need to find ways of boosting productivity and promoting innovations

By 2050 there will be ***just two working age people*** per one elderly person in Europe



Source: UN Population Division, World Population Prospects 2015

6. PRODUCTIVITY, PARTNERSHIP & PEOPLE

- **PPP will thrive as private sector looks for new markets – infrastructure, health, energy, education and affordable housing**



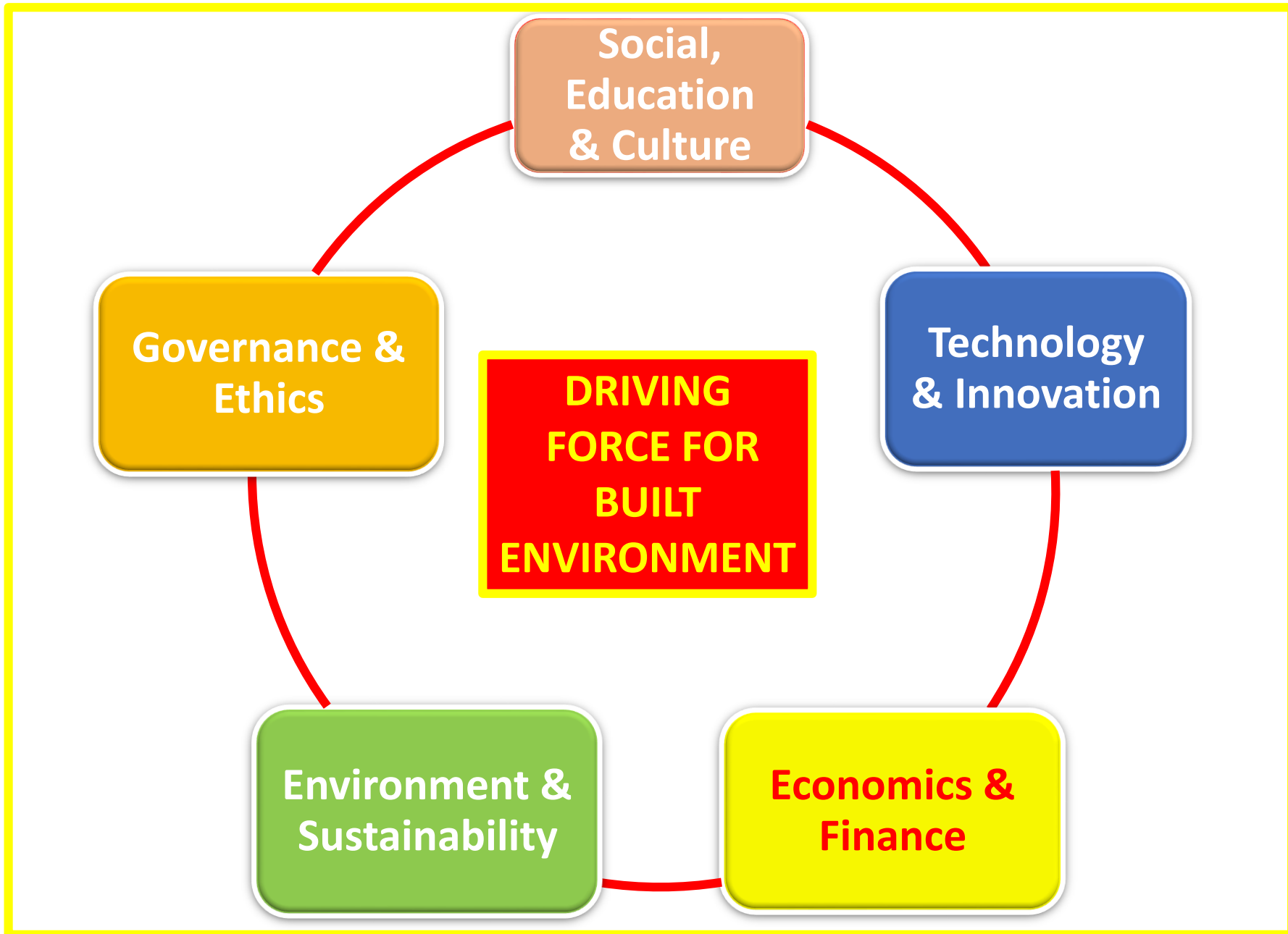
6. PRODUCTIVITY, PARTNERSHIP & PEOPLE

- **The war for talents and Leaders**





THE MAIN DRIVING FORCES FOR THE BUILT ENVIRONMENT



1. SOCIAL, EDUCATION AND CULTURE



- **Complex nature of built-environment issues will demand a growth in cross-disciplinary education, qualification, understanding and practice**
- **Challenge to incentivise, satisfy and excite the youth to the built environment profession**
- **Connecting and communicating with global youth perceived as potential source of social, political and economic power.**

1. SOCIAL, EDUCATION AND CULTURE



- Changing nature, size, mobility, habits and needs of families will dictate greater variety of housing design, form and function – **more flexible and innovative funding.**
- **Lifestyle communities** will become emerging property sector, heritage assets will be exploited more.
- Shopping centres and retail outlets will have to offer an **“experience environment.**

1. SOCIAL, EDUCATION AND CULTURE



- **Major breakthroughs in the design, delivery and construction, financing and management of affordable housing.**
- **New players from emerging economies entering international real estate market.**
- **New species of property investor, developer and manager – more concerned with communities, environment and sustainable development.**

1. SOCIAL, EDUCATION AND CULTURE



- **Health sector revolutionalised as global middle-class grows**
- **SOHO grows – workplace more like home and home more like workplace**
