

CITIES' APPROACHES TO CLEAN AND RENEWABLE ENERGY



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PRESENTATION CONTENT

Asian Development Bank

Strategy 2030- Approaches to
Urban Clean Energy

Introducing publications

Clean energy cases

Key Factors



ASIAN DEVELOPMENT BANK

- The Asian Development Bank (ADB), established in 1966, is committed to achieving a prosperous, inclusive, resilient, and sustainable Asia and the Pacific, while sustaining its efforts to eradicate extreme poverty. ADB has 68 member countries, of which 49 are regional members and 19 are non-regional members.

2020 Commitments

\$31.6 B

LOANS, GRANTS, EQUITY INVESTMENTS, AND GUARANTEES

\$294 M

TECHNICAL ASSISTANCE, EXCLUDING COFINANCING

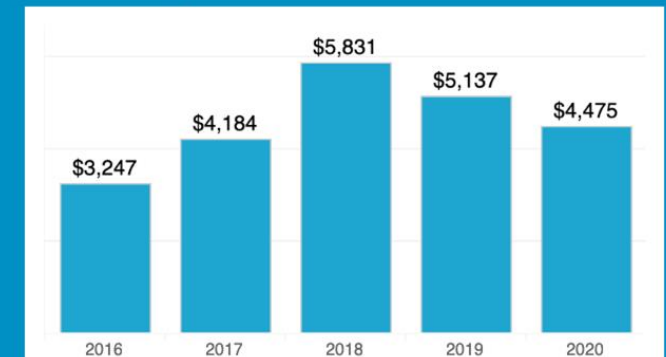
\$16.4 B

COFINANCING, INCLUDING TRUST FUNDS

\$23.6 B

DISBURSEMENTS

Nonsovereign Commitments in \$ million



Source: Asian Development Bank. Annual Report 2020



STRATEGY 2030

PROSPEROUS
INCLUSIVE
RESILIENT
SUSTAINABLE

ASIA AND THE PACIFIC



STRATEGY 2030'S SEVEN OPERATIONAL PRIORITIES



Addressing remaining poverty and reducing inequalities



Accelerating progress in gender equality



Tackling climate change, building climate and disaster resilience, and enhancing environmental sustainability



Making cities more livable



Promoting rural development and food security



Strengthening governance and institutional capacity



Fostering regional cooperation and integration

Operational Priority 4
**Making Cities
More Livable**



- Integrated urban planning and development with multisector approaches;
- Climate-resilient urban infrastructure and service delivery;
- Infrastructure investments with policy reforms, capacity development, institutional strengthening, and knowledge management;
- New and expanding existing financing;
- High-level technology promotion.

URBAN CLEAN/RENEWABLE ENERGY

CLEAN AND RENEWABLE URBAN ENERGY SYSTEMS

- Energy efficiency
- Wind-based district heating
- Qingdao district heating using geothermal, wasted heat from sewerage treatment plant, natural gas, air and water heat pumps, tri-gens (combined heat/cooling/power)
- Deployment of e-vehicles, e-buses, and e-charging infrastructure
- Smart energy management system
- Block heaters technology pilot

INTEGRATED MULTI-SECTORAL CLEAN ENERGY

- Regional Technical Assistance (\$3.75 M): Promoting Low-Carbon Development in Central Asia Regional Economic Cooperation Program Cities
 - ✓ The Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC)
 - ✓ Low-carbon city development planning
 - ✓ Reference books- (i) 50 Climate Solutions from Cities in the PRC; and (ii) 100 Climate Actions from Cities in Asia and the Pacific
 - ✓ Two International Forums on Low-Carbon Cities: Beijing 2018 and Seoul 2019
- Technical Assistance (\$1.7M): Low-carbon development in Xiangtan, PRC
- Xiangtan Low-Carbon Transformation Sector Development Program (Project Loan \$50M + Policy-based Lending \$50M) -

INTRODUCING TWO PUBLICATIONS

CITY PROJECTS IN THIS PUBLICATION ARE DIVIDED INTO FIVE SECTORS.



ENERGY



LAND USE AND RESILIENCE



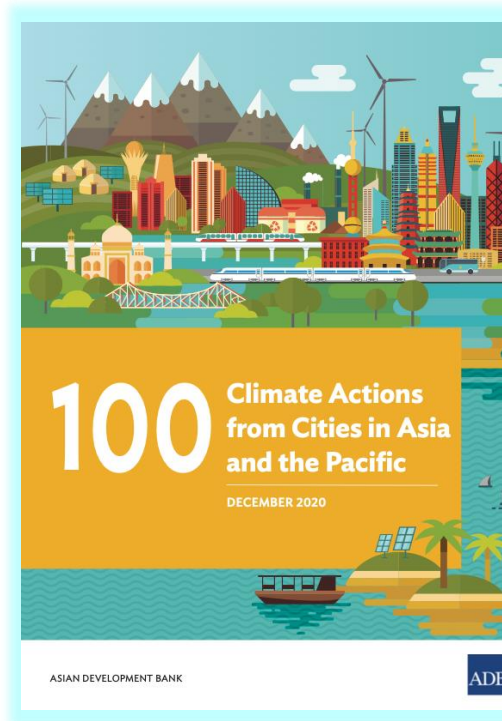
WASTE



CLIMATE ACTION



MOBILITY



CITY PROJECTS IN THIS PUBLICATION ARE DIVIDED INTO 10 SECTORS



Clean and Renewable Energy



Carbon Finance and Partnership



Urban Transport and Mobility



Land Use and Forestry



Smart Cities



Sustainable and Low-Carbon Communities



Climate Action Plans and Inventories



Building Energy Efficiency



Solid Waste



Climate Resilience

10 categories
97 Cities
29 Countries
65 ADB-financed cases

Sub-Regions (ADB-Financed cases):

- ❖ East Asia – 42 (22)
- ❖ Central West Asia – 21 (8)
- ❖ South Asia – 10 (10)
- ❖ Southeast Asia – 17 (15)
- ❖ Pacific – 10 (10)

- **Selection Criteria:**

- climate change impacts- both mitigation and adaptation;
- co-benefits;
- innovation;
- governance and participation

CLEAN/RENEWABLE URBAN
ENERGY PROMOTION
THROUGH VARIOUS
APPROACHES

- Heating Energy
- Cooling Energy
- Building Energy
- Transport Energy
- Energy Products
- Finance for clean/renewable energy



CITY: HOHHOT, Inner Mongolia Autonomous Region

Winds of Change for District Heating



EMISSIONS FROM WIND-POWERED DISTRICT HEATING IN HOHHOT.

