



KOREA UNIVERSITY Graduate School of Energy and Environment



Department of Energy, Environment and Climate Change
School of Environment, Resources and Development

Seminar on “Sustainable Urban Development and Climate Change”

9:30:am – 12:00pm, 28 January 2019
Milton-Bender Auditorium, AIT, Bangkok, Thailand

LOW CARBON AND CLIMATE RESILIENT CITIES: KEY FINDINGS FROM RECENT GLOBAL ASSESSMENTS

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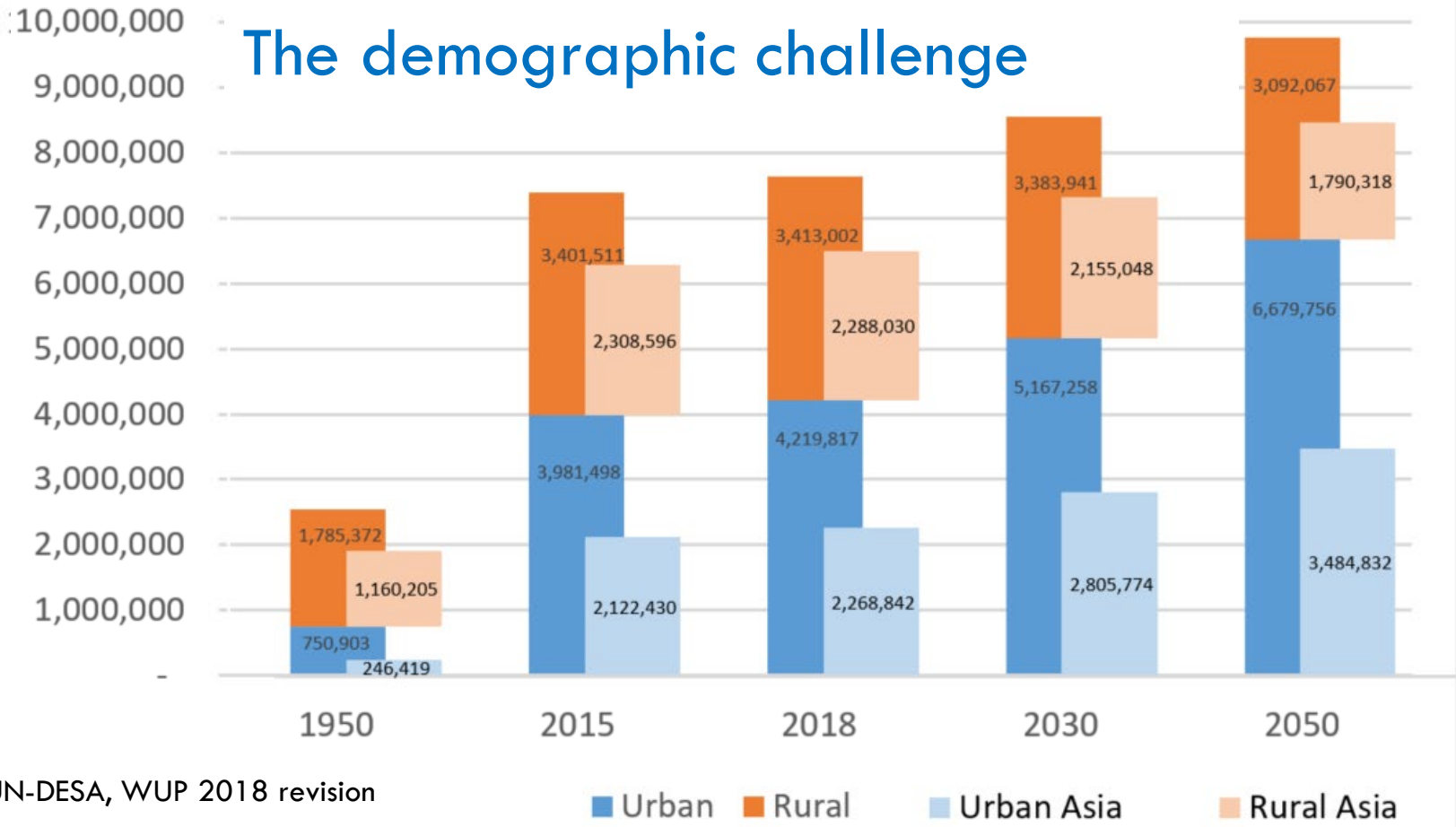
CONTENT

The nature and scale of challenge

The options and solutions

What we like to do in AIT?

