GREEN COUNCIL
環保促進會

Webinar:
Climate Change Mitigation: Decarbonisation Technology and Innovation - What To Know and Do About it

Global Trends on Decarbonisation Technology for building applications

Mr. Henry Wang
International Adviser and Author; Member, G20/B20 International Taskforces, London University SOAS SCI Advisory Board, Imperial College London Grantham Stakeholders Committee, University College London China Advisory Board

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Green Council Speech, HK, 22 Sept 2022

Global Trends on Decarbonisation Technology for Building Applications

EurIng. Henry K. H. Wang

FRSA, FIChemE, MCMI, C. Eng, MSc, DIC.

RC Taipo, ex RC Beijing, D3450 PPE Committee

President, Gate International Co Ltd.

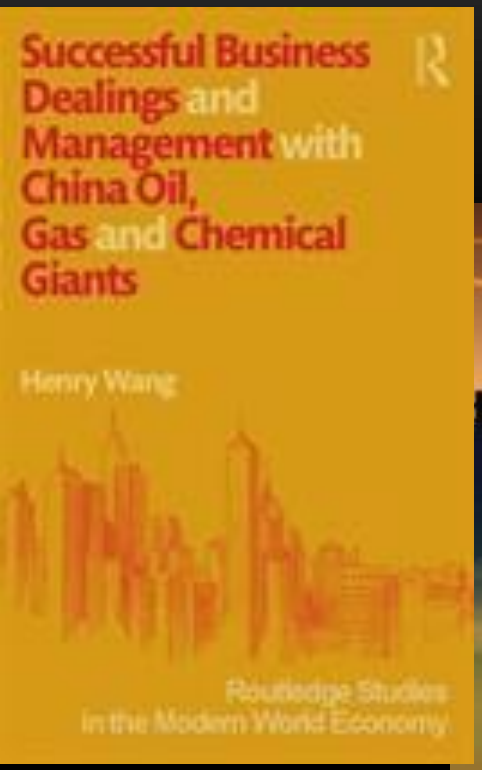
G20/B20 International Energy, Climate & Sustainability Taskforce

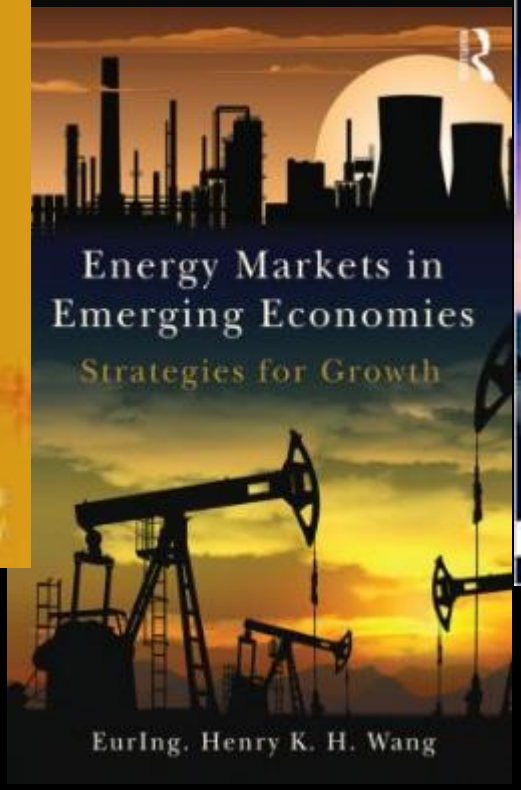
London University SOAS SCI Advisory Board

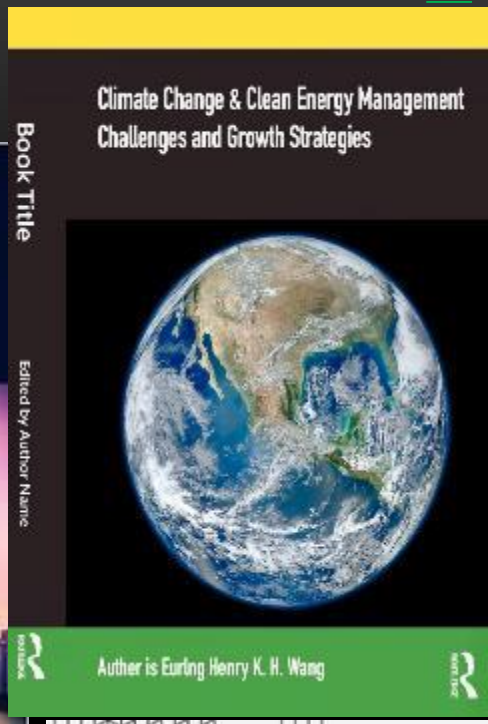
Imperial College Grantham Climate Stakeholder Committee

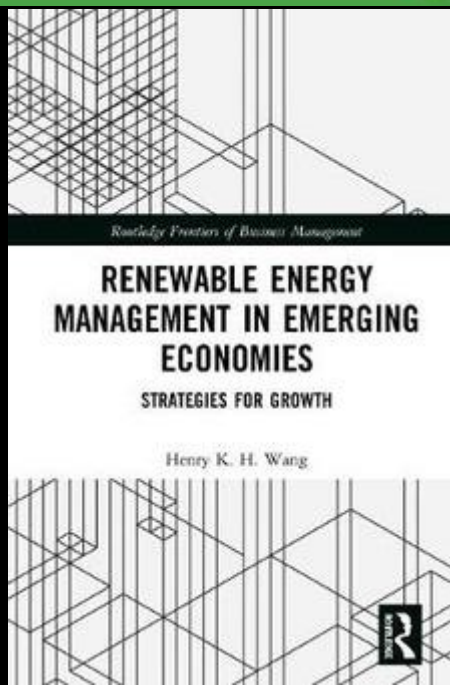
University College London China Advisory Board

Henry Wang, FRSA, FIChE, CEng, MCMI
International Advisor, Author & Speaker





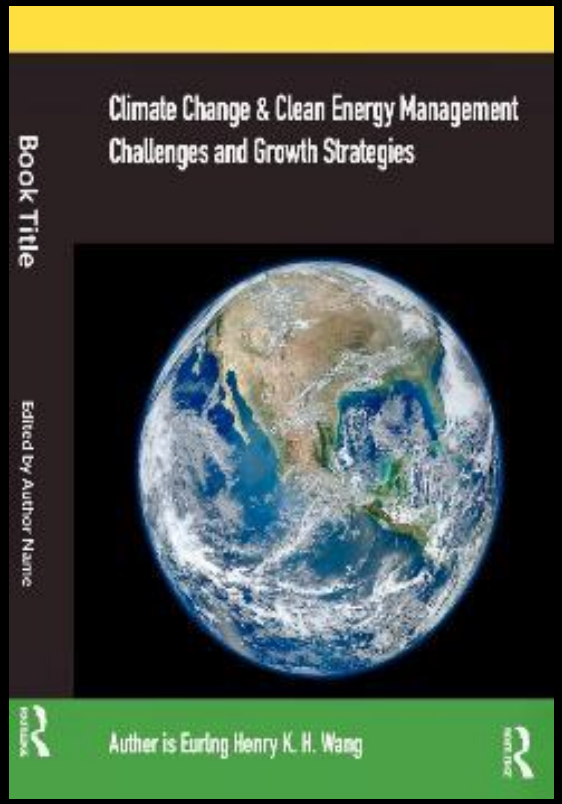




- London University SOAS SCI Advisory Board
- China Carbon Forum Advisory Board
- G20/B20 International Taskforces & Action Council
- RC TaiPo Hong Kong, D3450 PPE Committee, PP

HK Green Buildings & Decarbonisation - Agenda

- Climate Change Impacts
- G20 & B20 Outlooks
- Hong Kong Climate Plan
- UN Green Buildings
- World Green Buildings
- Net Zero
- Clean Energy Transition
- Energy Efficiency
- Smart City
- Education & Youth
- Policy Inputs & Cooperations
- Key Summary



Global Climate Change 2100: Temperature, CO2 Rising!