Inhabitants
2,870,000

GDP per capita
CNY101,428

Geographic area
17,224 km²

THE CHALLENGE

In the north of the PRC, demand for heat soars in the winter, with cities reliant on polluting coal to provide warmth. Meanwhile, the region's significant wind resources are being underutilized. This project aims to demonstrate the potential of wind power to heat homes through district heating networks in Inner Mongolia.

CO-BENEFITS

Economic

This initiative offers the chance to better utilize the 18 GW of installed wind capacity in the region, which is often curtailed by up to 45%, increasing returns on wind investment.

Health

By replacing coal with renewable wind energy, toxic air pollutants that cause respiratory illnesses, particularly when present in the home, are reduced.

Social

Through the project, district heating has been expanded to poverty-stricken areas of the city that have previously lacked access to the cheaper, more efficient heating system.

Hohhot is taking advantage of the region's underutilized wind resources to spread renewable district heating to its residents, cleaning up the city's air, and reducing demand for coal.

During Inner Mongolia's long winter, winds roar down from Siberia and temperatures drop to -40°C. Therefore, for Hohhot's 2.8 million residents, heating is a must, and until now has been provided by burning coal in households and district heating systems. Under a new pilot scheme, the city is using the region's massive wind resources, which blow the hardest in winter, to power two new 25 MW electric boilers. The new boilers are feeding into an expanded district heating network, which covers approximately two-thirds of the city.

The region has 18 GW of installed wind capacity, 25% of the national total, but struggles to make use of the resource, with curtailing rates of more than 45%. Replacing coal with wind energy to heat homes will reduce the thick, toxic smog that often fills Hohhot's cold air, and bring an end to the associated health problems for the city's residents. With national goals to meet 15% of the country's total energy demand with renewables by 2020, this sort of initiative will need to be supported and scaled to a greater extent.

An outstanding feature of the initiative and driver of its success is a new kind of three-party business model, creating more advantageous business circumstances for the wind farm, the grid, and the heating company.

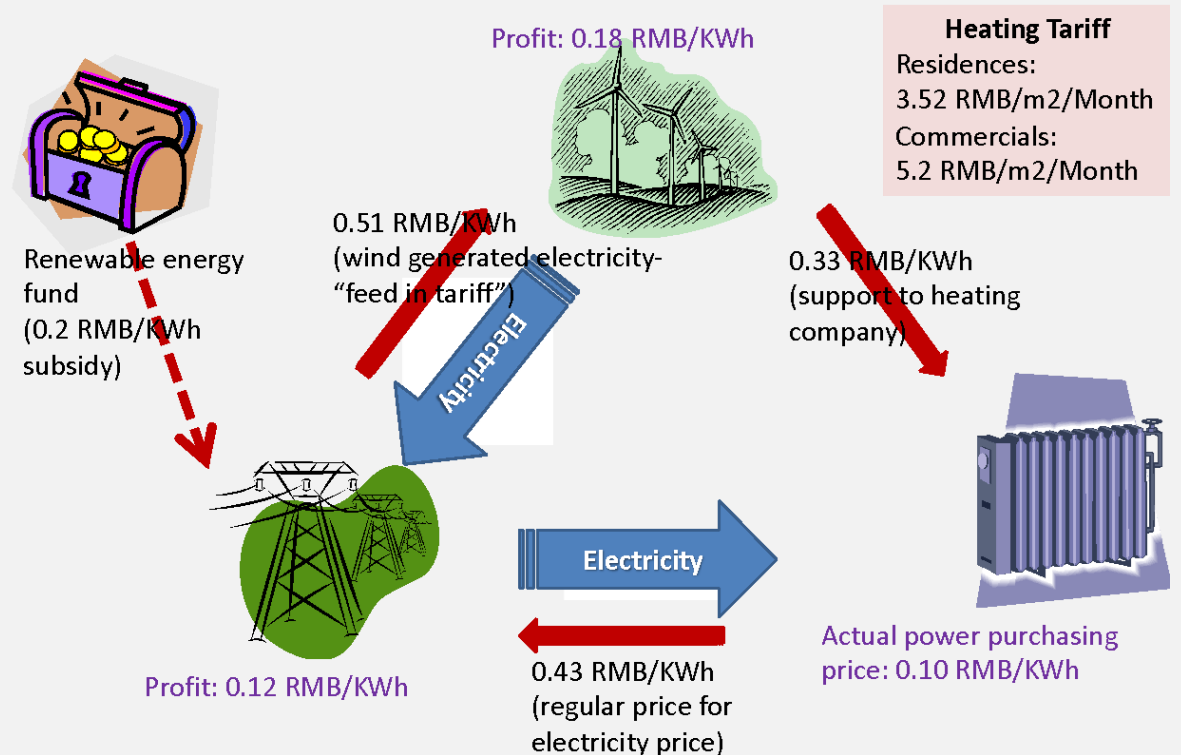
ADB provided technical assistance and a \$150 million loan.



The region's 18 GW of installed wind capacity is now helping to heat homes with this pilot project of two 25 MW electric boilers (photo by Jieshi Zhang).

Urban District Heating Energy

- Situation assessment
- New business model





CHANGSHA, PRC

Changsha Tests the Water with River Heating Technology

↓ 25K

TONS OF CO₂ EMISSIONS REDUCED PER YEAR



Inhabitants
8.39 million



GDP per capita
\$19,700



Geographic area
11,800 km²

THE CHALLENGE

Most of Hunan's central heating system relies on traditional heating mechanisms, including electricity and gas boilers, which release greater amounts of GHGs than cleaner alternatives.

CO-BENEFITS

Economic

The project will reduce operating costs by 40%–50%, resulting in significant energy cost savings for both residential and commercial buildings.

Environmental

The water source heat pump energy system results in no pollution, smoke, wastewater, or exhaust gas, which will improve local environmental conditions when compared to traditional heating.

Social

The central heating system will feature 24-hour uninterrupted service, supplying residents with a cost-effective and reliable heating source.