The demographic challenge



Asia Population: Asia+ Oceania, excl Australia and New Zealand

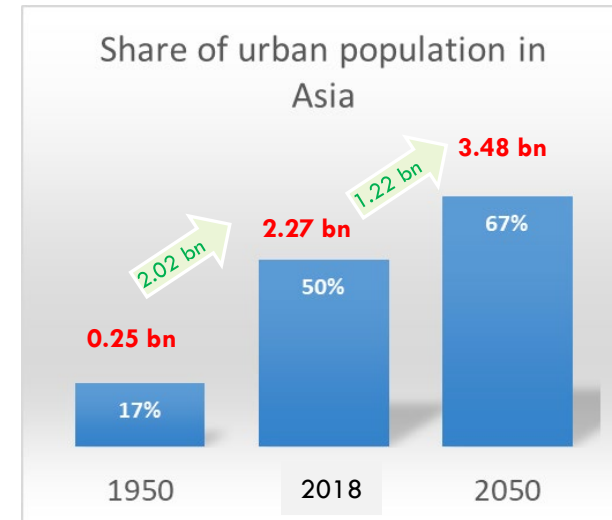
GEOGRAPHY OF URBANIZATION

Globally, 4.2 out of 7.6 bn population live in urban areas in 2018 (55.3%) → 1950(30%), 2050 (68%)

Within Asia, roughly 50% (2.27 bn) of population (4.56 bn) now living in cities (17% in 1950) → over 67% by 2050 → This means 1.22 bn new additions in 2019-50 in Asia (UN-DESA, WUP 2018 revision).

Rapid population growth expected in small (<300,000), 1-5 mn city, and the mega-cities (>10 mn) (UN-DESA, WUP 2018 revision).

If left un-checked, slum dwellers globally from 1 to 3 bn by 2030 (about 65% of them in Asia)