- **More optimal use of land – increased densities in both city and sub-urban locations**
- **Stronger demand for mixed use development**



2. TECHNOLOGY & INNOVATION



- **Continuous changes in technologies will transform human society and our built environment and will alter the requirements for commercial property of all kinds.**
- **Greater interconnectivity between home, car, air travel, and office**
- **Escalating cost of travels leads to waves of innovations and novelty in the leisure, entertainment and tourism industries – more homeworking and on-line shopping**

2. TECHNOLOGY & INNOVATION



BIM data vs. GIS data

- BIM data and GIS data are xenogeneous data.



- State of the art **augmented, virtual and mixed reality** will be the norm in built-environment planning, design, construction and management.
- Advanced communication systems, **BIM, UAV's, laser scanners, cloud computing** and the like will make previous professional processes such as engineering, cost analysis and measurement subject to automation – thereby placing greater emphasis for practitioner on interpretation and judgement.

2. TECHNOLOGY & INNOVATION



- **New technology will optimise the use of space and facilities**
- **Off-site construction – reducing time and cost of building achieving greater accuracy, higher sustainability and added performance efficient.**
- **Prefabrication and customisation will become more important in property development**
- **Smarter materials and tools will be used in the construction process: rotating towers, space-age strength composite bars, light transmitting concrete, etc.**

2. TECHNOLOGY & INNOVATION



- **Modular construction or IBS is growing.**
- **In China, a 30-story building was erected in only 15 days using factory-built modules, which Zhang Yue calls “a structural revolution.”**

2. TECHNOLOGY & INNOVATION

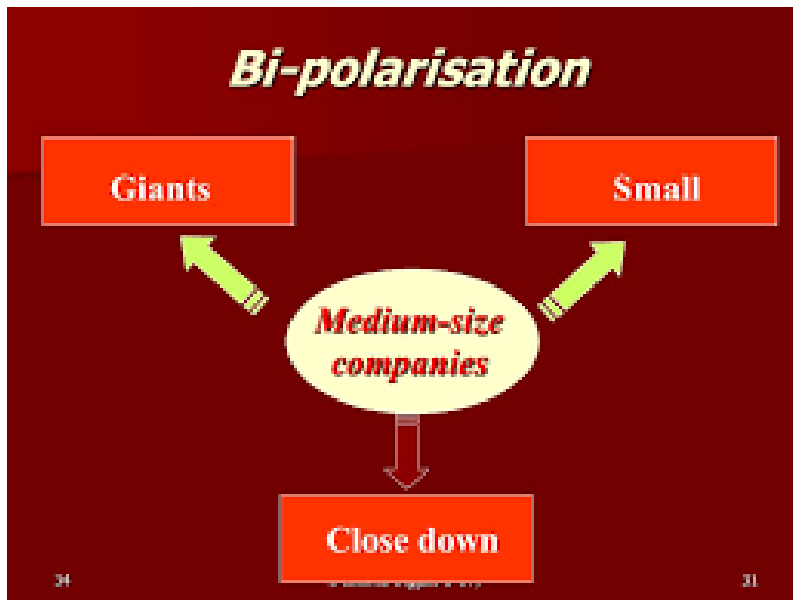
“Train Station in the Forest” in Jiaxing, China (2019-2021)