A new distributed heating project in Changsha uses river water as an energy source, cutting down on both operating costs and GHG emissions.

Two smart energy centers in the most populous city of Hunan Province will adopt river water source heat pump (RWSHP) technology, which will use water from the Xiangjiang River as an energy source for central heating.

These systems take advantage of temperature differences between the river and ambient air in both summer and winter; they will extract water as a cooling mechanism for air conditioning systems in the summer, and extract heat energy to transfer to building heating in the winter.

The energy centers, located in the new districts of Binjiang and Xiangjiang, will allow communities within a 2 km radius to connect to the heating system. Overall, around 320,000 square meters of commercial and residential buildings will be serviced by this sustainable energy system.

Compared to traditional systems, RWSHP technology will result in energy savings of around 20% in the summer and 40% in the winter. This will save the equivalent of 5,064 tons of standard coal and reduce emissions by 12,622 tCO₂e per year in each energy center.



A cleaner alternative for the locals.
Changsha has more than 700 residential and 50 commercial users connected to regional central heating services (photo by Changsha Ecological Environment Bureau).

Urban District Heating /Cooling

-Heat pumps technology
-Government support for new advanced technology



↑ 2.44M

M² HEATED AND COOLED AREA USE HEAT PUMP TECHNOLOGY AFTER PHASE 3 OF THE PROJECT.



Inhabitants
30,480,000



GDP per capita
CNY57,902



Geographic area
82,403 km²

THE CHALLENGE

With some of the longest and hottest summers in the PRC, Chongqing uses a significant amount of energy and water to cool its buildings every year. Air-conditioning units also emit potent greenhouse gases such as hydrofluorocarbons, contributing further to global warming. Smart use of heat pumps in Chongqing is looking to change that.

CO-BENEFITS

Economic

With reduced demand for electricity, heat, and water, approximately CNY2.1 million is saved each year. The 23,070 m² less floor space required are also of value where space is at a premium.

Environment

With less demand for coal-fired power generation, particulate emissions are reduced, as well as noise pollution and water use.

Health

A comfortable temperature for workers helps to improve quality of life, and fewer particulate emissions reduce the risk of respiratory illness.

CITY: CHONGQING

River Water Keeping Chongqing Ice Cool

Workers in Chongqing do not need to break a sweat when it comes to cooling and heating their buildings; a new system uses heat pumps from the Yangtze River and cold temperature storage to deliver a more efficient system.

When designing Chongqing's new Jiangbeizui Central Business District (CBD), developers needed a more energy- and space-efficient way to regulate temperature in its buildings. Over 1 million m² of buildings are already being cooled in the summer and warmed in the winter using heat pump technology. With the nearby Yangtze River, the plans are to more than double the capacity in the next phase of construction. Another aspect of the project is the use of ice storage technology. This system works by making ice at night, when electricity demand and price are low, and then dispersing the cold energy during the day, taking strain off the electricity grid and saving costs.

The more efficient system has reduced necessary floor space with 23,070 m² compared with a regular system, freeing up space to create economic value instead. In addition to this, power requirements have been reduced by 2.62 gigawatt-hours (GWh) annually in the first two phases of the project, which added to a significant reduction in water demand, resulting in annual savings of CNY2.1 million. The smart system reduces demand for coal-fired power and, therefore, eliminates carbon emissions by 26,000 tons per year, as well as creates a comfortable working environment in Jiangbeizui CBD.



The system uses river water and ice to reduce fossil fuel-based energy demand and ensure good temperature regulation in Jiangbeizui CBD's buildings (photo by Lie Wu).

Urban transport Energy

- Maximize renewable potentials
- Introducing new technology needs new institutional support



↓150K

KM OF BUS JOURNEYS PER YEAR ARE POWERED BY THE SOLAR SYSTEM.

- Inhabitants**
24,190,000
- GDP per capita**
CNY113,719
- Geographic area**
6,340 km²

THE CHALLENGE

Shanghai's 18,000 diesel-powered buses consume a huge amount of energy, and emit many harmful toxins, bringing high social, environmental, and economic costs. Harnessing the power of the sun through PVs can provide cheap and clean electricity to charge electric buses, promoting renewable energy and reducing air pollution.

CO-BENEFITS

Economic

Distributed PV generates 20 MWh of green power per year, which according to the current electricity tariff in Shanghai, will save the bus company CNY170,000 annually.

Environment

Using solar power to generate energy substituting fossil fuels, will reduce 6 tons of oxynitride and 160 CO₂ emissions.

Health

Using solar energy to power electric buses reduces vehicle emissions, urban haze, and air pollution, bringing many benefits to human health.

CITY: SHANGHAI

Buses Go Truly Zero Emission with Solar Power

Shanghai is the first city in the PRC to generate power for the city's electric buses using a rooftop PV system on the bus depot, exploring a new model of direct recharging zero emission vehicles.

To run electric buses on renewable energy and achieve 100% emission-free transport, Shanghai has set up the very first solar power project for bus depot in the PRC. The 195 kW rooftop PV system is providing enough energy to recharge six buses at the same time, and the expected annual power generation is up to 20 MWh. The system also provides energy for other purposes at the facility and even feeds electricity back to the grid. Covering nearly 2,000 m², the solar panels have also improved the heat insulation of the roof.

Since 2013, the local bus company has introduced 70 pure electric buses into operation, providing citizens with clean, green mobility. Each electric bus typically travels between 100 km and 120 km a day, consuming 220–230 kWh. The solar power installation will not only benefit the environment, but will also bring economic benefits for the bus company through reduced electricity costs.



The installed rooftop PV system can recharge 6 of the 70 electric buses at the same time, and provide electricity for other purposes at the bus depot (photo by Jieshi Zhang).



↑11M

PASSENGER TRIPS PER YEAR

- Inhabitants**
863,400
- GDP per capita**
\$877
- Geographic area**
203 km²

THE CHALLENGE

The outdated nature of Dushanbe's trolleybus infrastructure has forced residents to rely on more heavily-polluting modes of transport, instead of incentivizing a low-carbon option powered by relatively cheap and abundant hydropower.

CO-BENEFITS

Health

Trolleybuses are considered one of the safest forms of public transport and the number of traffic accidents in Dushanbe compared with 2017 numbers decreased by almost 60%.