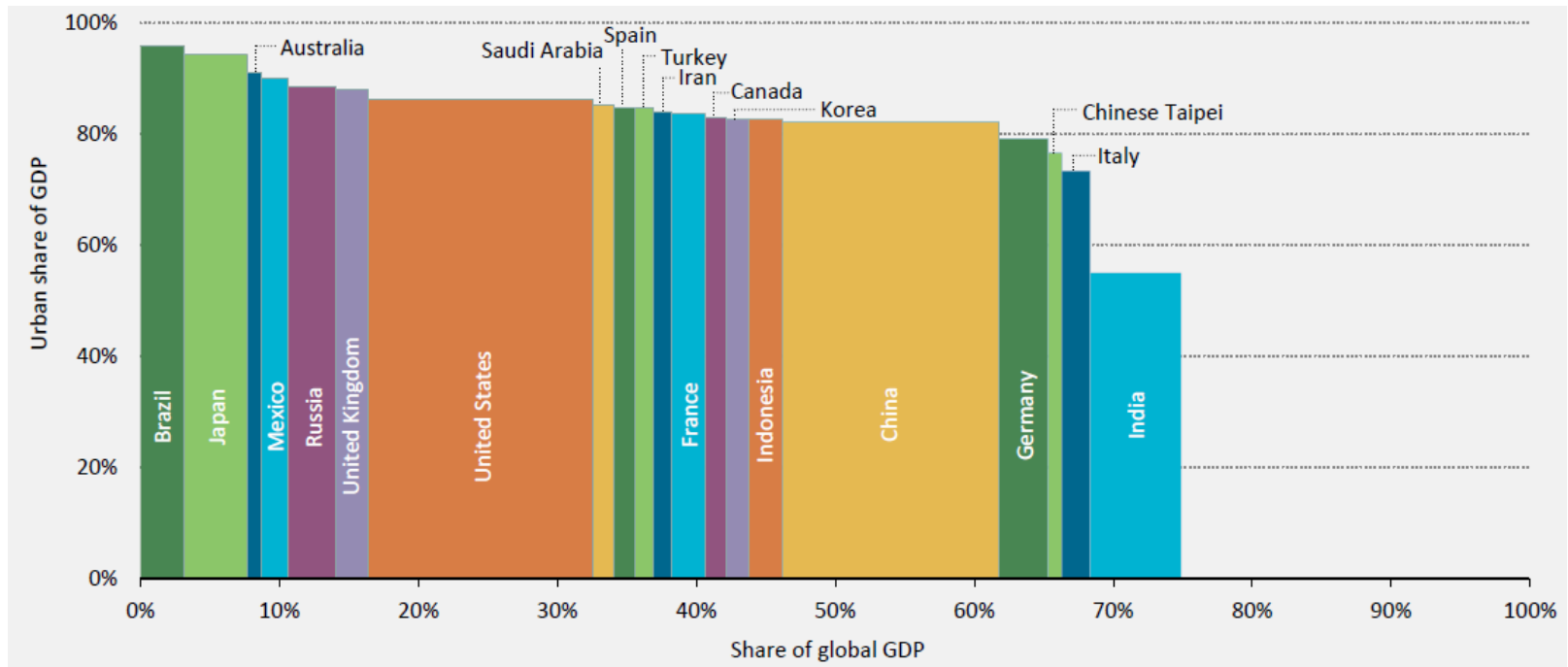
Implications



Within city

Outside city

URBAN CONTRIBUTIONS TO GDP, 20 LARGEST ECONOMIES, 2013

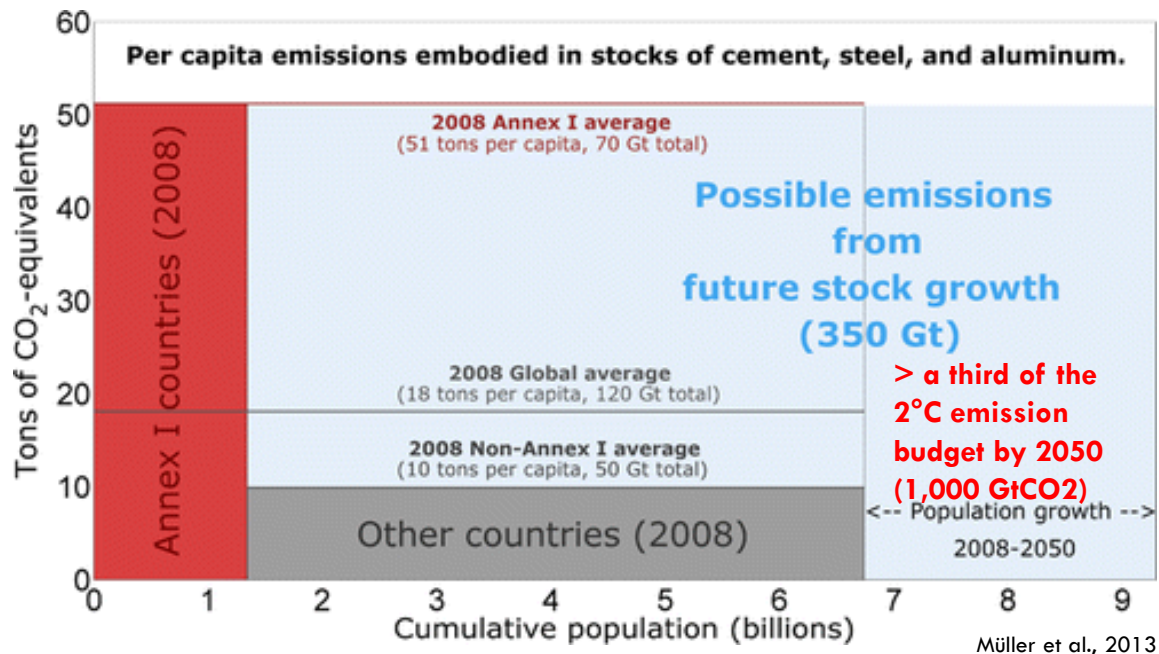


(IEA, 2016)

GLOBAL LAND EXPANSION CHALLENGE

- Urban land occupy between 0.2 to 2.4% of global terrestrial land (2000)- Expansion of urban areas is taking place at twice the rate of urban population growth
- Between 2000 and 2030, urban areas will expand between 0.3 million to 2.3 million km² (56-310%) - 55% of the total urban land in 2030 is expected to be built in the first three decades of the 21st century
- Nearly half of the global growth in urban land cover is forecasted to occur in Asia; 55% of the regional growth to take place in China and India

