

Cities: Asia's Catalysts for Net Zero

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Executive summary

Asian cities currently contribute 80% of Asia's economic activity and account for 54% of the region's carbon emissions. By 2050, Asia's urban population could grow by 1.1 billion and reach 3.4 billion, which is the equivalent size of today's global urban population. In the absence of significant climate adaptation measures, the most significant increase in energy consumption and greenhouse gas emissions is expected to take place in Asian mega-cities. Existing infrastructure and urban development pathways could lock cities into unsustainable growth and consumption models, with worsening impacts on climate change. The future expansion of urban areas on agricultural lands and forests could also lead to the destruction of natural carbon sinks and important climate adaptation systems. Limiting climate change therefore means decarbonizing Asian cities.

The good news is that there is a strong value proposition for Asian cities to accelerate their decarbonization. Physical climate risks and their associated social and economic costs are already significant. Their impact, if unmitigated, could increase substantially, and have a material effect on Asia's 597 million urban poor. Transition risks, if poorly managed, will also be consequential. Taken together, these risks could materially reduce the GDP of cities in Asia, and therefore regional growth. On the other hand, Asian cities are uniquely positioned to capture the opportunities that will arise from the climate transition. Through prioritizing climate adaptation solutions that deliver co-benefits, they also have the opportunity to achieve progress on broader development goals.

As the majority of Asia's economic activity takes place in cities and urbanization is still progressing, there is a significant opportunity to increase resource efficiency and transform Asian urban growth models to make them more circular, regenerative, and inclusive. While recognizing that the contributions to climate mitigation and adaptation of Asian cities will differ, the report discusses three key avenues through which cities could have a strong positive impact on decarbonization: as key sources of financial capital, dynamic hubs of innovation, and incubators of transformative policy solutions.

Asian cities are on the front line of climate change

Asian cities are a key contributor to carbon emissions. They are also on the front lines of the growing physical risks associated with climate change. Consequently, Asian cities must play a critical role in the fight against climate change. This section explores why.

Cities contribute significantly to climate change

The World Bank's Climate Change Action Plan (2021–2025) identifies cities as one of five key systems that generate the most greenhouse gas (GHG) emissions. More than 80% of Asia's economic activity (GDP) is concentrated in cities. Between 2000 and 2015, the urban share of regional GHG emissions in Asia increased from 46% to 54%, and average per capita urban GHG emissions increased 72% from 3.0 to 5.1 tCO₂-equivalent per person. With moderate to low mitigation efforts, this share will increase steadily through 2050.¹

Asia's rapid urbanization has also resulted in significant land use changes and the destruction of natural carbon sinks and adaptation systems. The future expansion of urban areas could take place on agricultural lands and forests, leading to the loss of carbon stock and carbon sequestration capacity.

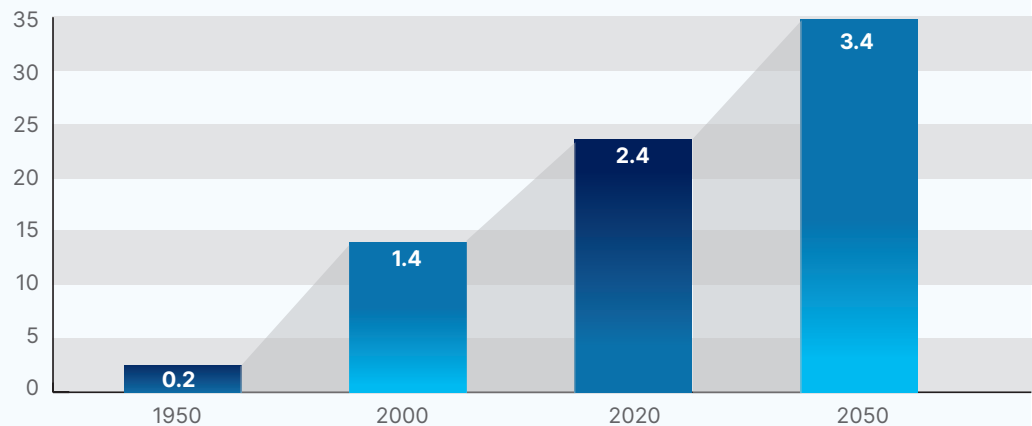
In the years to come, the most significant increase in energy consumption and greenhouse gas emissions in Asia is expected to take place in mega-cities. The growth of an increasingly affluent urban population will lead to the rapid expansion of housing and infrastructure. Existing infrastructure development and growth patterns could lock cities into unsustainable energy, and production and personal consumption models that could worsen climate change. Hence, limiting climate change means decarbonizing Asian cities and evolving their development pathways.

Urban population growth creates opportunities to decarbonize at scale

Since the 1950s, people have been moving to urban areas in search of better economic opportunities, services, and education, prompting Asia's rapid and continuous urbanization. Cities in Asia have been driving global urban growth. By 2050, seven out of 10 people will live in cities globally.

Today, Asian cities are home to 2.3 billion people, which is more than twice the size of the entire population of the United States and the European Union combined. By 2050, Asia's urban population alone is projected to reach 3.4 billion (Figure 1), which is equivalent to the size of today's global urban population.

FIGURE 1
Total urban population in Asia at mid-year, 1950-2050 (billions)



Source: United Nations, Department of Economic and Social Affairs, Population Division (2018). World Urbanization Prospects: Custom data acquired from their website.

Accordingly, Asian cities will account for a big part of the growth in CO₂ emissions in the coming decades unless they take strong climate action. With 66% of Asia's population projected to be living in cities by 2050, there is an opportunity to transform growth models and decarbonize at scale.

There is a strong value proposition for Asian cities to decarbonize

Climate change presents risks and opportunities for Asian cities as well as a number of material concerns. Asian cities therefore have a practical and moral imperative to decarbonize. This section highlights the linkages between climate action, economic development, competitiveness, and social equity, and explains why there is a strong value proposition for Asian cities to decarbonize.

Asian cities are particularly exposed to climate risks

Asia's export-oriented growth has led to the development of many coastal and low-lying cities. These, and Asian cities more generally, are now particularly exposed to the effects of climate change and facing multiple climate related crises.² The Notre Dame University's Global Adaptation Initiative (ND-GAIN) index shows that many Asian cities are both vulnerable to climate change and ill-prepared to deal with its effects.³ Data from Munich Re shows that Shanghai, Hong Kong, Dubai, and Mumbai are particularly at risk.

In 2021, Asia's 100 weather-related hazards resulted in almost 4,000 fatalities and affected nearly 48.3 million people. Estimates of the cost of related damages range from US\$35.6 billion (EM-DAT and UN-ESCAP) to US\$78 billion (AON) with most of the impacts concentrated in cities. In the decades to come, the human and economic costs of climate change are expected to increase significantly.⁴ The aggregate economic cost in particular, which includes both direct costs (damages from extreme weather, lost workdays, etc.) and the cost of adaptation, will be considerable. Southeast Asia and India are expected to suffer the biggest costs.⁵

For Asia, three types of risks stand out for their high probability of occurrence and high cost:

- **Floods:** According to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC6) and to the World Meteorological Organization, sea levels in Asia Pacific have risen faster than the global average and the rise is accelerating. In 2021 alone, an estimated 21.3 million people in Asia were affected by floods, most of them urban residents. In the absence of effective adaptation and mitigation measures, an estimated 300 million could be exposed to flood risks and the cost of floods will continue to increase.⁶ The rapid cave-in of land in several Asian cities is compounding risks.⁷ Recent satellite data shows that land subsidence rates in cities like Tianjin, Chittagong, Manila, Karachi, Taipei, and Mumbai are several times the mean sea level rise.