Environmental

The electric trolleybuses have zero tailpipe emissions, offering a low-pollution transport alternative to private vehicles and contributing to healthier air quality for citizens.

Economic

Four modern Belarusian trolleybuses were purchased as part of the project that work with energy savings of up to 45%.

DUSHANBE, TAJIKISTAN

Leveraging the Legacy of Tajikistan's Trolleybuses

Dating back to the 1950s, Dushanbe's antiquated trolleybus system was not keeping pace with modern life, but a refurbishment is breathing life into the system to make e-mobility popular again.

A 5-year refurbishment of the electric trolleybuses in Tajikistan's capital is bringing a transport favorite from the Soviet Union years into the 21st century. The spacious buses, connected to overhead electric cables for power, provide a low-carbon and affordable mode of transit through the city.

Trolleybuses had previously been essential for mobility in Dushanbe, providing a fossil fuel-free transportation option following the collapse of the Soviet Union and the periodic disruption of oil supplies throughout the 1990s. Trolleybuses hence thrived in the years when gasoline-powered transportation was crippled, and grew to a fleet of 250 units.

As oil supplies stabilized and competing travel modes emerged, the trolleybus system fell out of favor and were thus poorly maintained, forcing the elimination of poorly frequented routes and reduction of the fleet to 50 units.

The European Union-funded project reconstructed the old infrastructure to improve the quality and reliability of the seven-route transit system. Having facilitated 11 million passenger trips per year when it was dilapidated, city authorities predict the renewed system will boost this number significantly.



Low-carbon transport for Dushanbe. Dushanbe, home to over 800,000 people, is the capital city of mountainous Tajikistan. The project is expected to boost e-mobility among locals (photo by ADB).



↓430K

TONS OF CO₂ EMISSIONS REDUCED ANNUALLY

- Inhabitants**
1.16 million
- GDP per capita**
\$18,743
- Geographic area**
810 km²

THE CHALLENGE

During a 200-day winter season in Nur-Sultan, any extra idling time can add up to increased emissions of GHGs as well as other more locally problematic air pollutants.

CO-BENEFITS

Health

The engine block heaters reduce local air pollutants that adversely affect breathing air quality, especially for vulnerable groups such as the young and elderly.

Economic

The engine block heaters cost \$100–\$250, but savings from fuel bills and repairs mean that the payback time is 1–3 years.

NUR-SULTAN, KAZAKHSTAN

Block Heaters Blunt Idling Emissions

In the freezing winters of Nur-Sultan, having an electric heater to warm the car engine can reduce hours of unnecessary idling and tons of emissions.

With an average January temperature of –15°C, it can be difficult to start car engines in Nur-Sultan, the capital of Kazakhstan. Even if the engine does start, it can take an hour to sufficiently warm up for smooth running, causing unnecessary emissions from stationary and idling cars.

To improve this, Nur-Sultan is launching a pilot project with 100 block heaters installed in vehicles to warm the engine and interior of the car before it is needed for use—without relying on the engine running.

The block heaters are small devices installed in the cars next to the engine that generate heat from electricity, just like a kettle. The city is also installing 53 charging stations throughout the city so the heaters can be charged when needed.

Although not the final solution for Nur-Sultan's sustainable transportation, the block heating technology can help avoid such air pollutants and reduce GHG emissions substantially in the near term. Through wide deployment of block heating technology, Nur-Sultan can achieve a net reduction of around 430,000 tCO₂e emissions per year.

The \$150,000 pilot project was funded through the ADB-managed Clean Technology Fund.



Block heater installation in Nur-Sultan. Electric engine block heaters are being tested in Nur-Sultan to reduce emissions and fuel consumption from idling during Kazakh winters (photo by Andrey Terekhov).



XIANGTAN, HUNAN, PRC

Traditional medicine meets low-carbon design

↓3.2K

TONS OF CO₂ EQUIVALENT REDUCED ANNUALLY



Inhabitants
2,882,000



GDP per capita
\$11,371



Geographic area
5,015 km²

THE CHALLENGE

Xiangtan's recent urban growth has been accompanied by an increase in greenhouse gas emissions, and the city's new hospital will be built in a flat and flood-prone area.

CO-BENEFITS

Economic

The EDGE-certified measures will save the hospital 4,400 MWh of energy and 27,800 cubic meters of water each year, resulting in cost savings of \$560,000.

Health

Green zones around the hospital will improve local air quality and provide a recreational space for staff, patients, and visitors.

Environment

Ecosystem-based adaptation measures will provide more green spaces, which will strengthen biodiversity and serve as a source of medicinal plants and herbs.

Xiangtan's new traditional medicine hospital will integrate green building design, clean energy technologies, and ecosystem-based adaptation measures to make the structure low-carbon and resilient.

The project, running until 2023 and financed by ADB lending, will lower emissions from Xiangtan's public buildings while also reducing the vulnerability of the hospital to floods and droughts, both of which are expected to increase in the region due to climate change. The proposed designs will also serve to improve air quality and provide carbon sequestration through nature-based design.

In order to optimize the energy efficiency of the planned hospital, a natural gas combined cooling, heating, and power generation (CCHP) system will be utilized. The CCHP system can recover waste heat from power generation, which will provide around 15% of the total heating demand for the hospital and will be integrated with a rooftop solar system.

Planners have embraced an ecosystem-based adaptation design to provide flood protection and increase the overall resilience of the structure. A range of rainwater retention measures will be employed, including rainwater gardens and harvesting, permeable pavement, green roofs, and retention ponds, with a total water storage capacity of 7,840 cubic meters.



This will be PRC's first hospital to receive Excellence in Design for Greater Efficiencies (EDGE) certification. Photo by

Building Energy

- Passive building design
- Clean/renewable building-based energy system
- : Off-grid Tri-gen, solar rooftop, hybrid
- Smart Building energy management system



↓270

TONS OF CO₂ EMISSIONS HAVEN BEEN AVOIDED IN JUST ONE BUILDING

Inhabitants
21720000

GDP per capita
CNY14,590

Geographic area
16,410 km²

THE CHALLENGE

Demands on the coal-powered electricity grid are growing, reaching 60% for heating and cooling, leading to high greenhouse gas emissions and particulate matter. Constructing buildings that are cooled and heated in a smarter, more efficient way will help to alleviate this problem.