THE INFRASTRUCTURE CHALLENGE



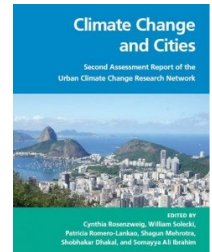
- The existing infrastructure stock
 - Average Annex-I resident is 3 times that of the world average
 - About 5 times higher than average non-Annex I resident
- Future carbon emission potential if developing countries catch up developed countries

.. THE FUTURE

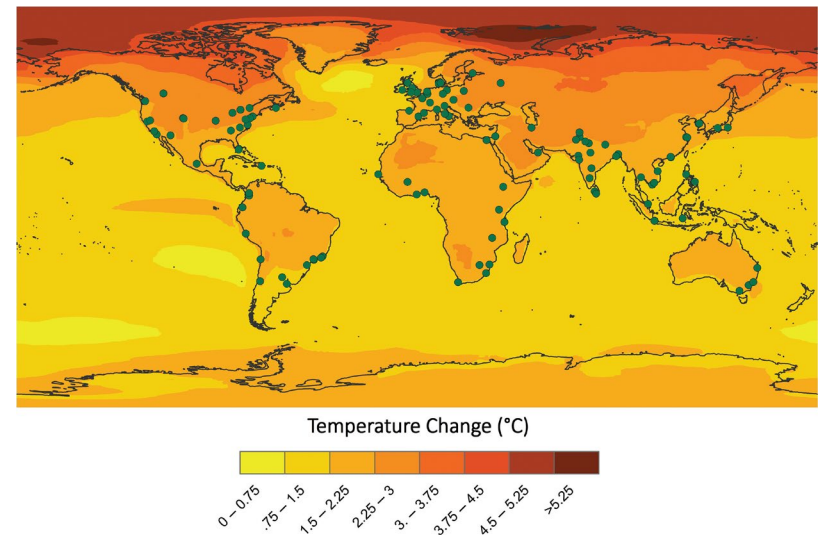
RCP4.5 Scenario in 100 cities:

- Mean annual temperatures to increase by 1.3–3.0°C in 2050s, and 1.7–4.9°C in 2080s;
- Mean annual precipitation by –9 to +15% in 2050s, and –11 to +21% in the 2080s;
- Sea level in 52 coastal cities to rise 15–60 cm by the 2050s, and 22–124 cm by the 2080s.

→ Elevated UHI, air pollution, exacerbated climate extremes, increase in frequency and intensity of heat waves, droughts, heavy downpours, and coastal flooding etc.



Rosenzweig et al. 2018, *Climate Change and Cities Second Assessment Report of the Urban Climate Change Research Network*, Cambridge University Press.



100 cities and 2050s temperature change projections for the mean of 35 global climate models (GCMs) and one representative concentration pathway (RCP4.5). Colors represent mean annual temperature changes for a mid-range scenario (RCP4.5), from CMIP5 models (2040–2069 average minus 1971–2000 average).

..... HEAT STRESS IN THE FUTURE

Ozone related mortality increases in cities with warming

@ 1.5°C, **twice as many megacities will become heat-stressed**, exposing more than 350 million more people by 2050

@ +2°C warming, Karachi (Pakistan) and Kolkata (India) could expect **annual conditions equivalent to their deadly 2015 heatwaves**

The urban poor is expected to be especially affected

Increases in the intensity of UHI could exacerbate warming of urban areas, with projections ranging **from a 6% decrease to a 30% increase for a doubling of CO₂**

Increases in population and city size, in the context of a warmer climate, are projected to increase UHI