Case Study:

Indonesia's US\$33 billion move to relocate its capital from Jakarta to Nusantara

In 2019, Indonesian President Joko Widodo announced his plan to move the country's capital city to Nusantara, in Borneo. Jakarta faces problems like air pollution, traffic jams, extreme amounts of rainfall, and severe flooding that have been worsened by climate change. Moreover, the massive extraction of ground water under the city is causing it to sink. By some estimates, 95% of north Jakarta will be underwater by 2050, affecting 1.8 million people.

The initiative is expected to cost US\$33 billion with 80% of the funding coming from private and foreign investors. The eventual goal is to create a new center for economic gravity. A "superhub" comprising six economic clusters in clean technology, integrated pharmaceuticals, sustainable agriculture, health and eco-tourism, chemical products, and low carbon energy will be developed, as well as supporting clusters focused on twenty-first century education, smart city technologies, and industry 4.0. The aim is to have 1.7 to 1.9 million people living in Nusantara by 2045.

The Asian Development Bank is supporting the project to ensure that Nusantara will be smart and carbon neutral. This entails achieving environmental sustainability, not least by reserving 70% of the city as green areas and revitalizing the rainforests at the heart of Borneo as the "lungs of the earth." Authorities have announced that 80% of mobility in the new capital will be supported by public transport, cycling, and walking, and that energy will come from renewable sources.

- **Droughts:** In 2021, an estimated 23.2 million in Asia people were directly affected by the reduced availability of water, including for irrigation. Economic damages increased 63% compared to the previous 20-year average, according to the UN-ESCAP. Droughts will continue to exacerbate food, water, sanitation, and energy security risks in Asia.⁸ By 2050, rice, soybeans, wheat, and maize prices are projected to rise due to lower yields.⁹ Much of ASEAN and South Asia have become water and food security “hotspots.”¹⁰ This will create supply challenges for cities that will comprise 66% of Asia’s total population by 2030.
- **Heatwaves and heat stress:** These are also intensifying, particularly in cities where they are compounded by the heat island effect. By 2050, Central Asian cities could see temperature increases of 6°C or more.¹¹ The International Labor Organization (ILO) estimates that a global average temperature increase of 1.5°C by 2030 will affect productivity through a 2.2% loss of total working hours due to heat stress. Asia’s poorest economies where more people work outdoors will be most affected.¹² Effective climate action could reduce social inequalities.

Cities can create inclusive growth by addressing climate change

Climate-related increases in water, food, and energy prices will impact the urban poor disproportionately. Moreover, Asia’s 597 million people living in slums and informal settlements, along riverbanks, on hillsides, or on slopes prone to landslides will be the most exposed to the physical risks of climate change.¹³

Targeted climate adaptation and mitigation actions could support gains in social equity as follows:

- The construction of sustainable and resilient infrastructure could help extend access to basic services, such as transportation, and enhance public health.¹⁴ It will also create jobs.
- Measures to build resilience in coastal areas, control urban floods, and upgrade inadequate housing will reduce climate risks for the most vulnerable communities. They will also support improvements in public health and well-being.^{15, 16}
- The transition to clean energy will help reduce energy poverty issues and their associated health risks, particularly for the elderly.^{17, 18}
- Green and blue urban infrastructure such as forests, parks, ponds, and lakes will reduce the exposure of the urban poor to excessive urban heat.^{19, 20, 21, 22, 23}
- Urban agriculture programs implemented to enhance food security will reduce household food expenditures and bring new or additional sources of income to the urban poor.^{24, 25, 26, 27}
- The pursuit of circularity may enable the development of informal jobs related to waste collection and management.

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- Carbon taxes and carbon trading revenues could be used to redistribute income toward those who will feel the biggest effects of climate change and of the climate transition, or to generate additional tax revenue for green development projects.

Climate action will protect and spur economic growth

Asia's long-term growth depends on a stable and well-functioning natural environment. Climate adaptation will decrease disruption risks. It will also promote cities' long-term growth.

Cost savings

Most Asian cities have sufficient solar and wind energy potential to cover their own energy needs. In most Asian markets, renewable energy sources such as solar photovoltaics (PV) and wind have become the cheapest source for new electricity generation.^{28,29} Recent modelling in 74 cities has shown that fully transitioning to wind, water, and solar energy by 2050 could trigger overall cost savings in excess of 80% (Figure 2). The savings would come from reducing energy costs, public health costs from mortalities and air pollution, and climate costs.³⁰ Moreover, switching to renewables creates indirect cost savings as low-carbon investments tend to have slightly longer lives and fossil fuel-based economies spend the most on physical assets for energy as a share of their GDP.

The energy efficiency measures associated with climate adaptation save money for businesses and residents. And urban resilience measures, such as coastal protection and flood control systems, also reduce the human and financial cost of climate disasters and help maintain supply chains of goods, services, and financial flows.

All these cost savings could enable investments in high-productivity economic activities that can lead to future growth.

Employment creation and higher wages

The transition to a green economy could boost overall job growth. Data from Europe supports this view. Europe's environmental economy grew faster than the overall economy over the period from 2000 to 2017, at a rate of 3.2% compared to 1.4% for the overall economy.³¹ A similar trend was seen in employment in the environmental sector. Green jobs grew by 32% over the period, compared with 9% overall.

While the transition to net-zero emissions is expected to accelerate job growth, there will also be job dislocations, and affected workers will require retraining and support to ensure a just transition.

Productivity gains and competitiveness

Compact urban development models, such as transit-oriented development (TOD) approaches and mixed-use models, decrease transportation times, thus reducing congestion and energy costs and increasing productivity.³² A study showed that congestion costs in Bangkok, Kuala Lumpur, Jakarta, Manila, and Beijing ranged from 0.7% to 15% of their gross domestic product.³³ Another study from Beijing also showed through reducing carbon emissions the city had realized cost savings, increased productivity, and enhanced socio-economic conditions.^{34,35} Adaptation measures and green innovation also support efficiency gains.

New growth opportunities

According to the OECD, the climate measures required to limit the average rise in global temperatures to two degrees by 2050 could increase global GDP by up to 5%.³⁶ Climate adaptation-related business opportunities could reach US\$2.1 trillion, which stands at around seven times current reliable estimates on the cost of the low-carbon transition (excluding losses on stranded assets).³⁷ For Asian cities these opportunities could come in several forms:

- **Opportunities related to green finance** – In 2020, climate-oriented equity indices and bonds outperformed the broader market by 2–5%.³⁸ Asia's green financial centers will derive significant wealth from trading green financial products as these are set to drive the highest rates of return. Moreover, Asian financial institutions will see significant new business opportunities related to climate mitigation and adaptation projects. Data from the Climate Policy initiative shows that in 2019 and 2020, Asia accounted for almost half of the globally tracked climate investments.³⁹ Asian financial institutions will play a significant role in facilitating raising the US\$18 trillion required to support Asia's climate transition by 2030.⁴⁰
- **Opportunities related to natural endowments** – Cities in Qatar, Saudi Arabia, the UAE, and Australia could produce green hydrogen for export. Cities with coastal blue carbon ecosystems and forestland could capture and store CO₂ and generate carbon credits that could be traded. Cities like Singapore and Shenzhen will indirectly benefit through building Voluntary Carbon Markets (VCMs) and becoming “carbon services hubs” in Asia.