CO-BENEFITS

Economic
Compared with traditional buildings, this project saved 341 MWh in 2015, corresponding to about CNY240,000 of avoided expense.

Environmental
The pilot building has achieved 80% energy savings. In addition, the project has also made significant water and material savings, improving environmental standards and comfort.

Health
The pilot building regularly monitors PM_{2.5}, the concentration of visible organic compounds and CO₂, as well as real-time information on temperature and humidity, ensuring high air quality and safeguarding the health of those who occupy the building.

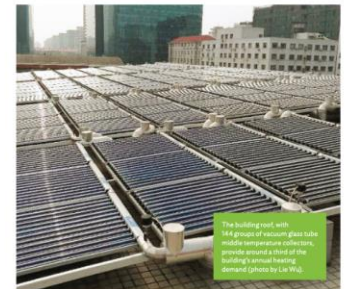
CITY: BEIJING

Innovative Technology Brings Near Zero Energy Building

Doing away with traditional heating and cooling systems, the latest renewable energy technology has been deployed in a 4,025 m² building in Beijing to achieve an 80% reduction in energy consumption and almost zero emissions.

Many areas in the PRC are hot and humid in summer, but cold and dry in winter, resulting in high energy consumption and CO₂ emissions from heating and cooling buildings. The near-zero-emissions project in Beijing is using the latest technology to explore how to greatly reduce emissions, while maintaining indoor comfort levels. The Near-Zero Energy Consumption Pilot Building by the China Academy of Building Research, a 4,025 m² building with a renewable energy system, has reduced its total energy consumption considerably.

During the cold winters, innovative ground-source heat pumps provide 65% of the heating demand, which can also work to cool the building during summer. PV solar systems power the electrical heat pumps as well as supply much of the power needs throughout the building. The pilot building shows how to achieve more than 50% emissions savings by implementing innovative technology, and is a landmark building for the future development of emissions-reducing technology in PRC buildings.



The building roof, with 164 groups of vacuum glass tube solar collectors, provides around a third of the building's annual heating demand. Photos by Lu Wu.



XIANGTAN, HUNAN, PRC

Energy management system drives energy efficiency

↓238K

ANNUAL TONS OF CO₂ EQUIVALENT SAVINGS BETWEEN 2030 AND 2045

Inhabitants
2,882,000

GDP per capita
\$11,371

Geographic area
5,015 km²

THE CHALLENGE

Emissions from industries are currently responsible for more than 50% of total emissions from Xiangtan. This program seeks to better understand the energy usage of industry, improve efficiency by as much as 20%, and equip the city for higher levels of renewables in the future.

CO-BENEFITS

Social

The CMEUMS creates a culture of collaboration among companies to control peak and non-peak loads and optimize energy and resource efficiency at a zone level.

Economic

The CMEUMS is helping to optimize energy consumption and balance, savings costs for industrial companies.

Xiangtan is installing a community-scale multi-energy and utility management system in the Jinhua Economic and Technological Development Zone to monitor energy, water, and gas consumption and drive energy efficiency gains.

Xiangtan will install a Community-scale Multi Energy and Utility Management System (CMEUMS), connecting more than 1,300 enterprises in the Jinhua Economic and Technological Development Zone, 5 km from the Xiangtan downtown area.

The system will monitor electricity, gas, and water consumption of the businesses and buildings in the zone in order to drive the improvement of operational efficiency and help with the integration of renewable energy which is predicted to increase in the coming years.

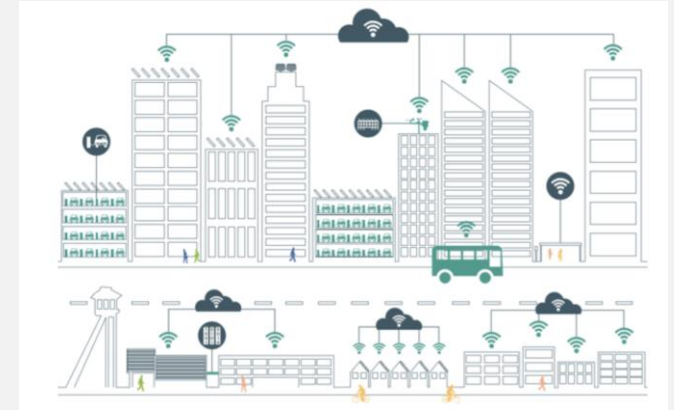
A community-scale multi-energy and utility management system is used to monitor, regulate, and improve efficiencies in energy systems, particularly where there is a high penetration of intermittent renewable power such as solar and wind. Increasing the CMEUMS coverage at the Jinhua Industrial Zone between 2030 to 2045 is expected to result in average annual savings of 238,185 tCO₂e/year assuming a long term growth plan.

The \$4.66 million project is funded through ADB's 20-year loan and PRC's counterpart financing.



The Xiangtan CMEUMS software will be developed and installed in the Xiangtan Municipal Big Data Center and all data will be collected in and sent from there.

Smart Technology for Energy Management





Unlocking the Value of Myanmar's Waste

↓4.7

TONS OF CO₂ EQUIVALENT REDUCED EVERY YEAR

Inhabitants
5,157,000

GDP per capita
\$2,104

Geographic area
599 km²

THE CHALLENGE

Cities often grapple with increasing waste volumes which cannot be processed at sufficient speeds or scales, and resort to extensive landfilling.

CO-BENEFITS

Economic

Waste-to-energy facilities can generate revenue for communities through the sale of electricity, tipping fees, and profits from recovered metals.