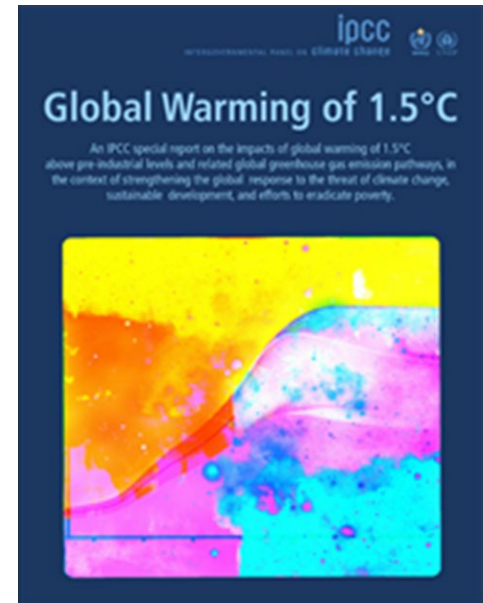


FLOODING AND SEA LEVEL RISE

At least 136 mega cities are at risk from flooding due to Sea Level Rise → Many of these cities are located in south and south-east Asia

Raising existing dikes helps to protect against SLR → By 2300, dike heights under a no-mitigation scenario could be more than 2 m higher (on average for 136 mega cities) than under climate change mitigation scenarios at 1.5°C or 2°C

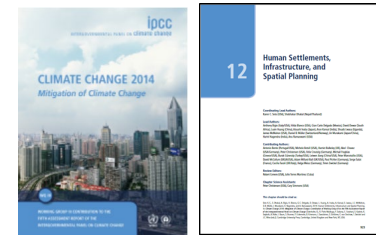
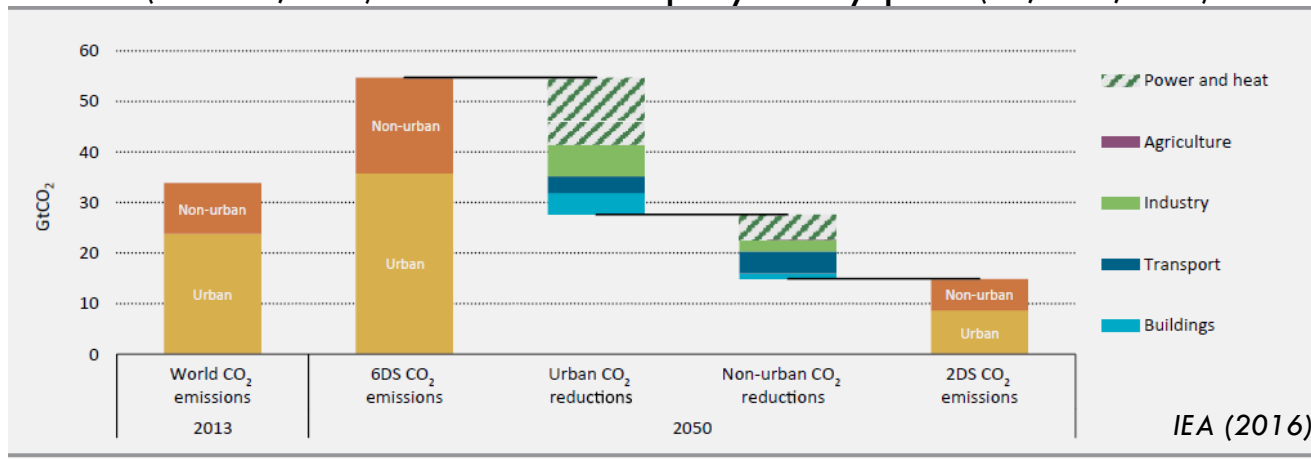
Compound flooding (the combined risk of flooding from multiple drivers) has increased significantly in major coastal cities and is likely to increase with further development and sea level rise



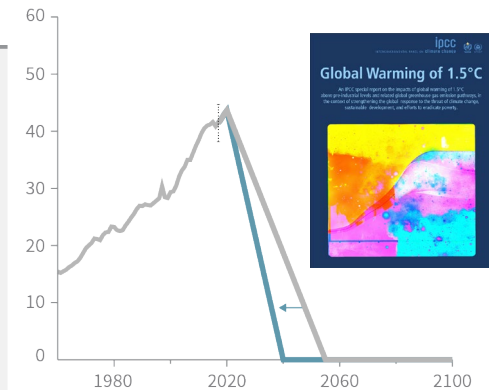
CITIES CONTRIBUTION TO GHG EMISSIONS AND MITIGATION POTENTIALS

Paris Agreement – for 1.5°C CO₂ emissions must fall by about 45% by 2030 (from 2010 levels) or “net zero” by 2050

Over 70% of global energy related CO₂ emissions from cities now (Seto et al, 2014) → Asian cities play a key part (IEA, 2008, 2016)



b) Stylized net global CO₂ emission pathways Billion tonnes CO₂ per year (GtCO₂/yr)



Under the 2DS, global urban CO₂ emissions can be reduced by around 75% in 2050 compared with the 6DS.