2. TECHNOLOGY & INNOVATION



- **GIS and blockchain technology will be applied to wider range of planning functions and property related issues**
- **Polarisation of consultancy services – large multi-disciplinary practice or small niche specialist.**
- **Skills gap in construction industry starts to close with greater access to advanced technology and international competition.**



3. ECONOMICS AND FINANCE



- **Cheap capital will diminish – businesses to adapt to rising interest rate in the long-term; governments must prevent prolong period of budget deficits**
- **Growth of emerging markets will strain global finance**
- **Property will not be viewed just as another financial asset class but as a functional asset – demanding specialised expertise in management service and operational relevance**

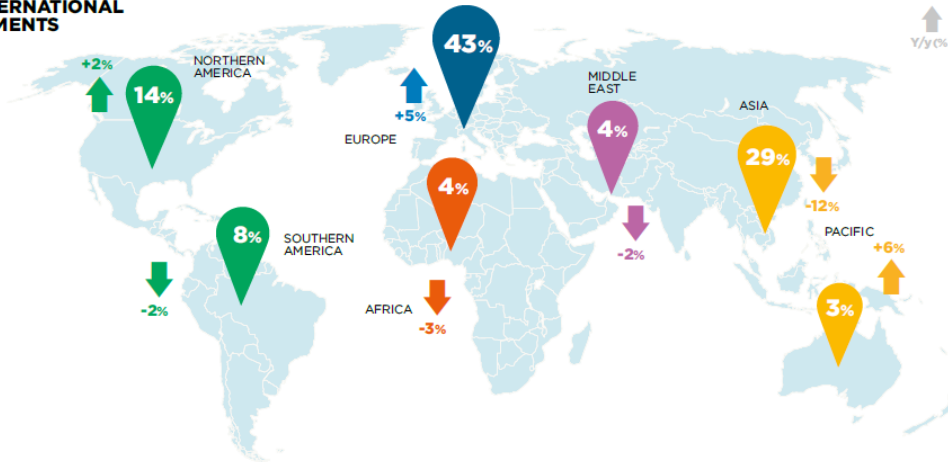
*Sources of Capital Flows into Sub-Saharan African Real Estate**



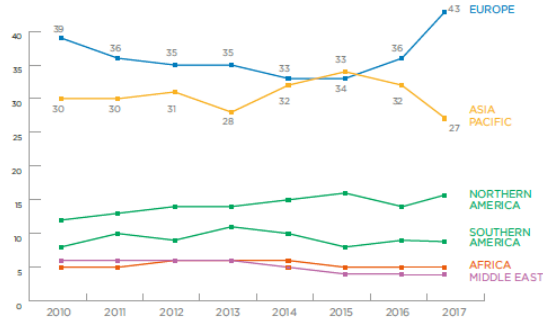
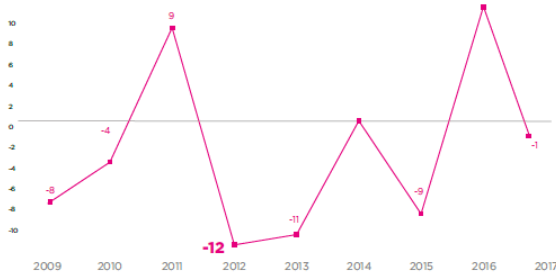
3. ECONOMICS AND FINANCE