FIGURE 7

Carbon dioxide emissions associated with different greenhouse gas concentration scenarios

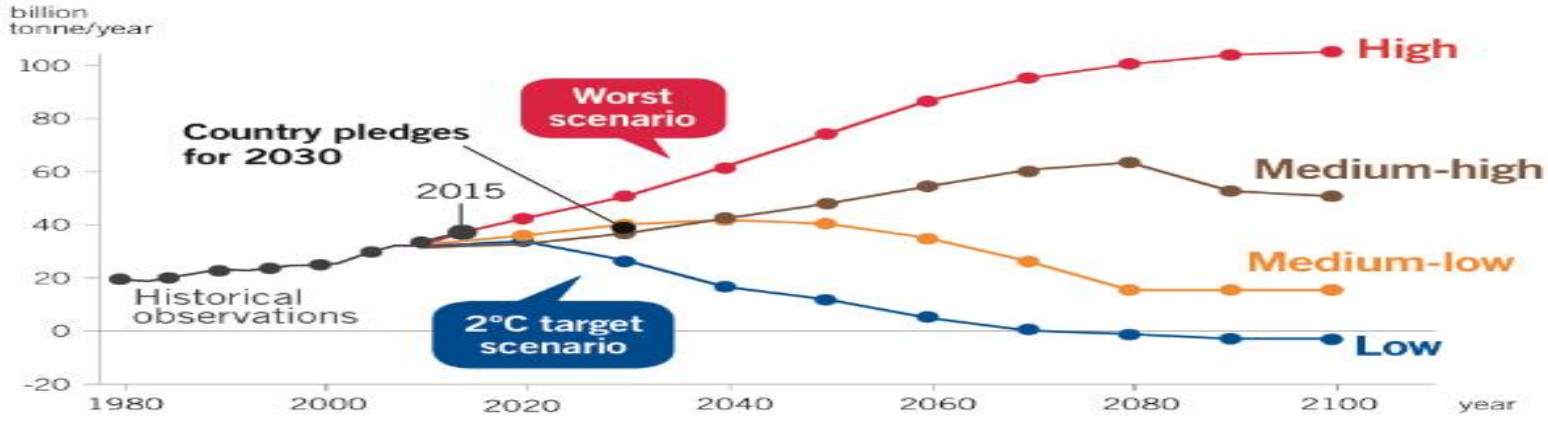
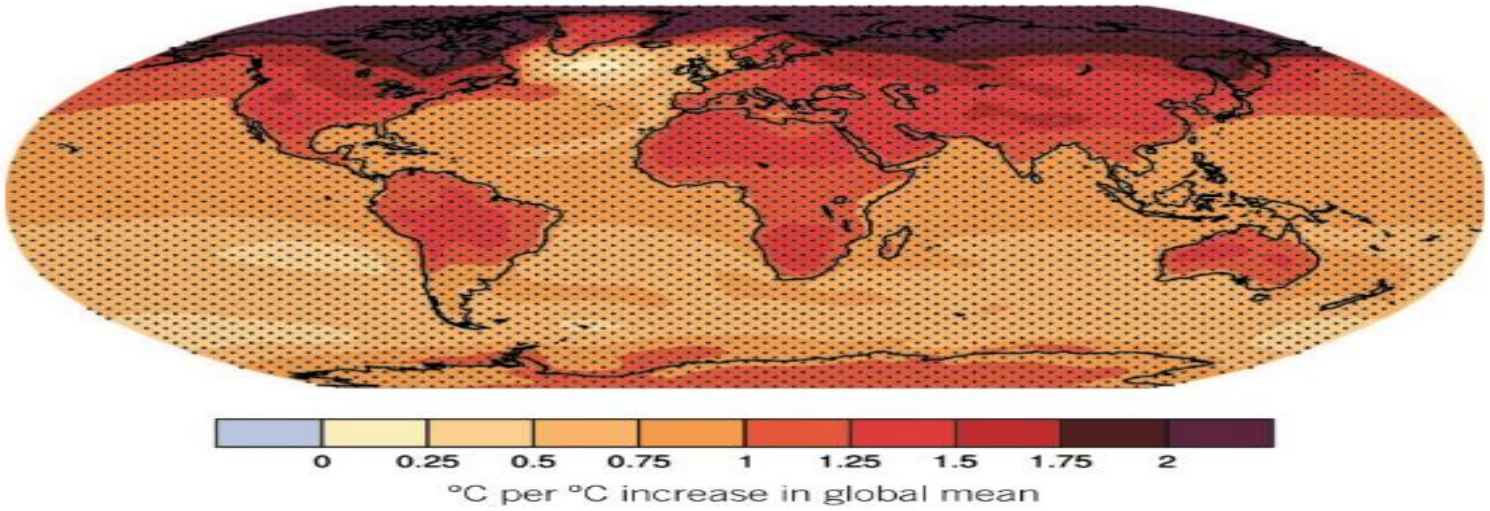


FIGURE 8

Projected regional temperature change (°C) for 2081-2100 per unit global average temperature increase (°C)

relative to 1986-2005



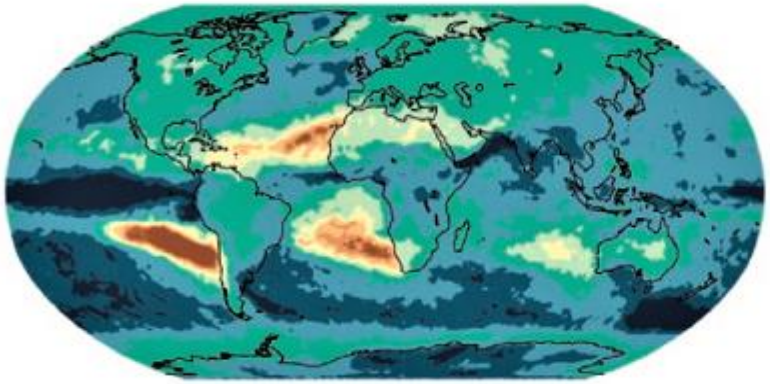
Ref: HKG, B2

Extreme Weather Events Rising: Rain, Flood, Sea Levels!

Ref: HKG, B2

FIGURE 9

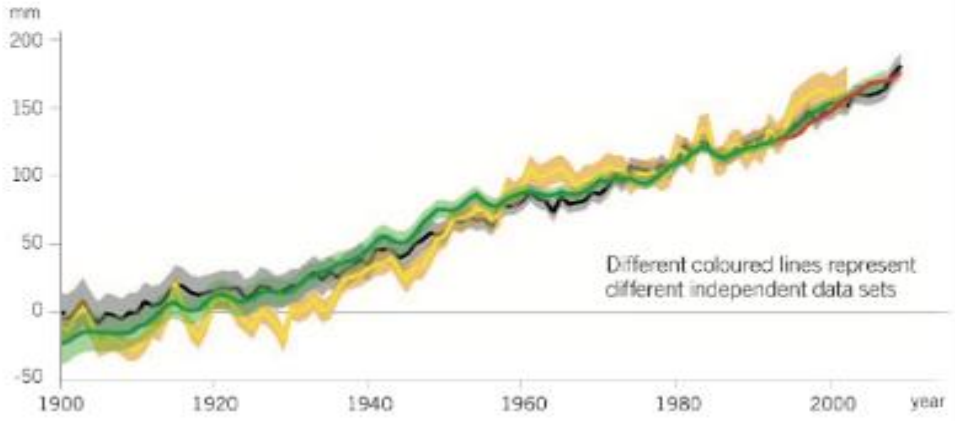
Projected percentage change in 20-year return values of annual maximum daily precipitation for 2081-2100 per unit local temperature increase (°C)
relative to 1986-2005



Extreme precipitation events will very likely become more intense and more frequent.

FIGURE 5

Global average sea level change
relative to 1900-1905



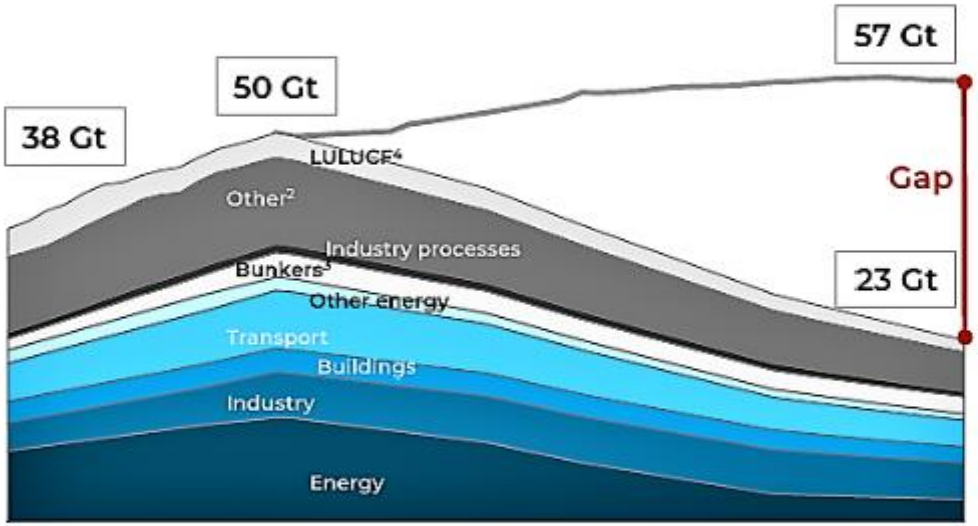
B20/G20 Paris Agreement CO2 Emissions Actions Outlooks

Ref: B20, B5

POLITICS IS AWARE OF THE NEED FOR CLIMATE ACTION - YET CURRENT EFFORT IS INSUFFICIENT

B20 SAUDI ARABIA 2020

Global GHG emissions Gigatonnes CO_2 equivalent



	2015	2050
GDP	$75 trillion	$235 trillion
Population	7.3 billion	9.7 billion

57 GT
Current policies[1]
>4°C pathway

23 GT
Paris agreement
2°C pathway

Current pathway leads to more than twice the emissions corresponding to the 2°C Paris goal

1. Baseline assuming implementation of current Paris pledges 2. Other: Agriculture, Waste and Fugitive emissions 3. International marine and aviation. GDP in 2010 USD 4. Land use, land-use change, and forestry
Sources: IEA, World Energy Outlook 2017; WRI; IMF; World Bank; Climate Action Tracker, BCG Analysis

Current efforts insufficient & urgent needs for stronger joint global climate actions.