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- **Opportunities related to innovation** – Many Asian cities could play a strong role in developing green technologies, setting technology standards, and grooming local enterprises to capture future market opportunities for sophisticated low-carbon goods. Green innovation also supports local productivity gains, helps attract high-value foreign direct investment, and creates well-paying jobs.
 - **Opportunities related to sustainable tourism** – The sustainable tourism market is expected to increase by US\$336 billion between 2022 and 2027, driven by the implementation of sustainable tourism practices and by the growing demand from environmentally conscious tourists.⁴¹ Asian cities could become eco-tourism destinations and generate revenue to support local conservation and climate mitigation activities.

Cities can achieve gains in well-being through climate adaptation

The United Nations Sustainable Development Goals (UN-SDGs) include a specific goal to make cities inclusive, safe, resilient, and sustainable (SDG 11). Urban adaptation provides opportunities to meet SDG 11 and to improve public health and human well-being (SDG 3).^{42, 43}

Evidence from cities in China, India, Indonesia, Vietnam, and Thailand shows that transitioning from fossil fuels to clean, renewable energy sources, electrifying transportation, and becoming more energy efficient not only reduces air pollution and global warming, but also improves public health and social equity.^{44, 45, 46}

Urban planning and transportation policies that promote walking, cycling, and using electric transportation also enhance the physical and mental health of urban residents.^{47, 48, 49} So do green and blue infrastructure as they improve air quality, reduce heat stress, and promote physical activity.^{50, 51, 52}

How Asian cities can be catalysts for net zero

The IPCC6 report highlighted the critical role of cities in tackling climate change. Asian cities have been accelerators of economic and social progress. They can leverage their capacity for innovation to become accelerators of climate action as well.

As key sources of human and financial capital, dynamic hubs of innovation, and incubators of transformative policy solutions, cities are uniquely positioned to lead Asia's decarbonization and capture the opportunities that will arise from the climate transition. Moreover, the concentration of people and activities in cities also provides opportunities to increase resource efficiency and decarbonize

at scale. It also creates the conditions for cities to become the climate policy and technology labs that will incubate solutions to decarbonize Asia.

However, the results of the Carbon Disclosure Project (CDP) City Climate in Action Project show that most Asian municipal governments still have low levels of climate and environmental leadership. CDP's A-list only includes 19 Asian cities out of a total of 122 that disclose transparent information on their climate, deforestation, and water security actions and that implement strong climate mitigation and adaptation measures.⁵³

Greater climate ambition is therefore warranted. Asian cities can start by acknowledging and acting to reduce their impact on natural systems and climate change through deep decarbonization and systemic transformation. As urbanization continues, Asian cities have the opportunity to change their patterns of development of reduce carbon emissions and enhance the livelihood and quality of life of their residents. Doing so will present growth and innovation opportunities, and enhance the overall quality of life, well-being, and social equity of urban residents. Cities may also enhance their soft power and international standing. For instance, in 2022, Singapore ranked first in the climate preparedness pillar of the Notre Dame University's Global Adaptation Initiative (ND-GAIN) index.⁵⁴ Canberra ranked first in Uswitch's global ranking of the most sustainable cities, for providing green public transport and supplying 48% of its energy sustainably.

Cities can become centers of policy experimentation

As compared to central governments, municipal governments can be nimbler in incubating new policy solutions. The high population density also means that cities have the right environment to test and deploy solutions at scale.

Policy experiments are underway in Asian municipalities. For instance, Tokyo and Shenzhen have piloted the development of Emissions Trading Systems (ETS) that are now being rolled out on a national level. Tokyo is testing a cap-and-trade program to incentivize building owners to reduce emissions. Singapore is at the forefront of climate adaptation strategies and taking a pioneering approach to greening existing buildings. Kuala Lumpur is one of the pilot project sites for the UN-ESCAP's "Closing the Loop" circular economy program.

In some key areas, cities are particularly well placed to establish their climate leadership.

Asian cities can lead the way in climate resilience

Due to their high exposure to climate risks, Asian are particularly well positioned to lead the way in climate resilience and to create innovative solutions that will also serve elsewhere.

Singapore's climate resilience approach⁵⁵

Singapore placed first in the latest Notre Dame University's Global Adaptation Initiative (ND-GAIN) index for taking an effective whole-of-government approach to building resilience.

Coastal adaptation and flood protection

The Building and Construction Authority (BCA) has restored Singapore's shoreline with a geo-bag seawall system and over 70% of Singapore's coastline is now protected against floods and soil erosion with hard structures such as seawalls and rock slopes. The National Parks Board (NParks) has also restored mangrove areas to help reduce shoreline erosion.

New reclaimed land and roads near coastal areas have been raised to protect them from sea level rise. The Maritime Port Authority of Singapore has protected existing port facilities. Singapore's fifth airport terminal is being built 5.5m above the mean sea level. The resilience of power stations and electricity grids, and that of telecommunications infrastructure, including mobile and broadband networks, has also been enhanced. The Land Transport Authority has installed flood barriers at various low-lying underground subway stations and sea level rise projections are being factored into the design of new stations. Minimum height requirements have been set for the entrance levels of buildings. BCA is reviewing strategies to address the increased risk of slope failure due to floods.

Singapore has also significantly upgraded its drainage system. The National Water Agency (PUB) has widened and deepened existing drains and canals and built diversion canals and centralized detention tanks. An underground tunnel and reservoir system is now under development to bring excess storm water into caverns for storage. Significant upgrades to the drainage system at Changi Airport are also in progress. Buildings are required to install detention tanks or green roofs, to slow runoff entering the public drainage system.

Biodiversity protection and green infrastructure development

Singapore is pursuing a "City in a Garden" approach, leveraging trees and biodiversity to provide shade and cover from the weather. About a third of the island is covered by trees. By 2030, 50% more land—around 200 hectares—will be set aside so that every household lives within a 10-minute walk from a park. One million trees will be planted across the island to sequester another 78,000 tons of CO₂, provide cleaner air and cooler shade, and moderate the rise in urban heat. Besides expanding Singapore's tree cover, NParks also established a marine park to protect rare and endangered marine species. Singapore's Civil Defense Force is also stepping up patrols at fire hotspots. Together with NParks and the Meteorological Services Singapore, they are developing a Fire Probability Index to measure the risk of bush fires for different areas.

Green buildings

Singapore's BCA Centre for Sustainable Buildings is collaborating with UNEP to develop and deliver policy tools and approaches, undertaking advocacy work, and providing coordinated support to countries for sustainable resource management in the building sector.

Water and food security enhancements

PUB has pursued a “Four National Taps” strategy to diversify water supplies. Desalination plants are also being built to increase supply as the population grows. Demand management measures, such as a Mandatory Water Efficiency Labelling Scheme, are being implemented. The Agri-Food and Veterinary Authority (AVA) is also diversifying Singapore’s food imports to reduce supply and price volatility risks. By 2030, Singapore aims to meet 30% of its nutritional needs through locally produced food and AVA is now helping local farmers to get climate ready and increase their productivity. Indoor farming is used to supplement vegetable supplies. Fish are protected against plankton bloom and other aquatic diseases in closed containment aquaculture systems, which enhance productivity and maximize resource efficiency.