WE CAN CUT EMISSIONS IN HALF BY 2040 IF WE BUILD SMARTER CITIES...


MENU ▾

nature
climate change

Commentary | Published: 24 November 2016

Urban infrastructure choices structure climate solutions

Felix Creutzig , Peter Agoston, Jan C. Minx, Josep G. Canadell, Robbie M. Andrew, Corinne Le Quéré, Glen P. Peters, Ayyoob Sharifi, Yoshiki Yamagata & Shobhakar Dhakal

Nature Climate Change **6**, 1054–1056 (2016) | [Download Citation](#) 

Cities are becoming increasingly important in combatting climate change, but their overall role in global solution pathways remains unclear. Here we suggest structuring urban climate solutions along the use of existing and newly built infrastructures, providing estimates of the mitigation potential.

ASIA-PACIFIC GRAPPLE WITH NEW WAVE.....

Demography: How to manage 1.22 bn new urban population in 2019-2050 reaching 3.5 bn by 2050 in Asia?

Economic growth: How to cope up cities as sustained **economic growth center**?

Technology: What is the influence of new technology, **digital economy** and how that helps with solution?

Urban renewable energy boom- what it means to cities?

Infrastructure needs and investment in cities- buildings, transport, built environment, and energy



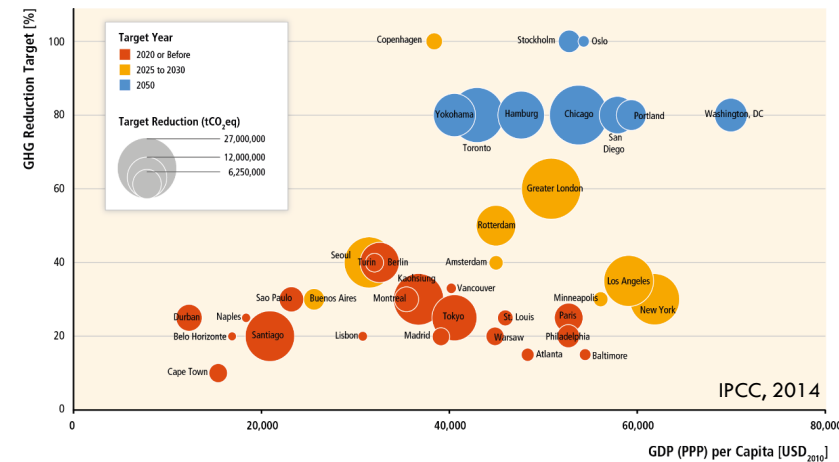
Source: <https://digestafrica.com/uganda-digital-economy-tax-mobile-money/>



Source: <http://itbusinessdirect.com/making-digital-economy-inclusive/>

RETROFITTING/RE-ENGINEERING EXISTING CITIES

- Enhancing the systemic efficiency
- Hastening the infrastructural replacement cycles with green infrastructure
- Re-orienting public choices and consumption through sound incentives, policies and governance
- Developing an effective Climate Action Plans in cities
 - Focused on energy efficiency and end-of-pipe solutions; aggregate impact of actions on urban emissions unclear
- No silver bullets for solutions - each city has to devise own local-specific responses





THE KEY CHALLENGES TO OVERCOME

- Need to go beyond **Incremental change** → to **transformative change**
- Overcoming the size, governance and income **dependency of mitigation solutions**
- Deploying far-reaching **market-based solutions** coupled with planning, such as pricing
- Overcoming the **governance paradox and policy fragmentations**
- Smoothing the entry points: Demonstrating the **best practice technologies and local co-benefits** of urban-scale mitigation actions



KEY MESSAGES

- Our ability to deep-cut global GHG and global climate resiliency depends, to a large extent, on **what kind of cities and towns we will build** and **how urban dwellers embrace carbon mitigation and resiliency**
- A **large window of mitigation opportunities** lie in guiding new urbanization **in next 2-3 decades**
- Low carbon future cities must address GHG emission **‘within’ as well as ‘outside’** its physical boundaries
- Larger opportunities are in **systemic and integrated solutions** → must overcome **governance and policy fragmentations**
- **Role for science** in providing solution-oriented knowledge is extremely important - IPCC, GEA, UCCRN’s ARC3 and others



ipcc



UCCRN
URBAN CLIMATE CHANGE
RESEARCH NETWORK

WHAT DO WE ASPIRE IN AIT..