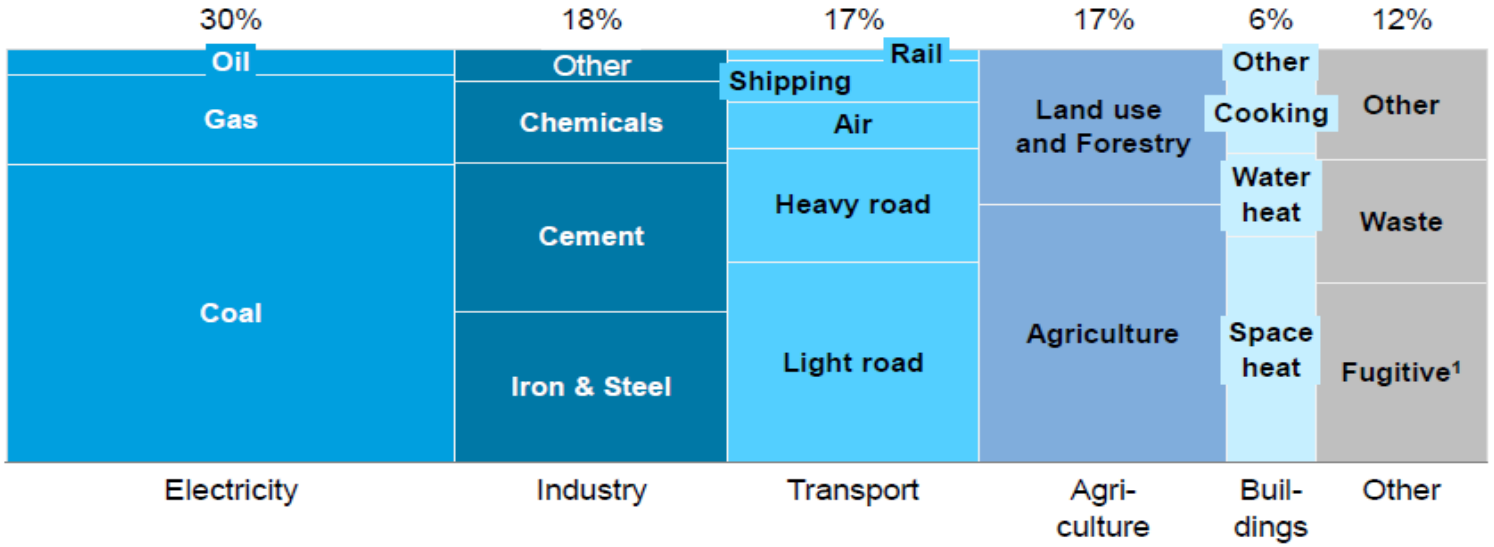
B20/G20 Energy, Sustainability, Climate ESC Taskforce

GI
Ref: B20, B5

…AND ELECTRICITY SECTOR IS THE LARGEST EMITTING SECTOR OF GLOBAL GHG EMISSIONS

B20 SAUDI ARABIA 2020

Gt CO_2e of global GHG emissions, 2017



1. Fugitive emissions are accidental emissions of vapours or gases from pressurised apparatus, either due to faulty equipment, leakage or other unforeseen mishaps.
Source: BCG analysis

10

Accelerate global energy transition, electricity sector reforms, carbon neutrality.

B20 Paris Agreement Temperature Goals & GDP Analysis

Ref: B20, B5

G20 leaders at Rome Summit 2021 remained committed to the Paris Agreement goals to cap the temperature rise within 2 C above the pre-industrial level, and to further pursue efforts to limit it to within 1.5 C, but no new commitments on carbon neutrality yet.

G20 B20 Global Climate Actions & Opportunities

GI
Ref: B20, B5

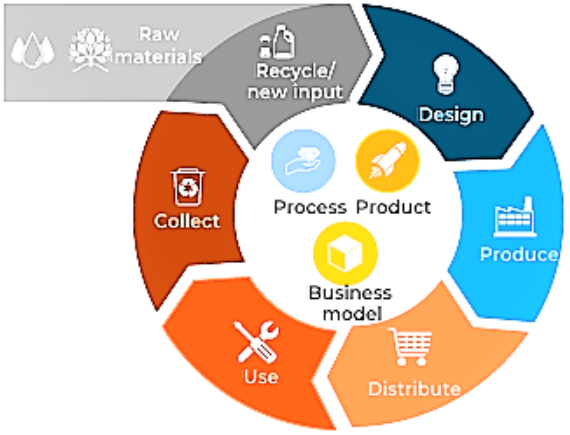
MORE AMBITIOUS CLIMATE AND SUSTAINABILITY ACTION PROVIDES SIGNIFICANT OPPORTUNITIES

B20 SAUDI ARABIA 2020

More ambitious climate action yields economic potential

- $ 26 trillion economic gains could be realized from low-carbon growth by 2030[3]
- 65 million additional jobs could result globally from climate action by 2030[3]
- Losses from weather and climate related hazards (e.g. $ 320 billion in 2017) could be mitigated[3]
- Wise water management could help to avoid GDP declines of up to 6% in water scarce regions by 2050[3]

New commercial opportunities are emerging from circular economy



Circular economy provides a $4.5 trillion business opportunity globally[1]

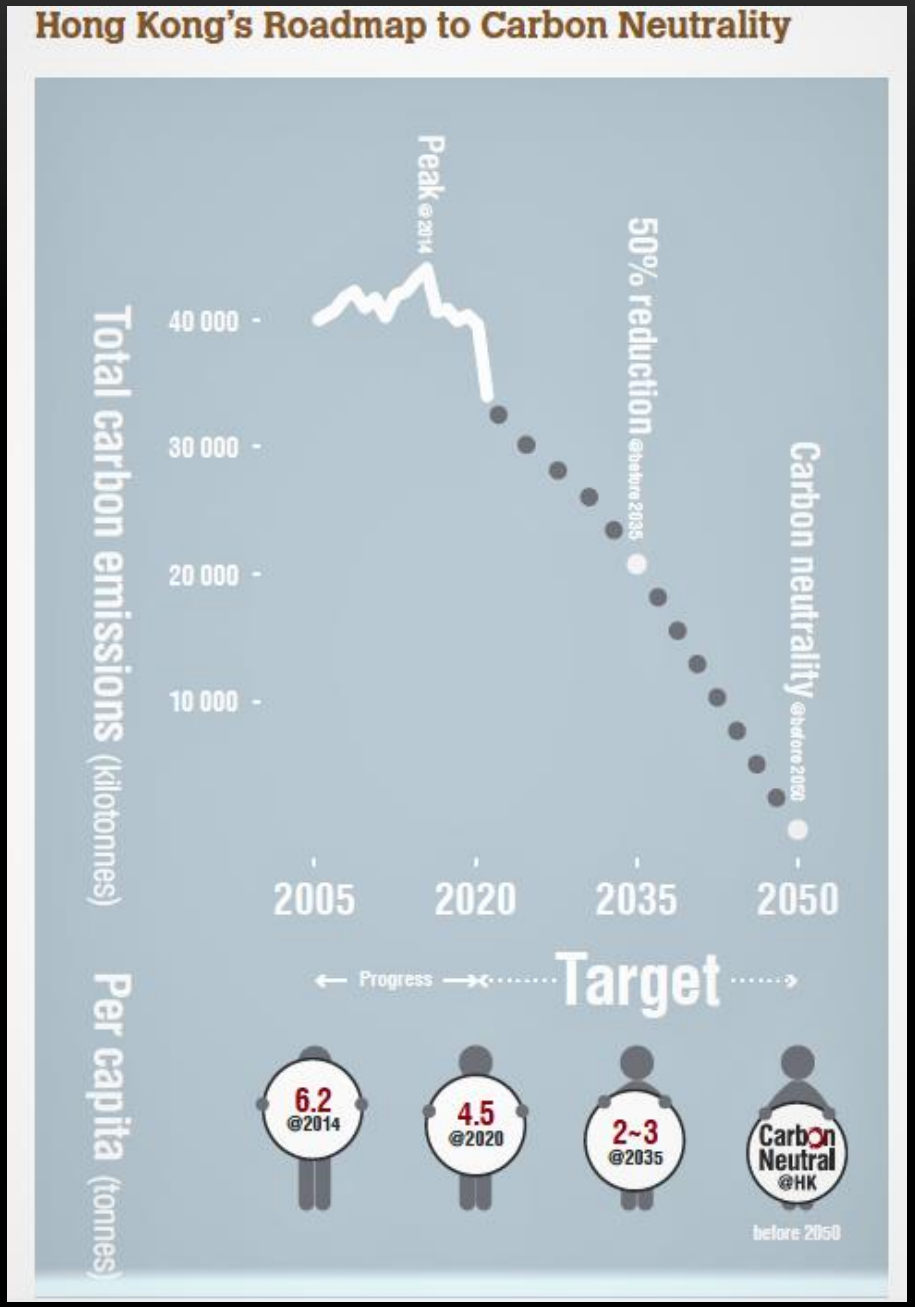
In India, implementing circular solutions presents opportunity to reduce GHG emissions by about 40%[2]

1. CEO Guide to the Circular Economy; WBCSD 2. Ellen MacArthur Foundation (2016): Circular Economy in India: Rethinking growth for long-term prosperity
3. The New Climate Economy (2018): Unlocking the Inclusive Growth Story of the 21 Century Sources: WBCSD; World Resources Institute; BCG

Climate actions can Lead to Significant Green Investments & Growths Globally.