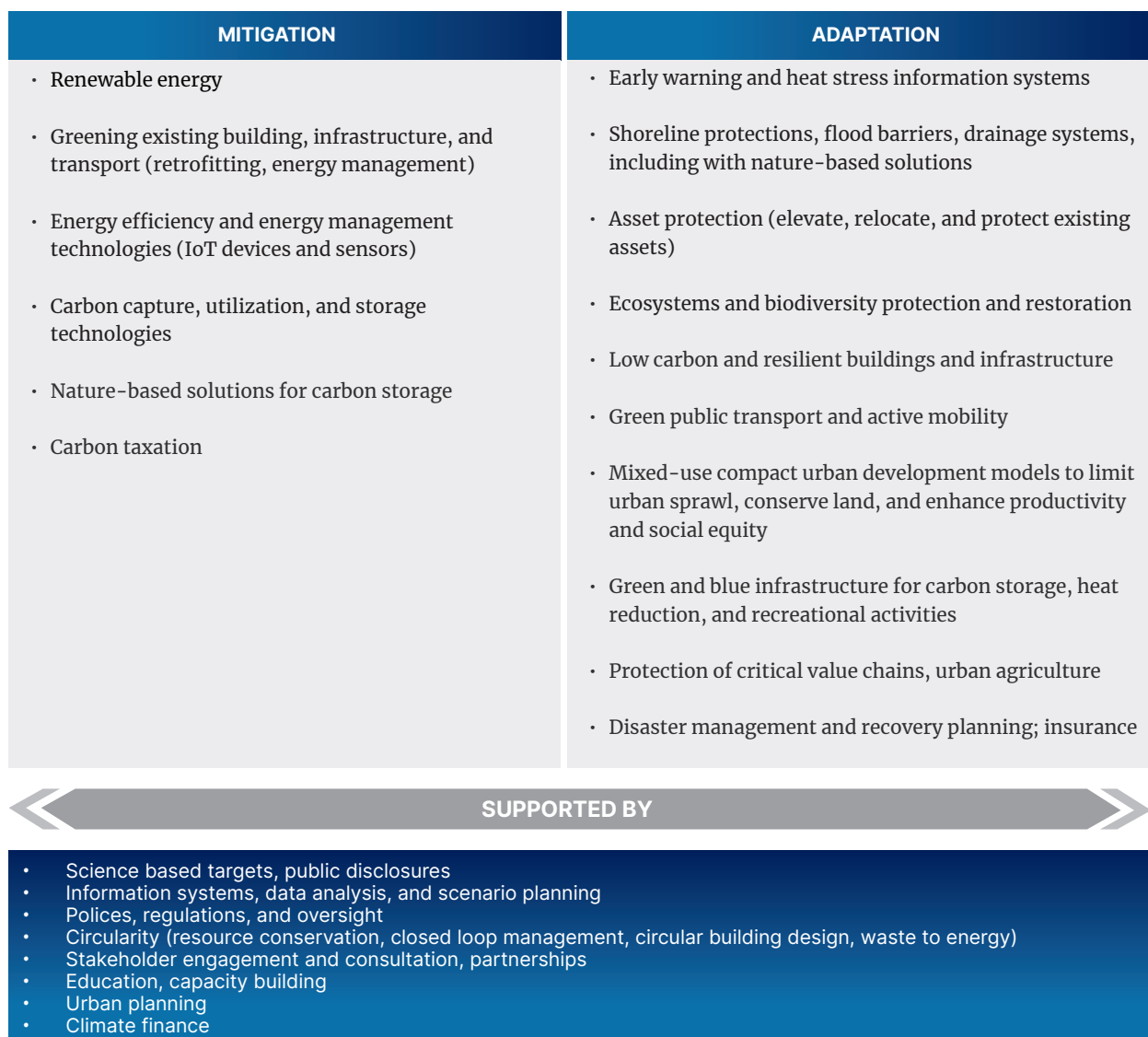
Public health protection

The Ministry of Health is developing a heat stress information system for the development of new solutions to fight future increases in climate-related illnesses.

Climate adaptation solutions will bring co-benefits

Asian cities will need to develop a continuum of policy solutions to concurrently reduce their impact on climate change (climate mitigation) and become less dependent on the natural resources and systems affected by it (climate adaptation). A number of supporting measures, including transitioning towards circular or regenerative economy models, could help achieve both goals (Figure 2).

FIGURE 2 **A continuum of solutions for urban climate mitigation and adaptation in Asia**



Source: Authors’ analysis and Asia Business Council

By implementing various solutions, cities will have the opportunity to support Asia's decarbonization at large and to incubate climate adaptation solutions that deliver co-benefits. Some examples include the following:

- **Compact urban models** – Asia's rapid urbanization provides an opportunity to evolve urban models to address the underlying drivers of climate change and poverty. Compact forms of development have been shown to promote more sustainable consumption behaviours and to limit transportation emissions. Limiting urban sprawl also minimizes the conversion of agricultural land and forests, leading to the loss of carbon stocks and carbon sequestration capacity. Finally, the co-location of jobs and housing increases productivity and enhances economic opportunities, particularly for the urban poor.

Liuzhou: China's capital for electric vehicles (EVs)

The city of Liuzhou in Guangxi, China, is an example of how local authorities worked with multiple stakeholders to encourage the use of EVs for a cleaner environment. With EVs accounting for almost 30% of car sales, more than five times China's national average, Liuzhou now serves as a blueprint for other cities that are looking to achieve similar objectives.⁵⁶

While Liuzhou residents were initially concerned about safety, the National Development and Reform Commission worked to ensure that they would see the convenience and benefits of using EVs. The first step was a complimentary 10-month test-drive public-private partnership campaign in 2017, after which as many as 70% of participants purchased an EV. The campaign was carried out by SAIC-GM-Wuling, a joint venture involving SAIC Motor Corp. and Guangxi Automobile Group and U.S.-based General Motors. Financial incentives and convenience also played an important role. EVs can be purchased from US\$4,500, and charging, which can be done from a household socket, costs just 0.1 yuan or 2 cents per kilometer. Unlimited free parking is available at certain lots. There was also the chance to earn a cash reward of up to 1,000 yuan for driving up to 10,000 kilometers with an EV.⁵⁷

- **Low-carbon, material-efficient, and resilient buildings and infrastructure** – Buildings and infrastructure generate a significant share of Asia's GHG emissions. Moreover, the long lifespan of urban infrastructure locks in behaviors and committed emissions. There is an opportunity to reduce the material and carbon intensity of buildings and infrastructure, to avoid higher future emissions.
- **Green and blue infrastructure** – Forests, parks, green rooftops, ponds, lakes, and rivers help mitigate climate change through carbon sequestration, avoided emissions, and reduced energy usage. Moreover, they support climate adaptation and deliver multiple co-benefits.

- **Carbon sinks** – Asia has significant carbon sequestration potential. Incentivizing the creation and supporting the scaling of nature-based carbon capture and storage projects could help generate new carbon revenue and also induce important co-benefits, as adaptation in agriculture is central to poverty reduction in Asia.
- **Circularity** – Circular economy policies help preserve natural resources and critical ecosystems. They support climate mitigation and resilience, and also reduce dependencies on global value chains. Asian cities should take time to rethink their patterns of consumption, production, and waste management as they continue to develop to promote circularity.

Surabaya: Indonesia's testing ground for waste management solutions

Indonesia's second largest city Surabaya offers lessons to other cities for its innovative and community-led approaches to waste management. Back in 2004, Pusdakota, a local non-profit, joined hands with Japan's Kitakyushu International Techno-cooperate Association (KITA) to carry out a pilot program for quick and affordable household composting in one of the city's low-income neighborhoods located near an industrial area.^{58, 59}

The plan was for pre-sorted organic waste to be transported to a nearby composting center which would produce large quantities of high-quality compost to be sold to farmers and vendors. While the pilot project initially faced obstacles such as residents' unwillingness to separate waste at the source, community participation gradually increased, resulting in a cleaner and greener environment.