Health

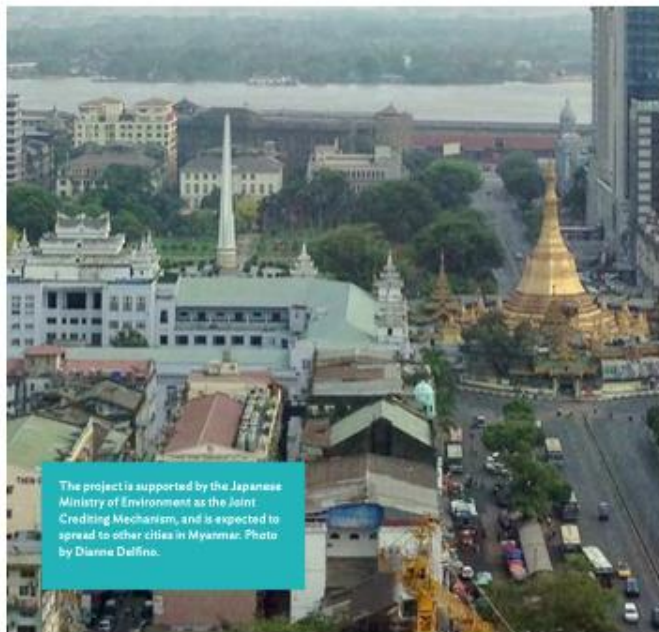
The new plant will effectively reduce some of the methane emissions from current landfills, improving the air quality for residents.

Myanmar's first waste-to-energy plant is alleviating Yangon's dependence on landfilling whilst meeting its growing electricity demand.

Yangon's 4.3 million inhabitants produced roughly 3,000 tons of waste per day in 2017, double the level of 2011. This has created significant waste treatment challenges for a city that relies on poorly managed landfills. In response, the city built a waste-to-energy plant in 2017, capable of processing 60 tons of waste per day, that generates electricity for the nation's former capital.

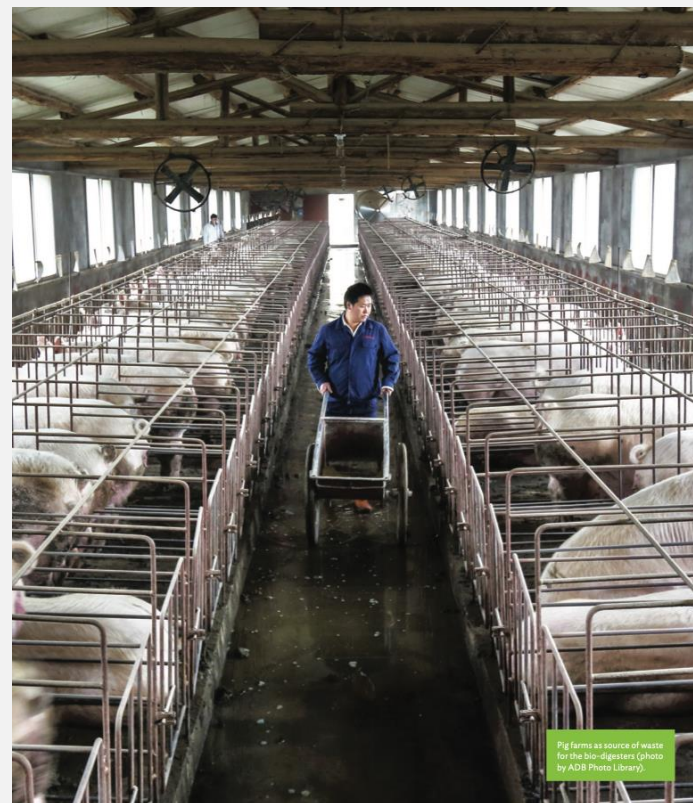
The plant provides a blueprint for alternative waste management in Myanmar and across Southeast Asia, where population and consumption levels are still on the rise and harmful landfills are the norm. Looking further ahead, Myanmar will also need to decrease total levels of waste production, and amplify recycling efforts.

The recent democratization of Myanmar has enhanced political stability and triggered rapid economic growth. This progress has posed challenges, however, where growth of city populations and the middle class have outpaced the modernization of the public services and infrastructure that support them.



The project is supported by the Japanese Ministry of Environment as the Joint Crediting Mechanism, and is expected to spread to other cities in Myanmar. Photo by Dianne Dalino.

Waste-to-Energy



Pig farms as source of waste for the bio-digesters (photo by ADB Photo Library).



↓108K

TONS OF CO₂ EQUIVALENT EMISSION WILL BE REDUCED OVER THE PROJECT'S LIFETIME.

Inhabitants
4,300,000

GDP per capita
CNY\$2,869

Geographic area
8,837 km²

THE CHALLENGE

The PRC's love for pork comes at a cost to the environment and public health. Pig slurry not only emits vast amounts of methane into the atmosphere, but pollutes water and air causing issues from high blood pressure to respiratory problems. This project in Hengshui is turning this challenge into an opportunity.

CO-BENEFITS

Economic
Electricity production from the biogas project creates annual revenues of more than CNY\$1.9 million.

Environment
Removing open lagoons of manure means a reduction in methane and ammonia emissions, and improved soil and water quality.

Health
Better management of manure reduces odors and wastewater, improving the well-being of all those living near pig farms.

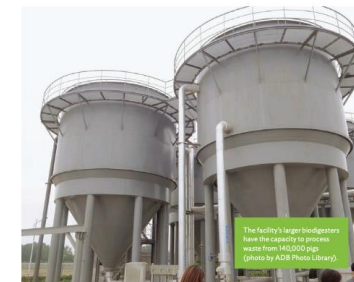
CITY: HENGSHUI, Hebei

Win-Win Scheme Turns Pig Waste into Power

In Hengshui, local farmers are receiving payments for their pig waste and producing electricity using biogas, thereby reducing the need for coal-fired generation.

The PRC has the world's highest per capita pork consumption, but as producers rush to meet demand, waste products from the industry can have detrimental impacts on the environment and public health. In Hengshui, a new facility has the capacity to treat waste from 140,000 pigs using four 5,000 m³ anaerobic digesters. The biogas created by this process is then used to generate 8.42 GWh of electricity annually, bringing in revenue of more than CNY 6 million. Between 2012 and 2015, the project reduced emissions by 108,000 tons of CO₂ equivalent through replacing coal-fired power generation and initiating proper waste processing.

A payment scheme has been developed between the biogas company and local livestock farmers, with those farmers receiving payments for delivering waste of a high solid concentration. As well as avoiding significant methane emissions, proper processing of manure is improving local air and water quality, which is of increasing importance as more citizens live in areas close to pig farming. The project is actively helping others to learn from their experience of bringing value to waste products, and three other companies in Hengshui are planning to implement the same measure.



The facility's larger biogas digesters have the capacity to process waste from 140,000 pigs (photo by ADB Photo Library).