Hong Kong Climate Action Plan: Carbon Neutral 2050

GI
Ref: B20, B5



Medium-to-long-term decarbonisation targets

Before 2035

50%

Total carbon emissions
Compared with 2005 level

Before 2050

香港邁向 碳中和 Carbon Neutral@HK

Four decarbonisation strategies

Net-zero Electricity Generation

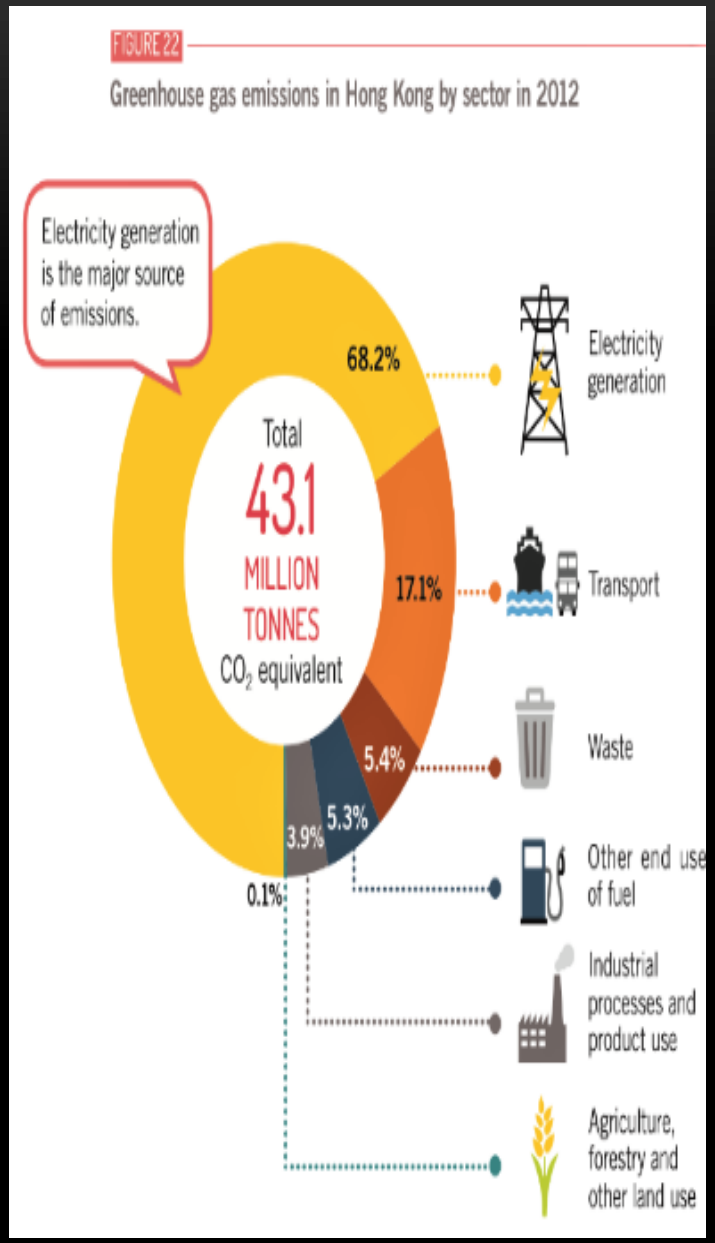
Energy Saving and Green Buildings

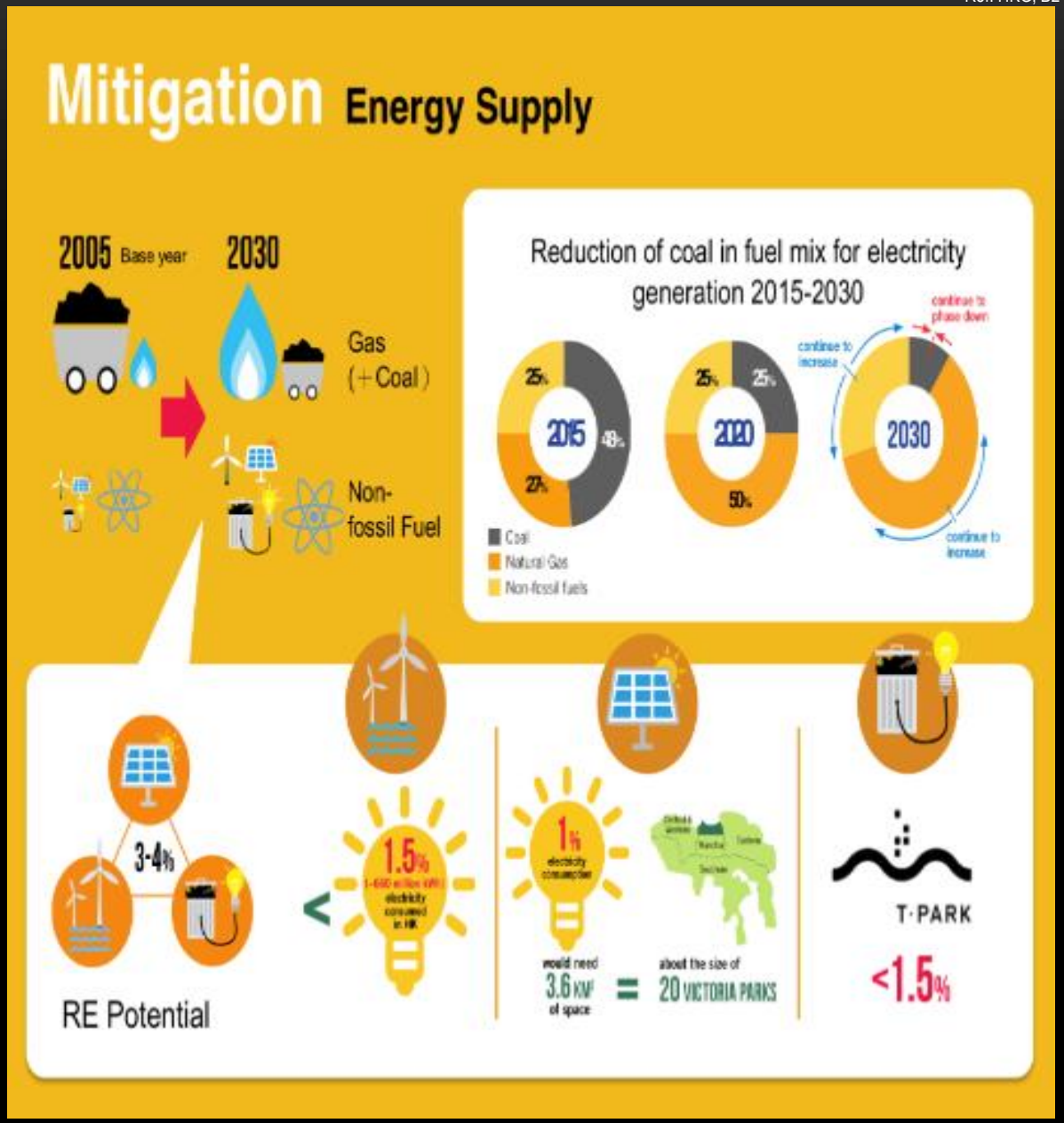
Green Transport

Waste Reduction

Hong Kong Electricity Major CO2 Emitter, Decarbonisation Key!

Ref: HKG, B2





Reduce Coal & Fossil Electricity! Increase Gas, Renewables & Clean Power?

HK Climate Action Plan: Strategies, Electricity, Buildings

Strategies • Opportunities

Moving towards carbon neutrality can bring ample and diverse development opportunities, enhance Hong Kong's competitiveness and support sustainable development

Steering and Coordination

The Steering Committee on Climate Change and Carbon Neutrality under the chairmanship of the Chief Executive to formulate the overall strategy

Climate Budget

Allocate – **$240 billion** to combat climate change in the next 15 to 20 years

Office of Climate Change and Carbon Neutrality

Set up a new office to strenghten coordination and promote decarbonisation

Advisory Committee

Establish a dedicated advisory committee to encourage public participation, including young people

Public Engagement

Government to work together with different sectors to promote low-carbon lifestyle

Green Finance

Accelerate the development of green and sustainable finance, develop Hong Kong into a green financial hub in the region

Green Economy

Facilitate the development of green industries, create investment and job opportunities

Technology and Innovation

Promote I&T development and re-industrialisation, facilitate the application of decarbonisation technologies and green R&D

Capacity Building

Climate change-related content to be incorporated into the curricula of tertiary institutions

Carbon-neutral Communities

Develop strategic growth areas into carbon-neutral communities

Net-zero Electricity Generation • Energy Saving and Green Buildings

In 2019, electricity generation accounted for about 66% of total carbon emissions. Hong Kong will gradually reduce the use of fossil fuel and expedite the use of clean zero-carbon energy

No Coal for Electricity Generation

2035

Cease using coal for daily electricity generation, to be replaced by low to zero-carbon energy

Zero-carbon Energy

2035 **60-70%**

Trial of new energy and closer cooperation with neighbouring areas to increase the supply of zero-carbon electricity