Surabaya then worked with other non-profit organizations to scale up the new waste management system. With one compost bin for every ten households, a soft infrastructure was established to help families share information and learn about the benefits of household composting.⁶⁰ Surabaya also held competitions for the cleanest district in partnership with media partners to strengthen community participation.

Next, in 2008, Surabaya introduced waste banks where residents could sell recyclable materials, incentivizing them to sort their refuse the national government unveiled guidelines for waste banks in 2012, and within four years there were 180 branches.⁶¹ In 2013, a collaboration with Japanese company Nishihara also resulted in a "Super Depo" that not only separates waste into various categories but also created jobs.⁶²

As a sidenote, Surabaya has also developed eco-parks as part of its greening efforts. Ten years after the closure of the Keputih landfill, the Institute of Technology Sepuluh Nopember (ITS) examined the soil and concluded that the area was cleared of harmful methane gas.⁶³ Today, the site has been transformed into Harmoni Park, a garden tourism attraction for local families and visiting tourists alike. Similarly, a former fishpond and an unmanaged area were converted into the Urban Forest of Gunung Ayar and the Wonorejo Mangrove Forest, respectively.

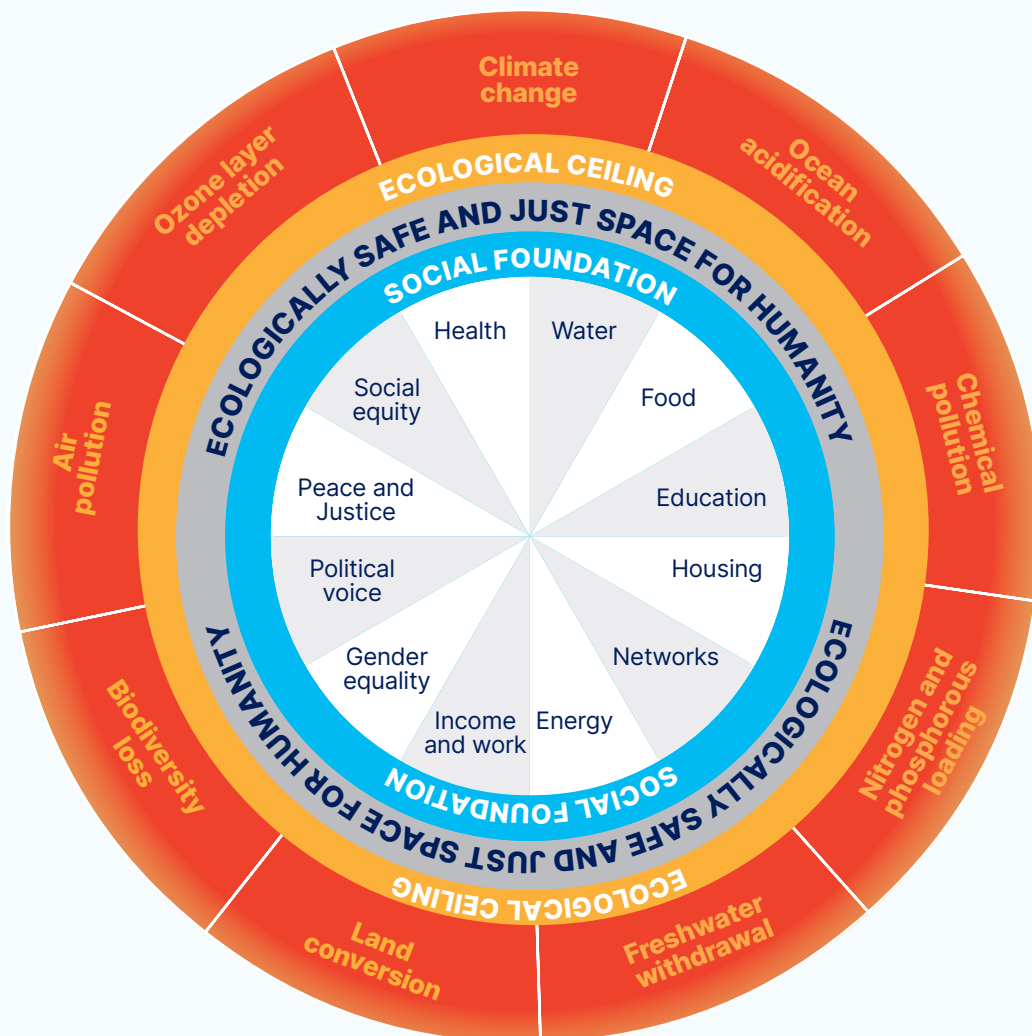
The municipality of Kamikatsu in Japan is another pioneer in waste recycling. It now sorts 45 categories of waste and recycles more than 80% of its refuse. Singapore also recycles and reuses its water to make NEWater and is now looking at ways of converting waste into construction materials.

Doughnut Economics can support balanced growth

Addressing climate change and poverty will promote social equity. In so doing, cities may consider using the Doughnut Economic Model as a guide for policy development.

This model (Figure 3) promotes the idea that economic prosperity depends on human and natural well-being. It puts forwards a humanist view of development that considers the effects of growth on society's 12 essential social goals as defined in the UN-SDGs (the social foundation) and the nine environmental thresholds that should not be exceeded to preserve the health of the planet (the ecological ceiling).⁶⁴

FIGURE 3 The Doughnut Economic Model



Source: Adapted from Kate Raworth's Doughnut Economic Model

The model has been used to guide the sustainable transformation of Amsterdam, Brussels, Melbourne, and Berlin amongst others. It proposes that development pathways be both regenerative and distributive, so that cities can “thrive in balance,” in an “ecologically safe and socially just space for humanity.”⁶⁵

Cities can drive the reallocation of capital to support Asia’s decarbonization

In addition to incubating policy solutions to decarbonize Asia, cities can also drive the reallocation of capital to support the region’s decarbonization. Asian economies must undergo a costly but necessary transformation to become low-carbon and climate-resilient. While discussions about climate justice are ongoing, the reality is that the funding for this transition will mostly come from Asia.

Nine of the world’s top 20 financial centers are located in Asia. As they become green finance centers, they will act as conduits to redirect financing towards the transition.⁶⁶

While investments in sustainable projects have been rising rapidly, they remain insufficient. Between 2013 and 2020, Asia received an average of US\$14 billion per year in climate finance. Collectively, Asian economies need to invest US\$1.3 trillion per year up to 2030 in new infrastructure, renewable energy, energy efficiency, and food, agriculture, and land use related projects to meet their Paris Agreement targets and mitigate climate risks.^{67, 68} This represents a funding gap of US\$1.28 trillion annually over current spending levels. The funding gap in adaptation finance is particularly large—in 2021, only one third of climate finance in Asia was directed to adaptation.⁶⁹ This section explores how Asia’s green financial centers can help fill financing gaps.

The race to net zero: How do Asian financial centers stack up?

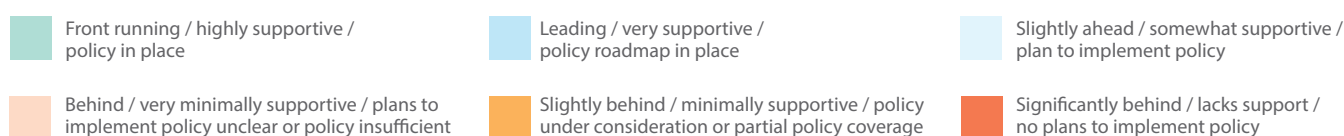
Hong Kong and Singapore have set out explicit goals to become sustainable finance centers for the region. Tokyo considers green finance to be a part of its climate action strategy. The Global Green Finance Index (GGFI), an annual ranking of green financial centers compiled by London-based financial think tank Z/Yen, ranks Seoul, Singapore, Shanghai, and Shenzhen in the top 20.⁷⁰ Its report noted that leading Asia-Pacific and U.S. centers are steadily improving their rankings and increasingly challenging the Western European dominance in green finance. While these are elevating their standing, they still need to evolve their policies and regulatory frameworks to redirect capital towards the transition at scale.