A regional hub on 'Cities and Climate Change' within next five year → we systematically organize this area inside AIT by → **consolidating**, **showcasing** and **expanding** our activities

Developing AIT as a 'Strategic think-tank' with multiple portfolios ranging from formal degree programs to trainings, dialogues, and strategic research on cities and climate change

To start with.... developing few set of concrete activities and work packages and **seeking active partnerships/collaboration with multitude of stakeholders**



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Contributions to Scientific Assessments and Policy Stock-takes

- IPCC, UCCRN,
- Edmonton 2018 Research and Action Agenda
- Asian Cities and Climate Change Assessment

Web-based Knowledge and Data Portal Development

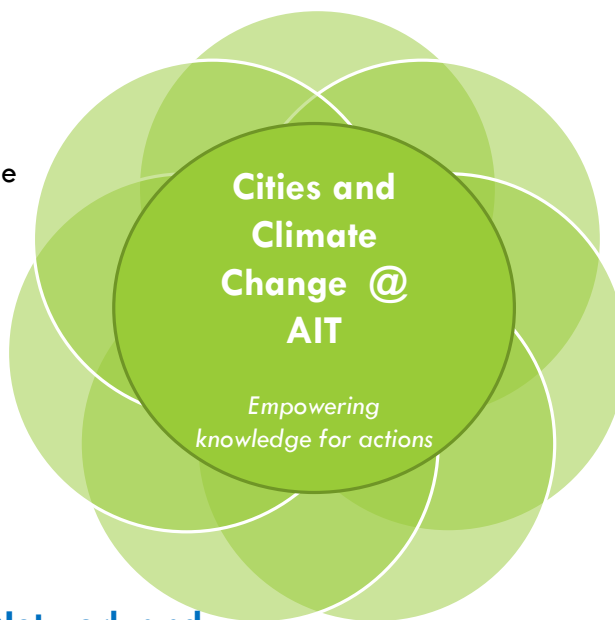
- Urban emission data and analysis
- Analysis of city climate actions
- Repository of key research papers, policy report and analysis
- Policy Briefs, infographics

Research Conferences to Network and Mobilize Regional Expertize

- Asian Cities and Climate Change Conference Series

Practitioner-oriented Formal Degree Programs

- Certificate Program (one semester)
- One year Professional Masters Program with minimum residency requirement on campus



Research-policy-practitioner Dialogues

- Mayors' Forum
- Research-Policy-Practitioners Dialogues

Our portfolio

Professional Programs

- Summer Program (2 weeks intensive): June-July
- **Tailor made Training Programs** for urban decision makers (Local and national government)
- **Tailor made Training Programs** for enablers in developing countries (NGOs, municipal associations, donors and others)

Strategic Research

- Role of disruptive technologies
- Integrated urban infrastructure
- City GHG mitigation options analysis
- City vulnerability and risk assessment
- Financing for local climate change actions
- Deep city de-carbonization for Paris Agreement
- SDG and climate change in cities
- Urban governance and capacities



THANK YOU

MOST OF THE CLIMATE CHANGE BATTLES (BOTH MITIGATION AND ADAPTION) WILL BE FOUGHT IN CITIES

- **Role of cities in meeting Paris Agreement is key:** Cities and climate change has emerged as key topic in both science, policy and practitioner communities
- **Science:** IPCC attach great importance to cities agenda, IPCC special report, UCCRN ARC3.2; citiesIPCC conf and research and action agenda.
- **Global Policy:** Other global key initiatives such as New Urban Agenda, SDGs and Sendai Framework on DDR all link cities strongly.
- **Actions:** Cities are ambitiously pledging, developing response plans and implementing actions with support from research, policy and practitioner communities.
- **The knowledge gaps are critical and the knowledge-based capacity building are crucial** for action - thousands of cities needs solutions and capacity building.