KABUL, AFGHANISTAN

Efficient Stoves Protect Lives, Forests, and the Climate

↓65%

LESS FUEL REQUIRED THAN
TRADITIONAL METHODS

- Inhabitants
4.27 million
- GDP per capita
\$502
- Geographic area
275 km²

THE CHALLENGE

Only a small percentage of the Afghan population have access to efficient cookstoves, and traditional mud or clay stoves are partly responsible for the 54,000 premature deaths that occur due to air pollution every year.

CO-BENEFITS

Economic

More efficient stoves will reduce cooking times by 50% and consume significantly less fuel, resulting in time and money savings.

Environmental

Reducing the need for firewood means a reduction in deforestation from forests around Kabul, conserving natural habitats and reducing carbon emissions.

Health

The project will play an important role in reducing indoor air pollution and improving the respiratory health of recipients.

The introduction of efficient cookstoves to families through Afghanistan's capital Kabul is improving health, reducing emissions, and slowing deforestation rates.

The "Efficient Cookstoves for Women in Afghanistan" project is distributing modern and efficient cookstoves to families throughout the capital Kabul, and is funded by a grant from the United Nations Development Programme (UNDP) and the Government of the Republic of Korea.

In Guldara, a district of Kabul, more than 95% of families use wood to cook their food, warm their houses, and boil water. The efficient stoves are estimated to require 65% less fuel than traditional methods and produce significantly less smoke, helping to contribute to healthier lives for women and children who spend the most time around the stoves. By reducing the need for firewood, the stoves also help improve household work productivity by reducing the amount of time that women spend collecting firewood.

The project expects to distribute a total of 19,488 aluminum cookstoves to communities with little or no access to electricity.



78 100 CLIMATE ACTIONS FROM CITIES IN ASIA AND THE PACIFIC

Policy Measures:

Green Procurement Policy

- Public procurement for energy efficient products
- Giving the right signals to market
- Inspiring private purchasing



XIANGTAN, HUNAN, PRC

Xiangtan's public procurement approach

↓240K

TONS OF CO₂ EQUIVALENT
REDUCED OVER 10 YEARS

- Inhabitants
2,882,000
- GDP per capita
\$11,371
- Geographic area
5,015 km²

THE CHALLENGE

Xiangtan has experienced rapid urbanization and growth over the past decade which corresponds to increased consumption and emissions.

CO-BENEFITS

Economic

The project promotes local green and low-carbon technologies and suppliers, and consequently will contribute to local economic growth.

Environment

The range of measures presented in this plan contribute to overall emission reductions for the city, which will reduce air, water, and soil pollution.

Social

By creating lifestyle and consumption habits that emphasize resource conservation, Xiangtan will be able to sustainably grow its economy and society.

The public sector can exert a huge influence on private activity. By adopting a green procurement approach, Xiangtan is using its influence to create positive change through a project funded by an ADB loan.

As part of Xiangtan's larger green transformation program, the city has created a low-carbon procurement policy across six pilot categories: air conditioners, vehicles, computers, streetlights, indoor lights, and toilets. By 2025, the policy aims to have a fully functioning e-procurement system, with integrated low-carbon procurement data and monitoring and reporting functions.

Green public procurement is a process where public authorities search for goods, services and works that have a reduced environmental impact throughout their life cycle. It is a voluntary policy tool that many other cities throughout the world have successfully implemented to cut greenhouse gas emissions that the city is responsible for.

In 2018, Xiangtan was selected by the National Development and Reform Council (NDRC) as a low-carbon city, and this is one of several programs being implemented in a drive to peak local emissions by 2028.





CITY: WUHAN, Hubei

Empowering the Next Generation for Climate Action

↓ 8

YEARS AHEAD OF NATIONAL PEAK EMISSIONS TARGETS WITH WUHAN'S ACTION PLAN

Inhabitants
10,600,000

GDP per capita
CNY111,469

Geographic area
8,494 km²

Wuhan has set a goal to peak emissions ahead of the PRC targets, and has placed a strong emphasis on education and management of schools to create a generational shift in carbon emissions.

The PRC megacity of Wuhan has committed to reach its carbon emissions peak around 2022. The model-based action plan established yearly carbon emission goals by district and industry across the city, and received inputs from businesses and citizens during the drafting process.

Schools are seen to be a key focus area for Wuhan, which has established a set of low-carbon management and education principles suited for middle and primary schools. This strategy is the first of its kind in the PRC, and will foster awareness of a low-carbon life and society, and help students understand what steps are being taken in response to climate change in their city and why. The city hopes that, with teachers and students as knowledge brokers, awareness among the general public will also increase.

THE CHALLENGE

Wuhan, the largest city in the central PRC, is growing rapidly. Building sustainability into future economic growth plans is a challenge for many cities, and Wuhan is demonstrating how more ambitious strategies can be put in place.

CO-BENEFITS

Economic

Based on the current carbon price, Wuhan will save around CNY2,500 billion by 2022 with carbon emissions reductions.

Health

Reducing emissions associated with polluting transport and coal burning will also improve air quality and save an estimated 50,000 lives by 2022.

Social

Including schools as a main pillar of the low-carbon strategy recognizes the intergenerational nature of climate change, as it is the next generation who need to live radically different lifestyles to achieve carbon emissions reduction goals.



Wuhan is home to more than 10 million people, and faces a huge challenge to decouple growth from carbon emissions (photo by Lie Wu).

Behavior Changes through Education & Recognition



CITY: SUZHOU, Jiangsu

Economic Incentives to Reduce Consumption and Go Green

↓ 5.58M

TONS OF CO₂ EMISSIONS HAVE BEEN AVOIDED AS A RESULT OF THE 483 COMPANIES' EFFORTS IN THE ENERGY STAR SYSTEM.

Inhabitants
10,600,000

GDP per capita
CNY145,000

Geographic area
8,488 km²

To reduce energy consumption and carbon dioxide emissions in the heavy industry heart of Suzhou, the city is incentivizing companies to conserve energy through its Energy Star Index scheme.

To reduce energy consumption and carbon dioxide emissions in the heavy industry heart of Suzhou, the city is incentivizing companies to conserve energy through its Energy Star Index scheme. The Energy Star Index system comes with a range of service manuals and industrial energy efficiency standards, all contributing to lowering the energy consumption in the heavy industry-dominated city. The index system evaluates the overall efficiency of each company annually, using four categories with nine subitems, including aspects of policy, regulation, energy management systems, technological progress, and energy performance. The purpose is to stimulate the internal transformation to more energy-efficient firms through market mechanisms, promoting the development of energy savings in the PRC.