FIGURE 4 Asia's financial centers can evolve their regulatory requirements to accelerate the mobilization of green finance

		Hong Kong	London	Seoul	Shanghai/ Shenzhen	Singapore	Sydney	Tokyo
GGFI ranking and market size	Global Green Finance Index ranking	41	1	12	17 (SH) 20 (SZ)	16	10	24
	Value of green and sustainable bonds issued on the territory or national level in 2021 (US\$ billion)	31.3	53.5	15.8	199	13.6	4.1	11.4
Overall performance in sustainability	Arcadis sustainable cities ranking 2022	63	6	26	66 (SH) 67 (SZ)	35	33	3
	City is A-listed on Carbon Disclosure Project 2022 ranking	No	Yes	Yes	No	No	No	Yes
	Net zero target	2050	2030	2050	2060	2050	2035	2050
	Climate Action Tracker score (compatibility with Paris Agreement)	Not rated	Almost sufficient	Highly insufficient	Highly insufficient	Critically insufficient	Insufficient	Insufficient
Carbon pricing	Is there a carbon tax?	No	No	No	No	Yes	No	Yes
	Price of carbon (US\$ per tCO _{2e} , data from April 1, 2022)	None	\$98.99 (ETS)	\$18.75 (ETS)	US\$9.20 (ETS)	\$3.69 (carbon tax)	None	\$4.42 (ETS) \$2.36 (carbon tax)
	Emissions trading system (ETS)	Integrated Greater Bay Area ETS system under development	Yes	Yes	Yes	No	No	Yes
	Voluntary carbon market in place	Yes	Yes	Yes	China plans to restart its VCM, which was suspended in 2017	Yes	Yes	Yes
Taxonomy	Green taxonomy	Will adopt Common Ground Taxonomy. May develop transition finance taxonomy	Under development	Korean Green Taxonomy	Green Bond Endorsed Project Catalogue	Under development. In consultation stage	Under development (industry led)	Basic Guidelines on Climate Transition Finance and sector-specific technology roadmaps in place, but lacks detail and specific performance criteria of other taxonomies
Disclosure requirements	Climate disclosures mandated for listed companies	Plans to mandate by 2025	Yes	Plans to mandate by 2030	Disclosure requirements under development	Mandatory for listed companies in certain sectors from 2023-2024	Yes	Mandatory for companies with a market cap of at least US\$74.7 million
	Banks required to disclose their physical and transition climate risks and/or climate impact of their balance sheets	Fund managers with at least US\$1.08 billion in assets must disclose scope 1 and 2 emissions	Comply-or-explain	No	No	No	Requirement to disclose material climate risks	No
Greenwashing oversight	Rules to prevent greenwashing in investment products	No rules, but financial regulator is conducting a review of how the industry is mitigating and managing greenwashing risks	Falls under existing laws that prevent false advertising. New rules under development.	Credit ratings subject to requirements when certifying ESG bonds. New draft law will help levy fines for greenwashing	Under consideration	Central bank has introduced disclosure and reporting guidelines for ESG funds	Prohibitions against misleading information for sustainability products, but not TCFD aligned	Financial regulator has set limits on which funds can be labeled ESG

*Note: Shenzhen and Shanghai are presented together because of common policies at the national level. Where policies differ locally, Shenzhen is denoted as SZ and Shanghai as SH.

Source: Official government sources, national stock exchanges, industry associations, multilateral institutions, non-profit research organizations, media reports, authors' analysis



Carbon pricing needs to be more effective in order to influence capital reallocation

In some Asian economies, gaps in climate data constrain carbon pricing. Moreover, carbon pricing can be politically sensitive due to its adjustment costs. But the practice helps markets price climate risks and opportunities, manage transition risks, and reallocate capital optimally. As such, the implementation of carbon prices should be fast tracked in Asia's leading green financial centers.

There are ongoing initiatives but these are mostly at early stages and uncoordinated, with big variations in coverage and prices.⁷¹ While in 2022, South Korea had a carbon price significantly above the world average of around US\$6 per metric ton of CO₂ (tCO₂), overall the share of GHG emissions covered by carbon pricing instruments in Asia remains extremely low, and Asian carbon prices are well below the US\$75 per tCO₂ recommended by the International Monetary Fund to limit global warming effectively.⁷² China's carbon price is around 50–60 yuan per tCO₂.

Carbon needs to be priced more effectively, consistently, and predictably across Asia. Asian financial centers should implement transparent and well phased carbon pricing strategies. The Asia Business Council's 2022 Climate Action Survey shows that this would considerably influence capital reallocation.⁷³ Aligning carbon prices on a regional basis would also help avoid carbon leakage and support Asian exporters as they get ready for the implementation of the European Union's Carbon Border Adjustment Mechanism.

Concerted policy action is required to unlock green finance

Asian financial centers must provide sustainability leadership to support the growth of green finance. Several priorities stand out:

- **Policy clarity and coordination** – Policy clarity is needed to reduce transition risks. Asian municipal governments should clarify their roadmaps to net zero and explain where they intend to go with carbon pricing, different industries, technologies, and regulations. They should also define clearer pathways to decarbonize brown industries and existing assets, to enable the development of responsible transition financing.
- **Facilitate and mandate disclosures** – Climate disclosures support well-informed investment decisions and proper capital allocations. Increasing access to timely and comparable climate data and analytical tools would facilitate disclosures and increase their reliability. The International Sustainability Standards Board (ISSB) in February 2023 approved a global baseline for disclosures: the International Financial Reporting Standards (IFRS). Asian financial centers should agree to follow the IFRS to facilitate disclosures, reduce disclosure costs, and increase transparency.⁷⁴

Currently, regulators in major Asian financial centers mandate disclosures on a “comply or explain” basis for listed companies, but not for banks and financial institutions. In cities that strive to be green finance centers, publicly listed and locally headquartered companies should be required to disclose

verified climate information, including for Scope 3 emissions, to set science-based targets, and to provide information about their transition plans. Financial institutions should be required to disclose their portfolio emissions. Regulators should also encourage disclosures by non-listed companies and SMEs. Exempting these firms risks encouraging “brown-spinning,” whereby companies exempt from disclosure requirements buy up carbon-intensive assets.