DESTINATION OF INTERNATIONAL GREENFIELD INVESTMENTS

Percentage of total by world region and year-on-year variation for each region



GLOBAL INTERNATIONAL GREENFIELD INVESTMENTS: YEAR-ON-YEAR CHANGES (%)



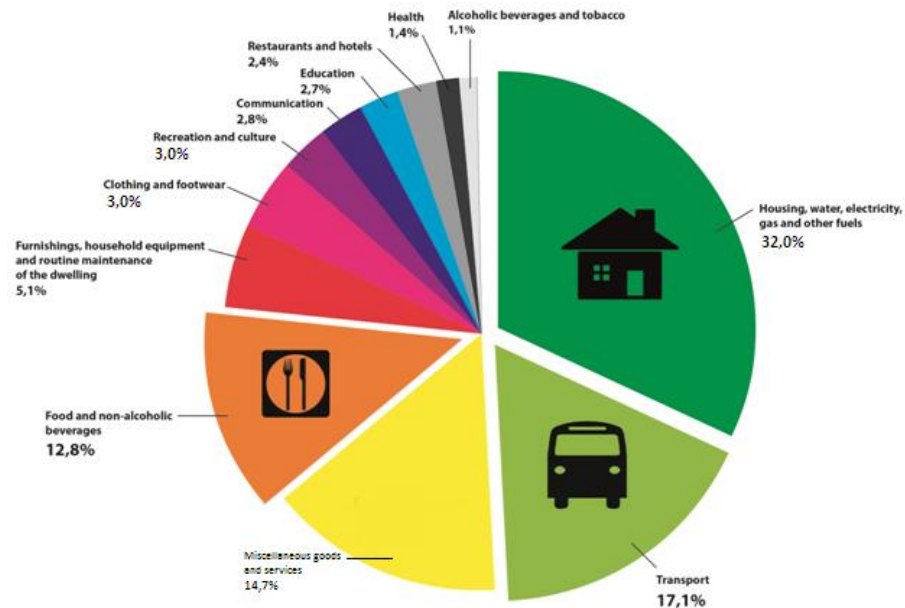
- Competition between cities will heighten – cities not countries will compete to attract investment, business, trade and talent
- Second and third tier cities become increasingly attractive due to price, connectivity, access and quality of life

3. ECONOMICS AND FINANCE



- **Public sector, agencies and authorities – need to collaborate more and use public property assets with greater efficiency and effectiveness through colocation and shared services.**
- **MNC's will gain greater power and influence, esp. on urban development, infrastructure, energy, education, transport, housing and health.**

3. ECONOMICS AND FINANCE



- **Three new poverties will rise and spread across urban settlements – transport poverty, energy poverty and food/water poverty**
- **Real estate markets more consolidated and increasingly connected – development of new investment vehicles, REITs will flourish**
- **Islamic bank and Syariah compliant funding will become more widespread**



3. ECONOMICS AND FINANCE

ICMS INTERNATIONAL
COST
MANAGEMENT
STANDARD

ICMS: Global Consistency in Presenting
Construction Life Cycle Costs and Carbon
Emissions

3rd edition, November 2021

ICMS Coalition



www.icms-coalition.org

- **Life-cycle costs or WLC become central issue in the design, construction and management decision-making processes**
- **Real estate will become increasingly a service industry changing the patterns of tenure (more transient), facilities (fuller provision) and management (greater attention).**
- **Facilities Management will become more a business enabler.**
- **Professional services will be transformed, traditional services challenged by tools like Google Earth.**