Renewable Energy (RE)

2035 **7.5-10%**

(Increase to 15% subsequently)

Public and private sectors to develop RE proactively to increase its share in the fuel mix for electricity generation

Cooperation and Innovation

Seek investment and development opportunities, participate in and operate zero-carbon energy projects near Hong Kong

Decarbonisation comes at a price. Buildings account for about 90% of Hong Kong's total electricity consumption. Promoting energy conservation and improving energy efficiency can help reduce the cost of transformation

Electricity Saving in Buildings

2035

Electricity consumption (Compared with 2015)

COMMERCIAL BUILDINGS 15-20%

(Reduce by 30-40% subsequently)

RESIDENTIAL BUILDINGS 10-15%

(Reduce by 20-30% subsequently)

Strengthening Regulation

Continuous enhancement of energy performance of buildings

- Expand the scope of regulation to cover all buildings with high energy consumption
- Conduct more frequent energy audits
- Implement the identified energy management opportunities
- Strengthen the promotion of retro-commissioning

Explore setting a minimum energy efficiency requirement for specified appliances

Smart Management

Use smart technologies to enhance energy saving management and energy efficiency of buildings and infrastructure

Incorporate district cooling systems in development projects

Green Transport

Transport constituted about 18% of total carbon emissions in 2019. Popularisation of EVs and other new energy transport can help the transport sector achieve zero carbon emissions

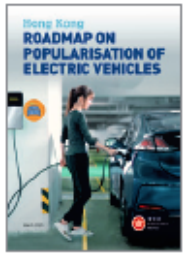
Clean Air Plan for Hong Kong 2035
Hong Kong Roadmap on Popularisation of Electric Vehicles

2035

Implement strategies in the Clean Air Plan to promote adoption of new energy transport to expedite low-carbon transformation

2050

Take forward measures set forth in the EV Roadmap to attain zero vehicular emissions before 2050



Hydrogen Fuel Cell Vehicles

within 3 years

Test out hydrogen fuel cell electric buses and heavy vehicles

Electric Private Cars

2035

Cease the new registration of fuel-propelled and hybrid private cars in 2035 or earlier

New Energy Transport

2035

Progressively adopt new energy ferries

Waste Reduction

Waste accounted for about 7% of total carbon emissions in 2019. Developing waste-to-energy facilities and promoting waste reduction and recycling will enable us to move away from reliance on landfills for municipal waste disposal

Waste Blueprint for Hong Kong 2035

2035

Implement the Waste Blueprint for Hong Kong 2035 to realise the vision of "Waste Reduction • Resources Circulation • Zero Landfill"

Municipal Solid Waste Charging

2023

Prepare for implementation of waste charging, encourage waste reduction and recycling, and strengthen community facilities and support

Regulation of Disposable Plastic Tableware

2025

Regulate disposable plastic tableware, etc. in phases, reduce plastic at source

Waste-to-energy

2035

Develop adequate waste-to-energy facilities, move away from reliance on landfills for municipal waste disposal

Before 2035

↓50%

Total carbon emissions

Compared with 2005 level

Before 2050

香港邁向碳中和 Carbon Neutral@HK

UN Green Building Decarbonisation Global Improvements

GI

Ref: HKG, B2

- UN IPCC has, in its latest 2022 climate report, suggested that cities globally should **incentivize green buildings**.
- Since the IPCC's 5th Assessment Report in 2014, an increasing number of **zero-carbon buildings** have been constructed in various cities in different regions globally.
- Improving green building electric heating, more efficient appliances and better lighting, plus the circular use of materials have been the key green building improvement areas.
- Progress must be accelerated in different cities globally to retrofit older buildings & ensure that improved technologies are incorporated into new construction projects.
- Municipal governments should accelerate the developments of **new green building guidelines** for construction and use, as well as building energy codes, so as to further drive progress.
- UNIPCC, Global Climate Report, US Apr 2022

UN IPCC Green Building & Decarbonisation global improvements

World Green Building Council Decarbonisation

- **World GBC's Net Zero Carbon Buildings** Commitment calls on businesses, organisations, cities and governments globally to reduce carbon emissions.
- It aims to reduce all operational and embodied carbon emissions within their portfolios **by 2030.**
- It advocate for all buildings globally to achieve whole life carbon **Net Zero by 2050.**
- Buildings globally contribute major GHG emissions with big carbon footprints.
- The sector is globally responsible for 36% of energy consumption, 38% of energy related carbon emissions, 50% of resource consumption, and expected to **double in total footprint by 2060.**

Buildings to reduce carbon emission by 2030 & Carbon Net Zero by 2050 globally.

WGBC Decarbonisation Net Zero Commitments

GI
Ref: B20, B5

- **Green Buildings Decarbonisation** will require deep collaboration across the entire value chain.
- Radical changes in the way buildings are designed, built, occupied & decommission required.
- New business models to promote circularity, re-use of buildings and materials, whole life cycle thinking, high performance operations, and ultimately a shift away from fossil fuels.
- **By 2030, existing buildings to reduce their energy consumption and eliminate emissions from energy and refrigerants.**
- Buildings to remove fossil fuel uses & replace clean renewable energy plus compensate for residual emissions.
- New developments and major renovations should be built to be highly efficient, powered by **renewables, with a maximum reduction in carbon and compensation of residual emissions**.

Decarbonisation will require radical building changes with clean transition.

Ref: B20, B5

HK GBC Green Building Decarbonisation Challenges?

- How urban planning can contribute to a lower carbon footprint whilst enhancing liveability in HK?
- What passive design and construction strategies are effective in creating super low energy high rises buildings in HK?
- What innovative active systems and renewable energy technologies can be integrated into new low/net zero carbon building designs and in the low carbon retrofit of existing buildings in HK ?
- How can we incentivise retro-commissioning and low carbon retrofitting in the Greater Bay Area GBA…
- Can Hong Kong become a high density compact Smart City model for advancing net zero?
- How can HK GBC Sustainable Development Committee (SDC) accelerate the decarbonisation of HK as built environment?

HK Buildings Decarbonisation critical with many key challenges.

Green Building Clean Energy Transition & Efficiency Improvements

- Building Clean Energy Transition & Energy Efficiency require urgent improvements.
- Buildings heating and cooling have accounted for **35 to 60%** of their total energy demands.
- High buildings energy requirements have produced nearly **40 percent of the greenhouse gas emissions** from buildings in HK & globally.
- Reducing energy uses and GHG emissions from buildings are very important for Net Zero Decarbonization in HK & globally.
- **Accelerate Buildings Clean Energy Transitions** by accelerating replacement of fossil fuels with clean renewable energy sources are urgently required in HK & globally.
- **Renewable energies widely applied** globally with new innovations & cost reductions.

Green Building Clean Energy Transition require acceleration in HK & globally

Green Building Clean Energy & Efficiency Improvements

GI

Ref: HKG, B2

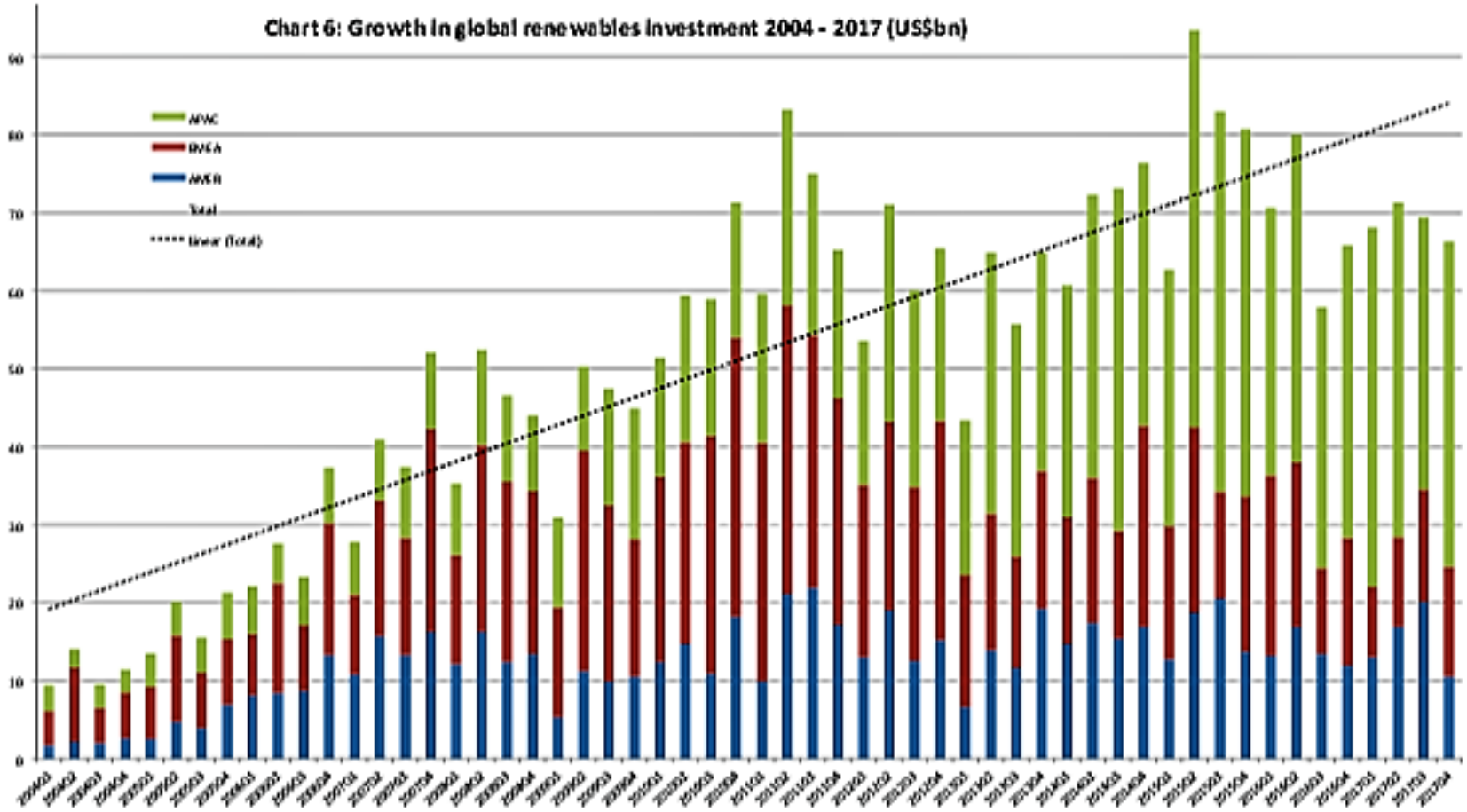
- **Building standards updating** for new building constructions & retrofitting of older buildings require urgently.
- Improvements of building **heating, cooling, HVAC** and water-heating technologies urgently required.
- Implement new **smart green building** lighting, appliance, and automation improvements.
- Improve building **insulation design and installation**.
- City leaders should **work closely** with building owners, both residential and commercial; plus real-estate developers and occupants on the improvements.
- **Combined actions** by all parties should help to reduce energy costs as well as providing more resilient, comfortable building spaces to live, work, and play for future smart city residents & to achieve **Net Zero by 2050 in HK**.