- **Strengthen oversight of green financial products** – Asian financial centers have not yet adequately tackled greenwashing in green financial products. Verification systems and information disclosure requirements largely remain weak. Banks from China and Japan are still topping the list of lenders to carbon-intensive industries.^{75, 76} Issuers should be required to communicate transparently about their methodologies to create green indices and funds, as well as their portfolio composition. Regulators should also mandate that issuers set Science-Based Targets (SBTs) for their portfolio emissions and disclose verified climate information using IFRS-aligned metrics. In Europe, greenwashing is becoming a finable offense under consumer protection regulations.
- **Improve taxonomies and align definitions** – Taxonomies support disclosures and promote the allocation of capital toward sustainable projects. Asia has 15 taxonomies, some still under development. Inconsistencies between those create frictional costs. The International Platform on Sustainable Finance is developing a Common Ground Taxonomy (CGT) to highlight commonalities between the European and Chinese taxonomies and harmonize definitions. The CGT will facilitate disclosures and cross-border investments and enable the creation of climate-aligned financial products that can be traded internationally. To support the efficient reallocation of capital across Asia, and minimize transaction costs and greenwashing risks, Asian regulators should align local taxonomies to the CGT and include clear principles, definitions, and screening criteria, particularly for Do No Significant Harm (DNSH) projects.
- **Promote transition finance** – Western taxonomies support the allocation of capital towards climate mitigation projects. Asia is at a different stage than the West in its journey to decarbonization. In addition to promoting climate mitigation, Asian taxonomies should therefore also enable investments in effective, verifiable, and time-bound transition projects. Singapore and ASEAN are developing “traffic light” systems, metrics, and thresholds to support the decarbonization of selected carbon intensive sectors. Hong Kong is planning to develop a transition taxonomy. The criteria, definitions, and thresholds used to identify, describe, and classify transition activities will need to be clear, supported by evidence, and aligned across the region. Verification safeguards will help minimize greenwashing risks.
- **Address knowledge and capacity gaps** – Building talent and strengthening

the capabilities of bankers, insurers, and asset managers in green finance, and of companies to disclose and manage climate risks, is essential to accelerate the development of green finance in Asia. Initiatives are underway across the region. These should be scaled and integrated, and access costs lowered, to accelerate talent development across Asia. Training should address broad environmental and social challenges, not just climate ones, to help meet the UN-SDGs.

Incentives can support faster reallocation

Besides enabling the development of green finance, municipal policy makers should also incentivize capital reallocation. As discussed, carbon pricing and policy clarity can have a big impact. Other policy incentives and price signals can help accelerate the capital reallocation:

- **Increase the cost of capital for carbon-intensive assets** – Policymakers could use policy signals, fiscal regulations, and prudential regulations to set risk management requirements for fossil fuel assets such as higher capital requirements and asset concentration limits. The careful removal of fossil fuel subsidies would also gradually increase the price of fossil fuel energy and assets and support more investments in renewable energy.
- **Incentivize investments in transition activities and green research** – The CGT should serve as a basis to develop incentives for high-impact climate transition and mitigation projects and activities. Blended finance could help lower the cost of capital and de-risk investments in projects that support the transition of critical industries and the decarbonization of harder-to-abate sectors.

Cities can drive green innovation

While the technologies needed to mitigate some 70% of carbon emissions are already commercially available, critical technologies such as electrification, hydrogen, bioenergy, and carbon capture still need further research and development.⁷⁷ While 62% of the world's green innovation comes from the West, Asia includes some of the world's most innovative cities, and these could play a significant role in the developing and scaling of new green technologies.

Asian cities can become green innovation hubs

Asian cities have the enabling environment to incubate green technologies.

- **Access to funding** – The International Finance Corporation estimates that emerging market cities could raise nearly US\$30 billion in climate investments by 2030.⁷⁸ Asia's green financial centers could help raise research funding. Asian municipal governments are also investing in the development of new technologies. South Korea, Japan, China, and Singapore spend a high percentage of their GDP on R&D activities. Some of that spending is being reallocated to green tech research. Guangzhou is allocating RMB 29 billion to support local innovation. Hong Kong has set up a HK\$400 million Green Tech Fund. Singapore's Low-Carbon Energy Research (LCER) Funding

Initiative supports the development of low-carbon energy technologies in hydrogen and carbon capture, utilization, and storage (CCUS). Its Research, Innovation, and Enterprise Plan 2025 promotes domestic innovation and attracts foreign investments in research to develop CCUS solutions, low-carbon hydrogen, and solutions to enhance energy efficiency and enable a circular economy.⁷⁹

- **Strong talent pools** – Many Asian economies have a high percentage of science, technology, engineering, and math (STEM) graduates among their tertiary degree holders.⁸⁰ In 2020, 39% of Malaysia tertiary graduates were in STEM fields, 36% of Singapore's, 34% of India's, and 30% of South Korea's. Besides, Asian cities can be a magnet for talent, supplementing their existing talent pool through selective immigration. Research shows that talent, urban density, and cultural diversity promote creative problem-solving and innovation, leading to the development of cutting-edge industries and system-level change.^{81,82}
- **Leading-edge research facilities** – Asian cities are home to top-ranked universities, such as Tsinghua University, Peking University, University of Hong Kong, the Hong Kong University of Science and Technology (HKUST), National University of Singapore, Seoul National University, and University of Tokyo. These universities provide an enabling environment for students to develop green tech solutions. And they are setting up research institutes related to climate change. In Singapore, the Ministry of Sustainability and the Environment, National Environment Agency, PUB, National Water Agency, and Singapore Food Agency are jointly investing in R&D and building science and technology capabilities to address climate change, environmental sustainability, water and food security issues, and other challenges. South Korea contributed 21%, Japan 16%, and China 4% of existing green innovation.⁸³
- **Public support for innovation** – Most private companies have neither the capacity nor the capabilities or appetite to develop green technologies. Technologies therefore need to be incubated in research labs and through the startup ecosystem. Municipal governments in large Asian cities play an active role in guiding and incentivizing local research activities. Asian universities also offer funding to young entrepreneurs. Because of their important role in supply chains and as consumers of goods and users of technologies, municipal governments can also influence the development and use of decarbonization technologies.⁸⁴ For instance, Beijing's decision to replace its fleet of internal combustion engine taxis with EVs has fostered private investment in green urban mobility solutions.⁸⁵

How the Greater Bay Area became a leading innovation hub

Shenzhen has been called the Silicon Valley of the East. Its rise as a global technology center started as a centrally led government project to create a special economic zone for economic experimentation and reform. Beginning as a basic manufacturing center, Shenzhen moved on to high-tech manufacturing and now has an increasing focus on emerging industries. Shenzhen's competitive advantage in research has been supported by its easy access to STEM talents. Over the period 2009-2019, more than three-quarters of China's PhDs students specialized in STEM fields, compared to 45% in the US.⁸⁶ Shenzhen has attracted graduates from across China through supportive policies.⁸⁷ It is now home to many of the world's largest technology companies, including internet platform company Tencent, drone maker DJI, and telecom firms such as Huawei and ZTE, and is turning its attention towards green innovation as well.

To further amplify the city's innovation capacity, the Chinese government is doubling down on a plan to integrate Shenzhen into a regional economic hub known as the Greater Bay Area (GBA). The hub combines the strengths of three different regions: Guangdong province, a manufacturing base of which Shenzhen is a part; Hong Kong, an international finance center; and Macao, a tourism and leisure hub.⁸⁸ Free trade zones have been established within the GBA, with dedicated innovation hubs and incentives for entrepreneurship.

The Qianhai Shenzhen-Hong Kong Modern Service Industry Cooperation Zone, is one of these, envisioned as a pilot center for mainland China-Hong Kong collaboration in research. Launched in 2010, it has attracted businesses and skilled professionals by offering subsidies and tax incentives. Qianhai is now second nationally in terms of foreign investment after Shanghai, with US\$4.1 billion in 2019. Moreover, efforts have been made to attract venture capital funding from Hong Kong to incubate start-ups in Qianhai.⁸⁹

In Guangzhou, the Nansha free trade zone is positioned as a hub for international trade and advanced manufacturing, and includes 400 technology firms. 44% of those have local R&D facilities benefiting from tax subsidies. The zone's start-up incubators, Nansha Innovation Valley and Xiangjiang Unicorn Field, subsidize start-ups and entrepreneurs and have launched companies like AI voice recognition giant iFlytek.