The Energy Star Index rates companies' energy efficiency performance from one star to five stars, and offers economic rewards of up to CNY200,000 for the highest-achieving firms. Since 2011, a total of 483 enterprises in Suzhou have been rated as "Energy Star" firms, with sectors ranging from energy and pharmaceuticals, to textiles and high-tech industries. A total of CNY5.8 billion has been invested to date in energy-saving technologies from these enterprises.

THE CHALLENGE

Energy-intensive manufacturing and continued growth of energy consumption make it difficult for Suzhou to control greenhouse gas emissions. The total energy consumption of Suzhou in 2015 was equivalent to almost 50 million tons of coal, with a high proportion of fossil fuel energy sources. Therefore, energy efficiency schemes are important to develop the city in a more sustainable way.

CO-BENEFITS

Economic

In 2011, the first year of implementation of the Energy Star Index scheme, an economic benefit of CNY1.55 billion was achieved, and, in the three following years, a further CNY400 million annually.

Environment

The implementation of the scheme reduces the pollution caused by fly ash, slags, and other industrial solid waste. It also reduces the emission of air pollutants, including sulfur dioxide and nitrogen dioxide, significantly improving air quality.

Social

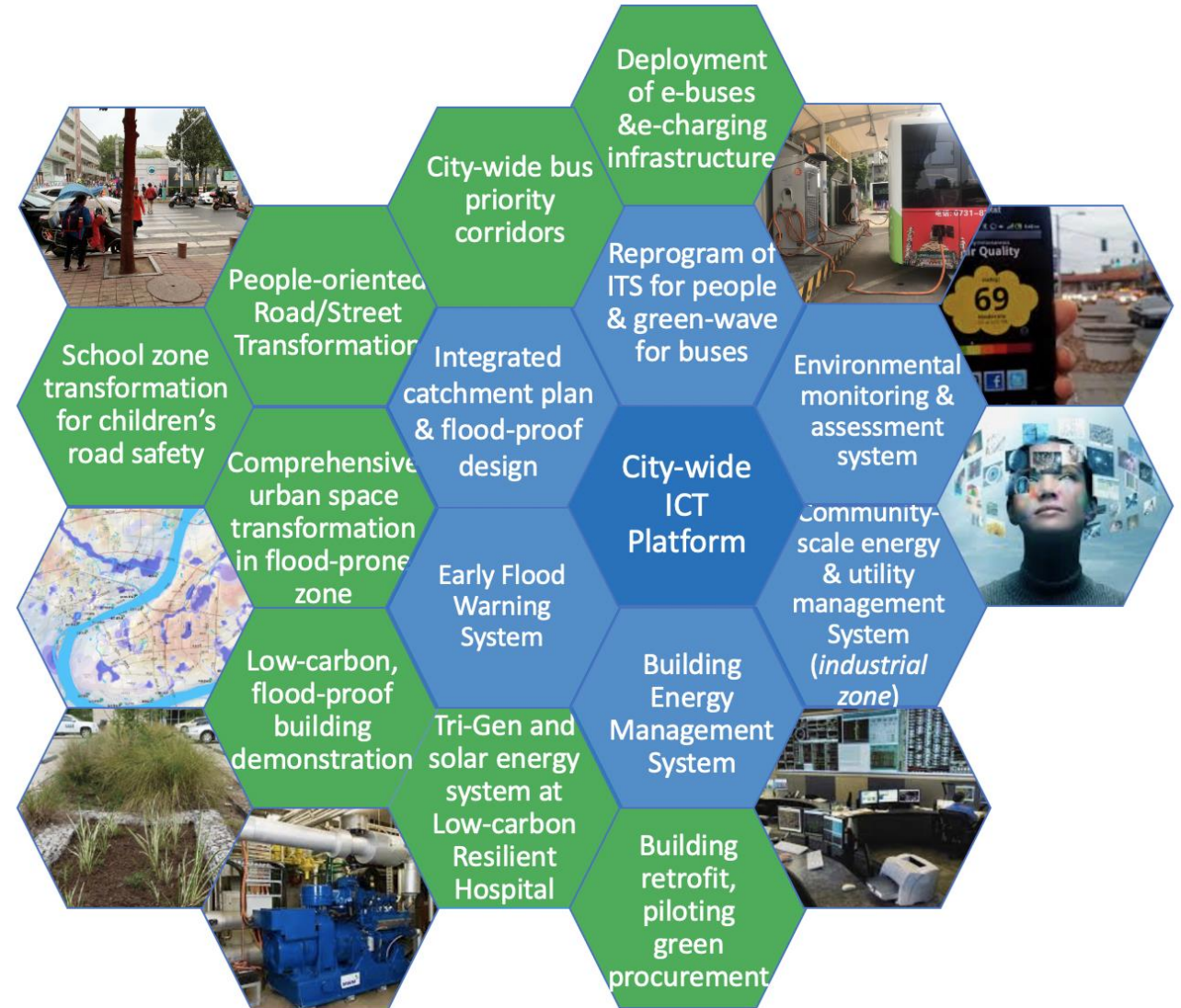
The project aims to engage citizens at every stage, increasing awareness of the importance and ease of energy savings among the public.



The reduction of air pollutants is beneficial for citizens' health, especially for children and seniors who are particularly vulnerable to respiratory diseases (photo by Jieshi Zhang).

XIANGTAN LOW-CARBON TRANSFORMATION PROGRAM

- Off-grid Natural Gas-based Tri-Gen +Solar hybrid
- Building energy/utility management system
- Passive house design + energy efficient appliances
- Intelligent transport management system for low-carbon mobility
- E-buses and e-charging infrastructure
- Industrial energy/utility management system
- Green public procurement
- Right heating tariffs for industrial waste heat for district heating





KEY
FACTORS

- The Governments' roles are critical.
 - ✓ Right incentives for technology push and deployment
 - ✓ Appropriate policy making
 - ✓ Creating new institutions
 - ✓ Creating, supporting, facilitating markets for clean energy other



THANK YOU