Green Building Energy Efficiencies improvements will require joint cooperations

Global Renewables Growths & Green Investments Growths

Ref: GTI, B2

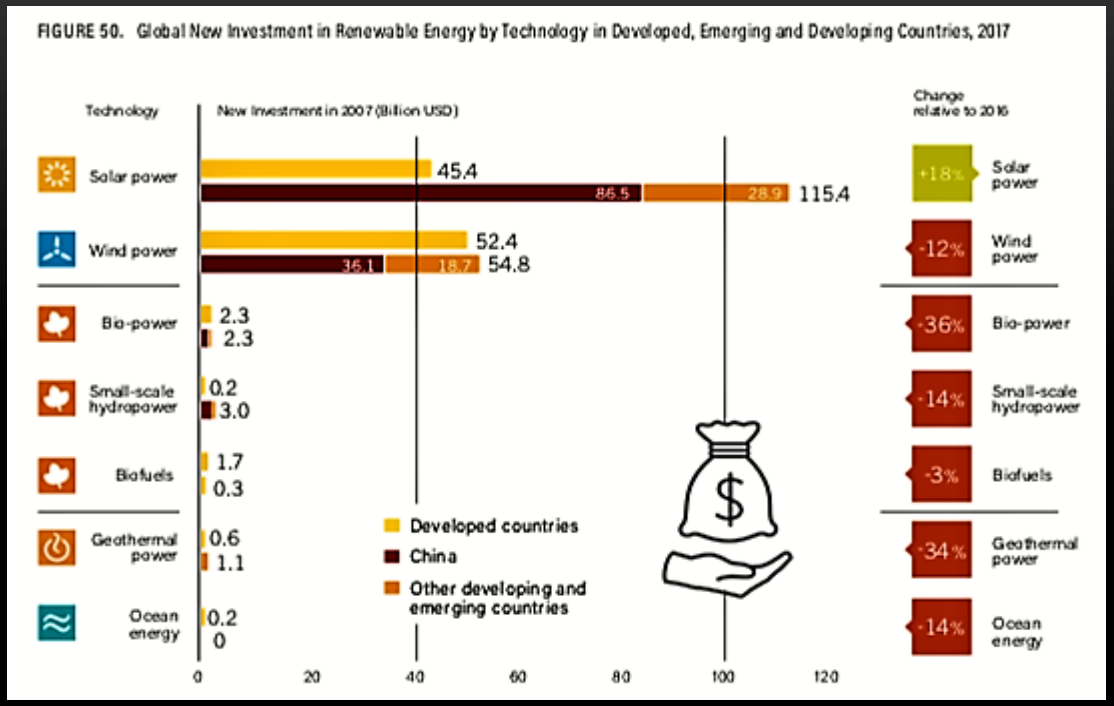
CHART 4.
Growth in global renewables investment 2004-2017 (US$bn)
Source: Bloomberg New Energy Finance



Renewables investments of $1+Trillion since 2013 & new $200+B/year investments

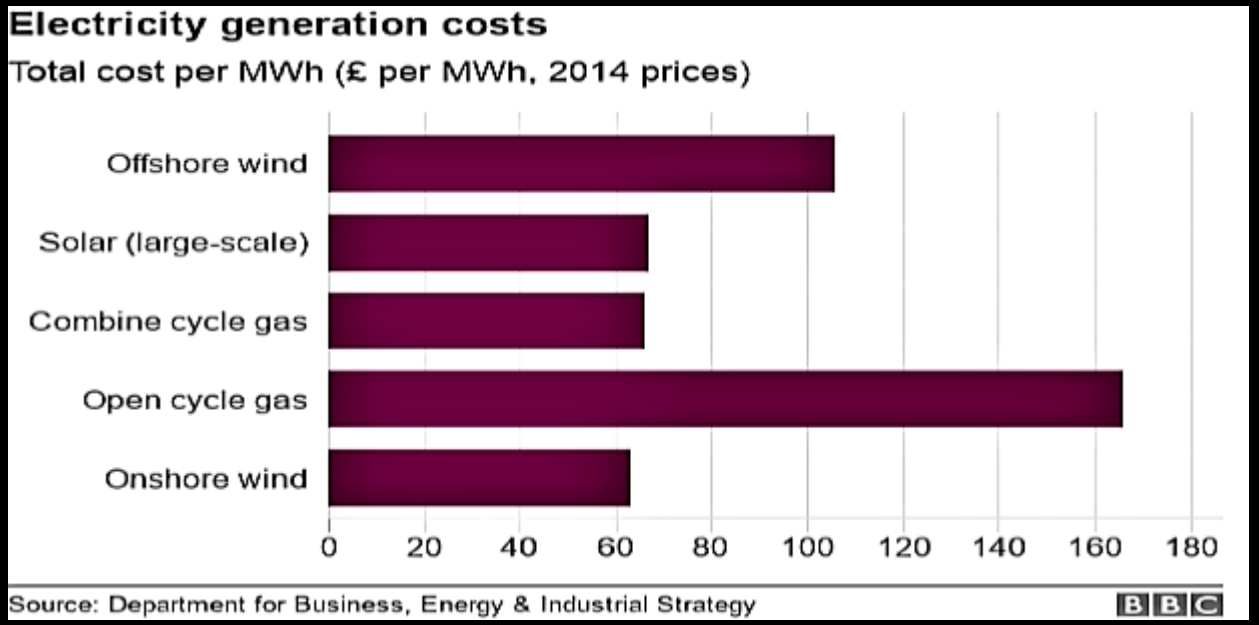
Renewables Technology Investments & Cost Reductions

GI
Ref: REN, B2



Globally, onshore wind schemes are now costing around $0.04-0.06 per kilowatt hour (kWh) & is competitive vs fossil.
The cost of solar PV is down to $0.10 per KwH.
In comparison, the cost of electricity generation based on fossil fuels typically falls in a range of $0.05 to $0.17 per KwH
IRENA estimates that offshore wind and concentrating solar power should cost in a range of $0.06-$0.10 per KwH by 2020-22 which are competitive with fossil fuels.