4. ENVIRONMENT AND SUSTAINABLE DEVELOPMENT



SUSTAINABLE DEVELOPMENT GOALS



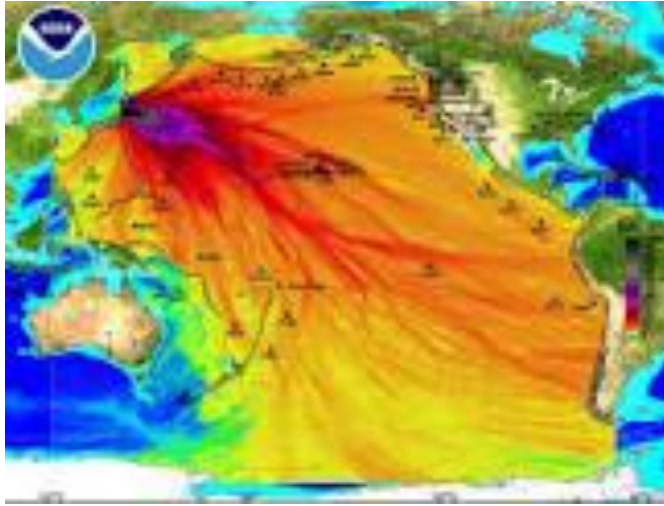
- Sustainability will stay mainstream
- Increasing pressure on corporations and individuals to consider ecological impact of business operations.
- Professions of the built environment, agencies and regulators need to gain better understanding of the nature of mega cities and develop strategies in managing their growth and reducing CO2 emission at the same time.

4. ENVIRONMENT AND SUSTAINABLE DEVELOPMENT



- **Urbanisation phenomenon, esp. in Africa, India and China will tax the ingenuity of planners and developers in balancing economic productivity, population growth, sustainability and quality of the physical environment**
- **Waste management and mass transportation policies and practices become increasingly important.**
- **Economic value of building will be determined more by talent and function than by access and location.**

4. ENVIRONMENT AND SUSTAINABLE DEVELOPMENT



- As global temperatures rise and extreme weather conditions prevail, planners and developers need to consider urban development strategies locally, nationally, regionally and globally.
- Risk management strategies to prepare for rising sea levels, energy security and water shortage.
- Disaster Management and recovery development will become necessary expertise.



4. ENVIRONMENT AND SUSTAINABLE DEVELOPMENT

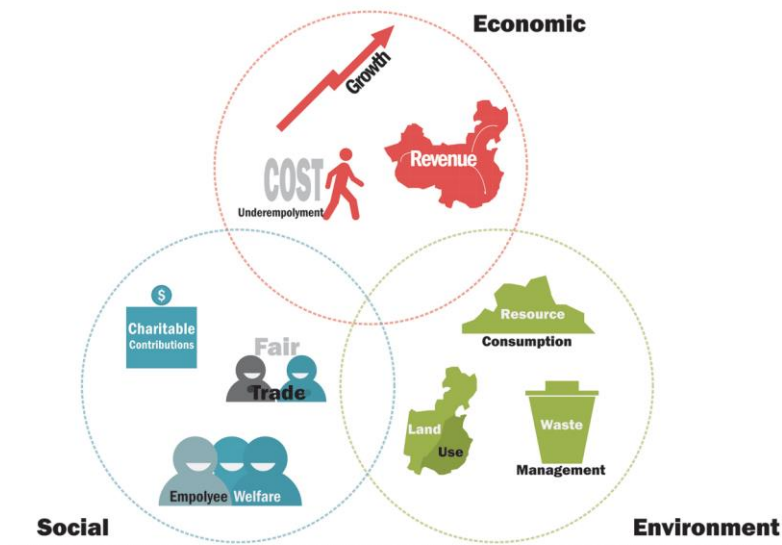


- **Challenge for the construction industry: getting cost and carbon down and creating more customer value.**
- **Great opportunities for green building services and products, in particular green retrofit market will grow stronger.**
- **Insurance premiums will rise due to increasing vulnerability of built environment assets to extreme weather and climate change related loss.**

5. GOVERNANCE AND ETHICS



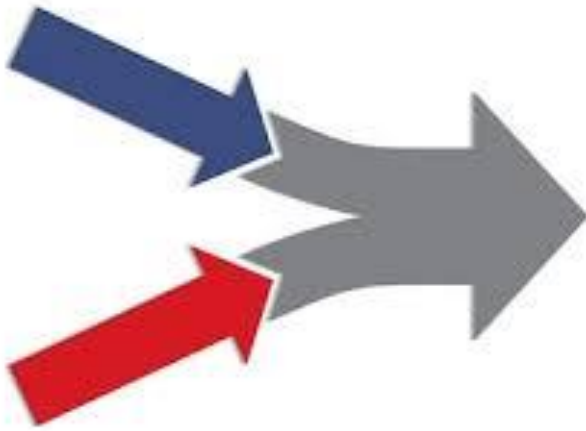
- **Greater transparency and accountability across all fields of governance impelled by legislation and regulation**
- **Growing movement of ethical investment policy and practice among global funds**
- **Social Responsible Investment (SRI) becomes fast growing field of activity for investors, fund managers, developers, etc.**