Now, there is an increasing focus on cleantech innovation in the GBA. In February 2023, Hong Kong put together a task force to study how to make the city a green-tech innovation center and direct more financing toward green startups.⁹⁰ Current cleantech start-ups include Carbonbase, which helps clients calculate their carbon footprints, and GRST, a lithium-ion battery recycling start-up.

- **Industrial ties** – Municipal governments in Asia can facilitate efficient interactions between research centers, financiers, and industry players to create new technologies and capture opportunities related to these. HKUST, which attracts top talent from across China, has been a launchpad for some of the country's biggest start-ups, such as DJI, the world's largest drone company. The university works closely with Hong Kong's business incubator and Science Park which provides a bridge to industry players to create business cases for innovation. In Seoul, the hydrogen innovation cluster comprises universities as well as private sector players from the automotive and shipping industries.⁹¹ Singapore has established government research centers that work with the private sector and research partners to co-develop climate solutions. NEU Battery Materials, a start-up that was initially funded by the National University of Singapore's Graduate Research Innovation Program (GRIP), is developing a technology to recycle the lithium batteries used in EVs.⁹²

Hydrogen innovation clusters in Japan and South Korea

Hydrogen clusters in East Asia are one example of how cities can become centers for climate innovation.⁹³ Japan and South Korea, both net energy importers, have taken early steps in seeking alternatives to coal and nuclear power. Japan created the first national hydrogen strategy in 2017 and South Korea passed its first hydrogen law in 2021.⁹⁴ Hydrogen has the potential to be a low-carbon fuel, but this requires transitioning from fossil fuel-generated hydrogen to green hydrogen. To enable a cost-effective transition, research is ongoing across the production, storage, distribution, and utilization of hydrogen.

Japan's corporates and research institutions have put their resources behind the push. Tokyo and Osaka were the world's top two hydrogen innovation centers over the period from 2011 to 2020 as measured by their share of patents in hydrogen technologies (7.5% and 3.9%, respectively).⁹⁵ This patent activity has been facilitated by the presence of major chemical companies, equipment providers, automotive companies, and industrial conglomerates. Patents are closely tied to local industries; many of the patents filed by Tokyo-based institutions are in rail applications, while the cluster in Nagoya—home to auto companies including Toyota and Suzuki—is focused on automotive applications.

In addition to these patent clusters, industry, government, and academia have collaborated to develop integrated hydrogen value chain clusters that comprise pilot projects and value chain demonstrations. One of these, in Fukuoka, is the “hydrogen hub” of Japan as designated by the Ministry of Economy, Trade, and Industry.⁹⁶ Kyushu University, which has the world's largest hydrogen research facility, anchors the cluster, and industrial and energy companies such as Nippon Steel are active here.

While Asian cities are well positioned to becoming leading green innovation hubs, more policy support and incentives are required to accelerate green innovation.

Policy support and incentives are needed to accelerate innovation

Besides ensuring a strong intellectual property protection regime, cultivating a robust talent pool trained in STEM subjects, and promoting green innovation, Asian cities could leverage their unique advantages, and address local shortcomings to enable green innovation. Key recommendations are outlined below.

- **Increase investments in research** – The IEA estimates that, globally, US\$90 billion in public R & D financing needs to be mobilized by 2026 to create a portfolio of demonstration projects in emerging technologies by 2030.⁹⁷ Currently, only around US\$25 billion is budgeted worldwide. Municipal governments should incentivize the development of green finance products, facilitate access to venture capital, and allocate some of their R&D funding to incentivizing applied research.
- **Provide incentives for applied research** – Tenure and ranking systems for universities, as well as government funding schemes, need to evolve in order to promote the kind of cross-disciplinary, applied, and collaborative research that produces sustainable innovation. HKUST, in this respect, is taking a novel approach. Its Sustainable Smart Campus as a Living Lab (SSC) initiative encourages researchers and the university's operational staff (building designers, IT, and maintenance teams amongst others) to work together to develop concrete solutions for climate adaptation and sustainability that are tested on campus.
- **Leverage industry ties to bring innovations to market** – Commercialization remains the main challenge for emerging green technologies. Municipal governments should facilitate connections between universities, financial institutions, and industry players to facilitate the development of

technologies that have potential for commercialization. In this respect, HKUST's GREAT Smart Cities Institute and Hong Kong's Mass Transit Railway Corp. (MTR) have established a Joint Research Laboratory to encourage local scientific research in railway technologies and apply smart mobility solutions to Hong Kong's public transport.

- **Build vibrant start-up ecosystems** – Asia lags behind in sustainable entrepreneurship. Start-up database CB Insights lists 156 environment-related start-ups in Asia that have completed Series B financing rounds and beyond or reached the IPO stage, compared to 257 in the United States and 113 in Europe. China is a bright spot due to high levels of government support.⁹⁸ And some 20% of startups in India's incubators are also focused on sustainability.⁹⁹ But cleantech startups overall in Asia lack funding.^{100,101} Incubators and university-based venture programs could provide some support. Fiscal and other incentives could also help unlock philanthropic and venture capital.
- **Attract more FDI and deepen international R&D cooperation** – Western venture capital firms have signalled their greater focus on sustainability. Municipal government should deepen their efforts to attract angel investors, and connect local entrepreneurs with investors abroad.¹⁰² They should take steps to attract global companies as well as their corporate innovation, venture, and research offices, international accelerator programs, and foreign government trade and investment organizations. These institutions tend to promote collaborative research and deepen capacity on both sides. Silicon Valley is an example of a start-up hub that has capitalized on “tech diplomacy” to accelerate its capacity for innovation through the global movement of talent and ideas.¹⁰³
- **Improve sustainability literacy throughout the education system and work with corporates to provide relevant skills training programs** – In a survey of companies with sustainability programs conducted by Schneider Electric, workforce skills were one of the biggest barriers to implementing sustainability plans cited by Southeast Asian organizations.¹⁰⁴ Sustainability should become a part of the curriculum beginning in primary education to encourage more students to choose related majors and become specialists in their area of interest. There is a need to develop a common understanding of what workforce sustainability skills are most needed, now and in the future, and how they can be most effectively developed through the primary, secondary, and tertiary education system. Cities can also implement targeted knowledge-sharing, training, and talent development programs. Toyota City, for example, has developed an open innovation platform for engineering companies. The city has also organized various programs to help small and medium enterprises and younger engineers tap into the expertise of larger companies and more experienced engineers.¹⁰⁵

Conclusion

Asia's rapidly growing cities are faced with critical developmental choices. They are racing against time to mitigate and adapt to climate change, in order to reduce its worst impacts and ensure sustainable growth by addressing the challenges of rapid urbanization and climate change concurrently.

While local leadership will be essential to achieve strong results, so will collaboration. Asian cities rely heavily on natural capital and external supplies for food, construction, and other activities. Therefore, partnerships with suppliers will be required to reduce emissions along their critical value chains. Partnerships between Asian municipalities – and with international development organizations, multilateral development banks, national and regional governments, local businesses and civil society – will enable Asia's systemic urban transformation and the mobilization of capital to support it. Western governments will also have an important role to play in enabling investments in transition projects, considering the impact of their taxonomies on capital reallocations in Asia. Regional collaboration will be required to support climate innovation and enable green capital flows across the region. Doing so will strengthen the capacity of Asian cities to work toward a sustainable transformation, securing a more prosperous and equitable future for their populations.

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