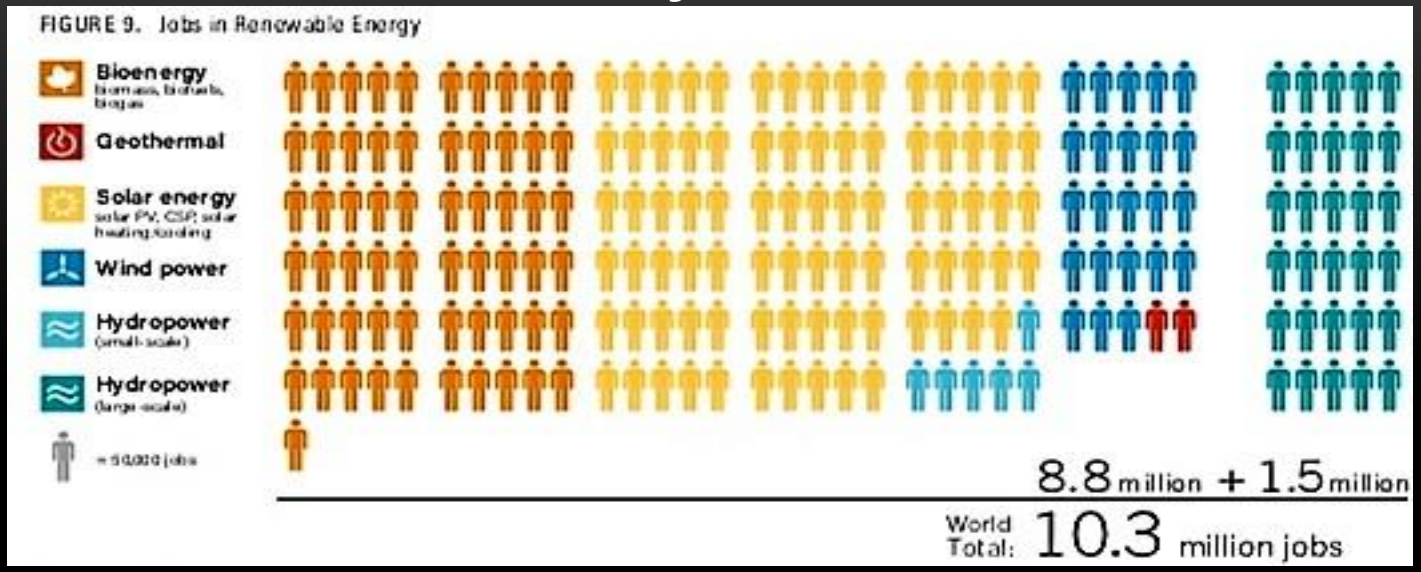
IRENA said the cost of generating power from onshore wind has fallen by around 23% since 2010 while the cost of solar photovoltaic (PV) electricity has fallen by 73% in that time. With further price falls expected for these and other green energy options, IRENA forecasted that key renewable energy technologies should be competitive on price with fossil fuels by 2020.



Low Carbon Economy Created 10M+ New Jobs Globally

GI

Ref: REN, B2

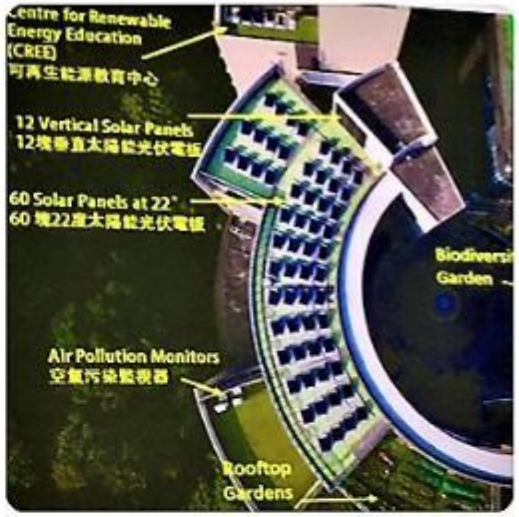


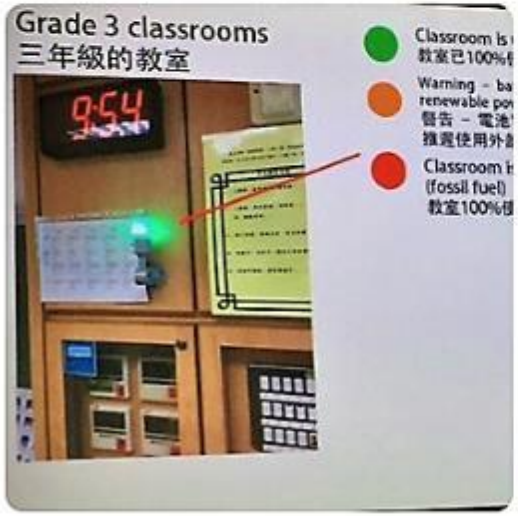
IRENA estimated that since 2013 more than $1 trillion has been invested in renewable energy globally & the industry now provides nearly 10 million jobs globally.

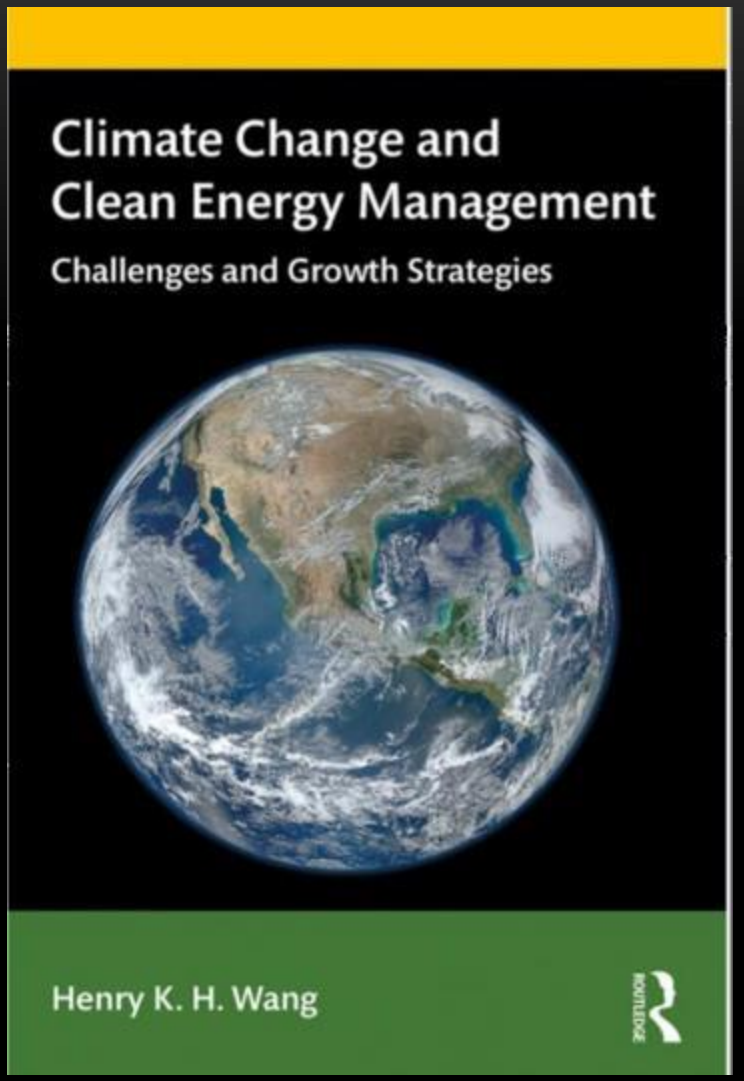
TABLE 1. Estimated Direct and Indirect Jobs in Renewable Energy, by Country and Technology

	World	China	Brazil	United States	India	Japan	Germany	Total EU[a]
	Thousand jobs							
Solar PV	3,365	2,216	10	233	164	272	36	100
Liquid biofuels	1,931	51	795[a]	299[b]	35	3	24	200
Wind power	1,148	510	34	106	61	5	160	344
Solar thermal heating/cooling	807	670	42	13	17	0.7	8.9	34
Solid biomass[a,b]	780	180		80[c]	58		41	389
Biogas	344	145		7	85		41	71
Hydropower (small-scale)[c]	290	95	12	9.3	12		7.3[d]	74[d]
Geothermal energy[a,d]	93	1.5		35		2	6.5	25
CSP	34	11		5.2			0.6	6
Total	8,829[e]	3,880	893	786	432	283	332	1,268
Hydropower (large-scale)[e]	1,514	312	184	26	289	20	7.3[d]	74[d]
Total (including large-scale hydropower)	10,343	4,192	1,076	812	721	303	332[d]	1,268