5. GOVERNANCE AND ETHICS



- **Internationalisation is reworking and redefining the profession.**
- **National borders diminish – mobility of people, money and work increases.**
- **Income and wealth disparities between rich and poor will widen – rising social tension and urban unrest.**
- **Growing uniformity of standards of governance and regulation across market.**



5. GOVERNANCE AND ETHICS



- **Major mergers and acquisitions across the spectrum of built environment professional firms continue to grow – emergence of global multi-disciplinary urban development consultancy**
- **International standards based on collaboration gaining importance in emerging markets due to mobility of funds and requirements by investors and fund managers.**

5. GOVERNANCE AND ETHICS



- **Safety and security issues will gain higher priority in the design, development and management of residential estates and urban renewal.**
- **Gated communities more prevalent**
- **Data and knowledge security become even more crucial than security of physical structures.**
- **Leadership will maintain its momentum as the mantra for the built environment of the future.**



THE FUTURE TRENDS



THE FUTURE TRENDS



Pillar 1:

Thinking Ahead

The pace of change in the built environment is breath-taking. This will continue to accelerate. Time and effort spent planning for the future is rarely wasted.

THE FUTURE TRENDS



Pillar 2:

Leadership and Inspiration

The future leaders of the profession will face new challenges shaped by the changing world in which we live. The skills and leadership styles that exist today may not be those needed tomorrow.

THE FUTURE TRENDS



Pillar 3:

Sustainability

Buildings have the largest single impact on global resources and pollution.

Increasingly, non-sustainable practices are no longer seen as acceptable by the likes of investors, occupiers and policy makers.

THE FUTURE TRENDS



Pillar 4:

New Skills and Multi-disciplinarity

The growing complexity of global business will require new ways of working. Professional boundaries will be increasingly blurred. Many traditional roles in the built environment sector will need to evolve to reflect new skill sets and business practices.

THE FUTURE TRENDS



Pillar 5:

Networks and collaboration

No man is an island. The increasingly multi-faceted nature of our personal and professional lives makes collaboration absolutely pivotal. Social media has revolutionised the way we interact with each other, leading to new ways of sharing information and experiences.



Pillar 6:

Technology

Sometimes called the “IR-4”, the digital revolution has forever changed the face of global production, work and communication. Smart automation, connectivity and operational alignment, will transform the design, manufacturing and servicing of products and productions systems in the built environment sector.

THE FUTURE TRENDS



Pillar 7:

Ethics, Values and Standards

Standards provide a consistent framework for compliance and quality assurance in a fast-changing world. Organisations will need to adjust their own values in order to avoid potential reputational risks and threats to their brand and business activities.

CONCLUDING THOUGHT



- **Future cities – reform of land use planning, integration of smart technology, building in resilience, helping define economic and social purpose of place making and affordable delivery of community infrastructure.**

CONCLUDING THOUGHT



- **War for talent - attracting the next generation, retaining talent, diversity and inclusion and ensuring the right education is available to meet our sector's needs**

CONCLUDING THOUGHT



Buildings & Structures



Drainage



Parks & Recreation



Roads & Transport Services



Sewerage Infrastructure



Water Infrastructure

- **Opportunities for the profession to grow and develop in – Infrastructure, Programme Management and Asset Management (Business, Land, Capital and Real Estate).**

CONCLUDING THOUGHT



- **Leadership is needed across the land, real estate and construction sectors, including representation at board level, a stronger voice in government, collaboration across professional bodies**

CONCLUDING THOUGHT



- **A stronger commitment to sustainability from our sector is needed bring about positive change – through our industry leaders, greater convergence of consistent standards and measurement and smarter government policy interventions and direction**

Have a safe sail ahead.....



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