Green Building Transformation, Education & Youths

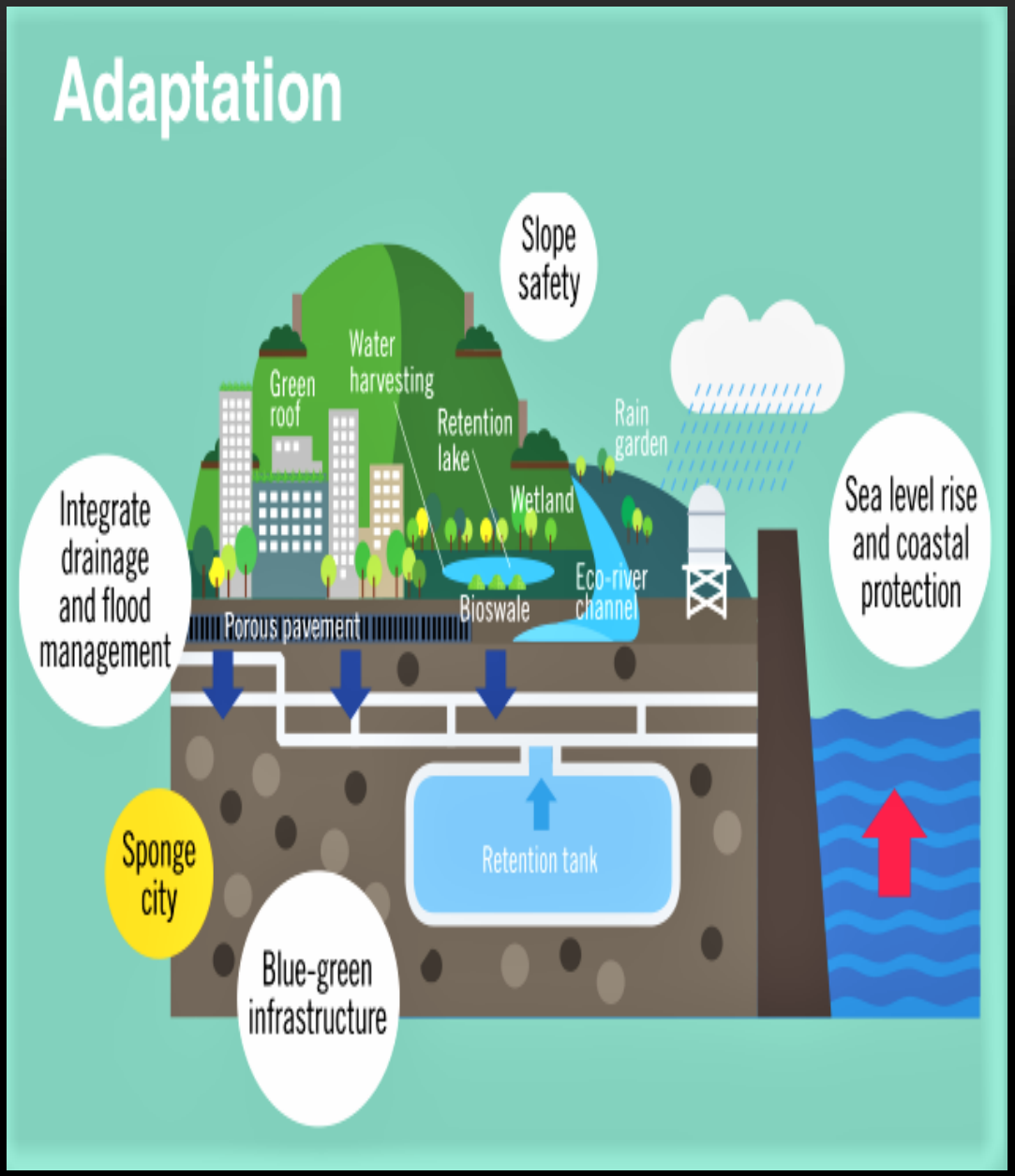






A leading International School in Hong Kong has successfully incorporated Sustainability & Green Building into their Education programs.
Renewables installed in School, with green power traffic lights in classroom.
Food waste recycling with students to make compost for School gardens.

HK Sustainable Smart City Green Buildings Improvements



- **Smart Sponge City?**
- **Clean Energy Net Zero?**
- **Green Economic Growths?**
- **Paris Agreement Targets?**

Ref: HKG, B2

HK Green Buildings & Decarbonisation - Key Summary

- Climate Change Impacts
- G20 & B20 Outlooks
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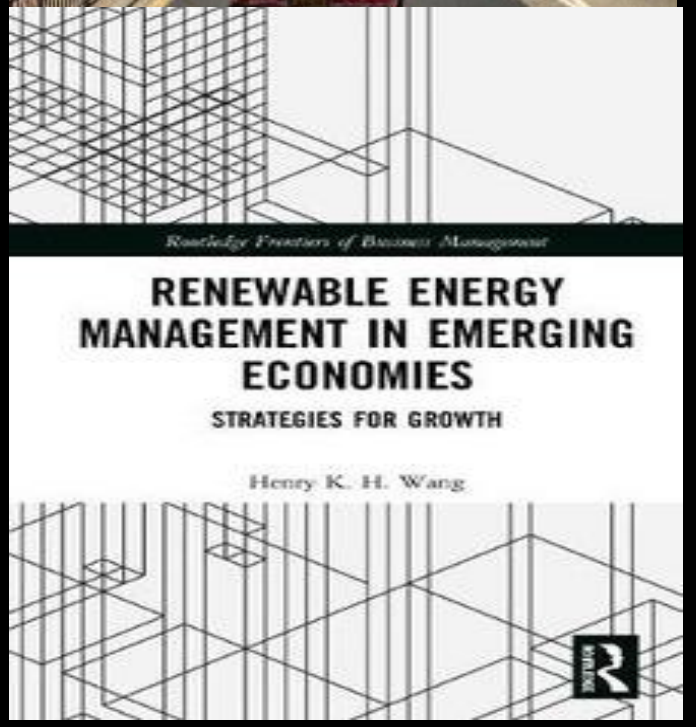
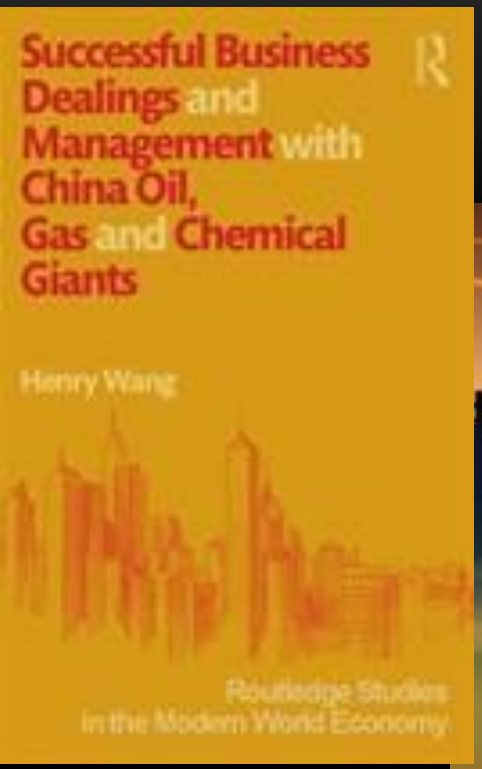
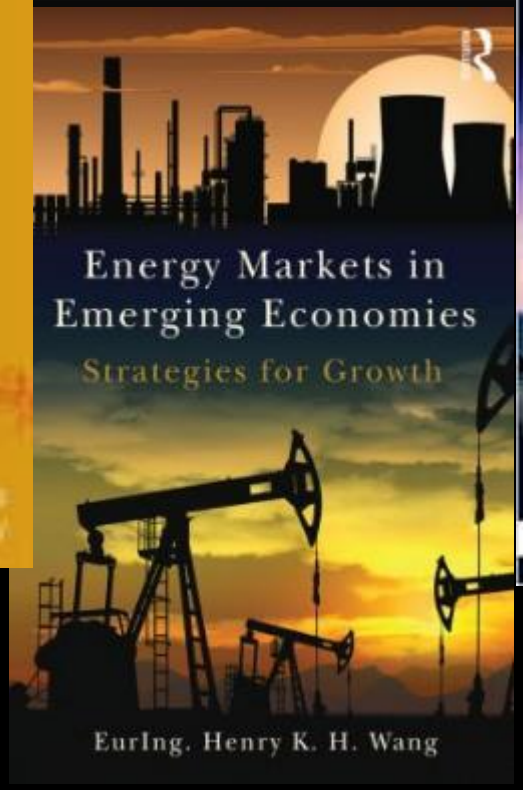
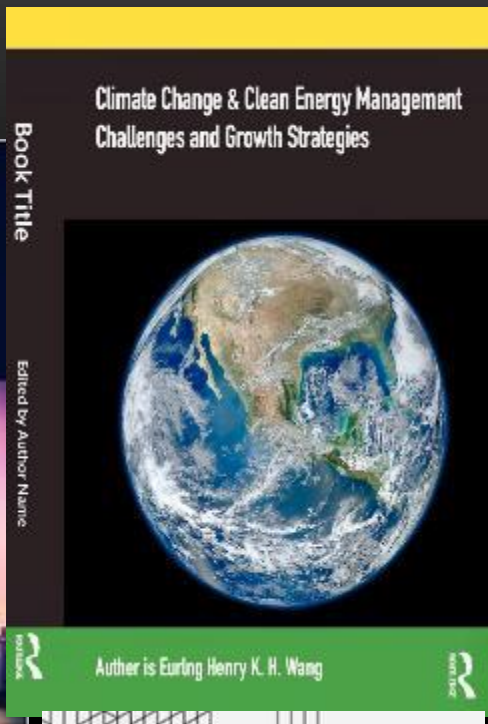
- Policy Inputs & Cooperations

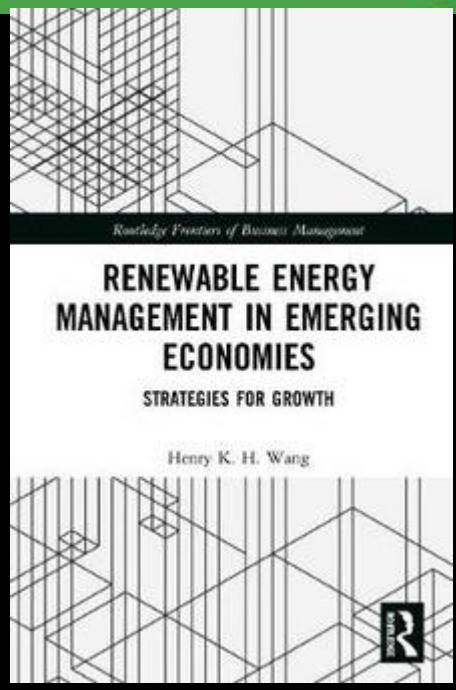


Henry Wang, FRSA, FIChE, CEng, MCMI
International Advisor, Author & Speaker









WeChat: hpcn8899

➢ **Welcome Q&A, Ideas?**

hpcn8888@yahoo.co.uk