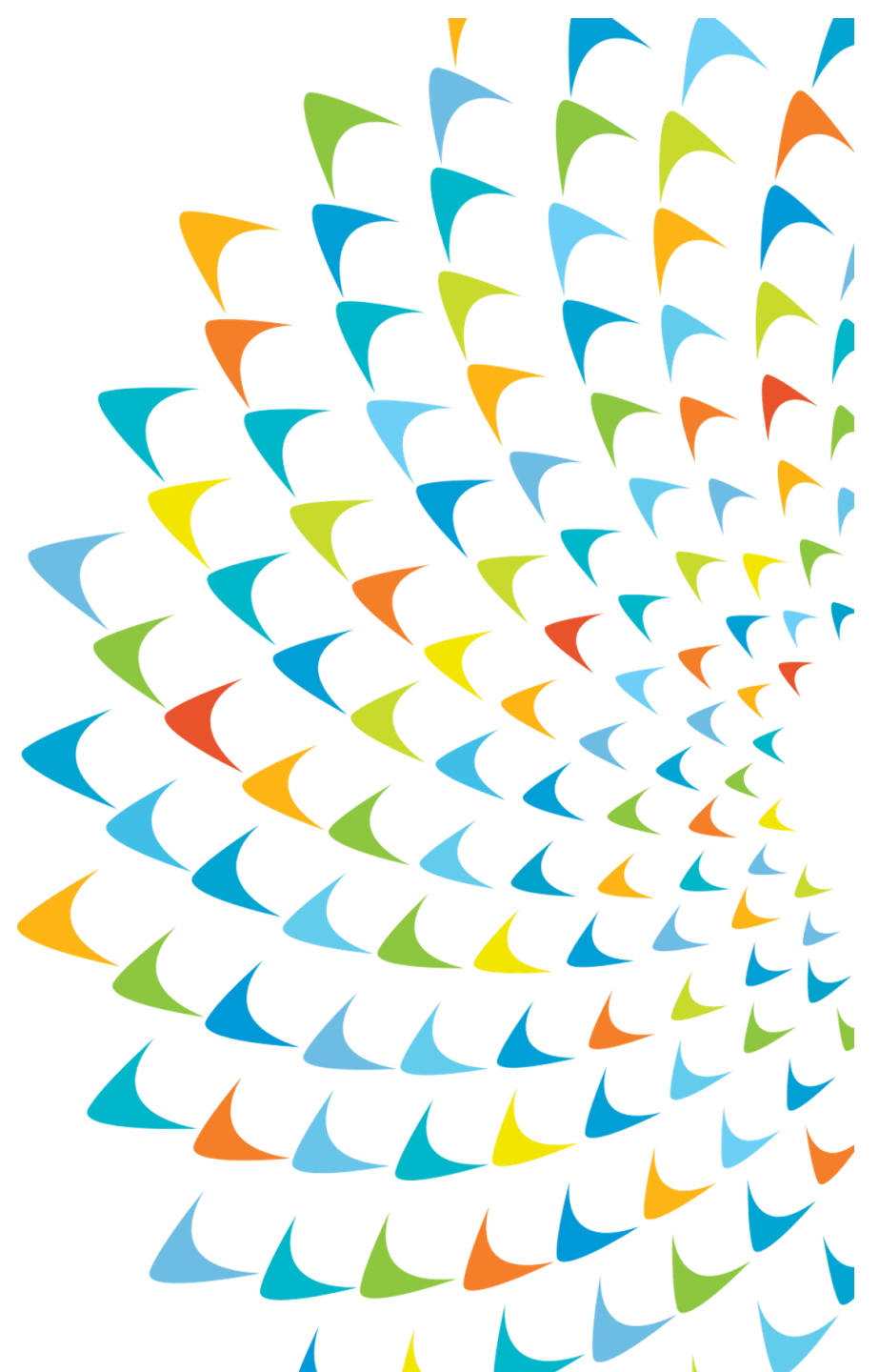


ADB

Addressing Climate and Energy Challenges through Innovations

- Asian Development Bank Approach

Yongping Zhai
Chief, Energy Sector Group
Asian Development Bank



Outline of Presentation

1. About the Asian Development Bank
2. Evolving Trends in Energy Sector
3. ADB's Response to Changing Energy Systems
4. ADB Activities on CCUS (including in China)



About the Asian Development Bank

The Asian Development Bank



- Founded in 1966
- 67 members; 48 in the region
- 40 borrowing members
- Japan and the United States are the 2 largest members

ADB's Strategy 2030

- Strategy 2030 published in July 2018.
- ADB aims to achieve a:

PROSPEROUS

INCLUSIVE

RESILIENT

SUSTAINABLE

ASIA AND THE PACIFIC



....while sustaining efforts to eradicate extreme poverty

Seven operational priorities under Strategy 2030



Addressing remaining poverty and reducing inequalities



Making cities more livable



Accelerating progress in gender equality



Promoting rural development and food security



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

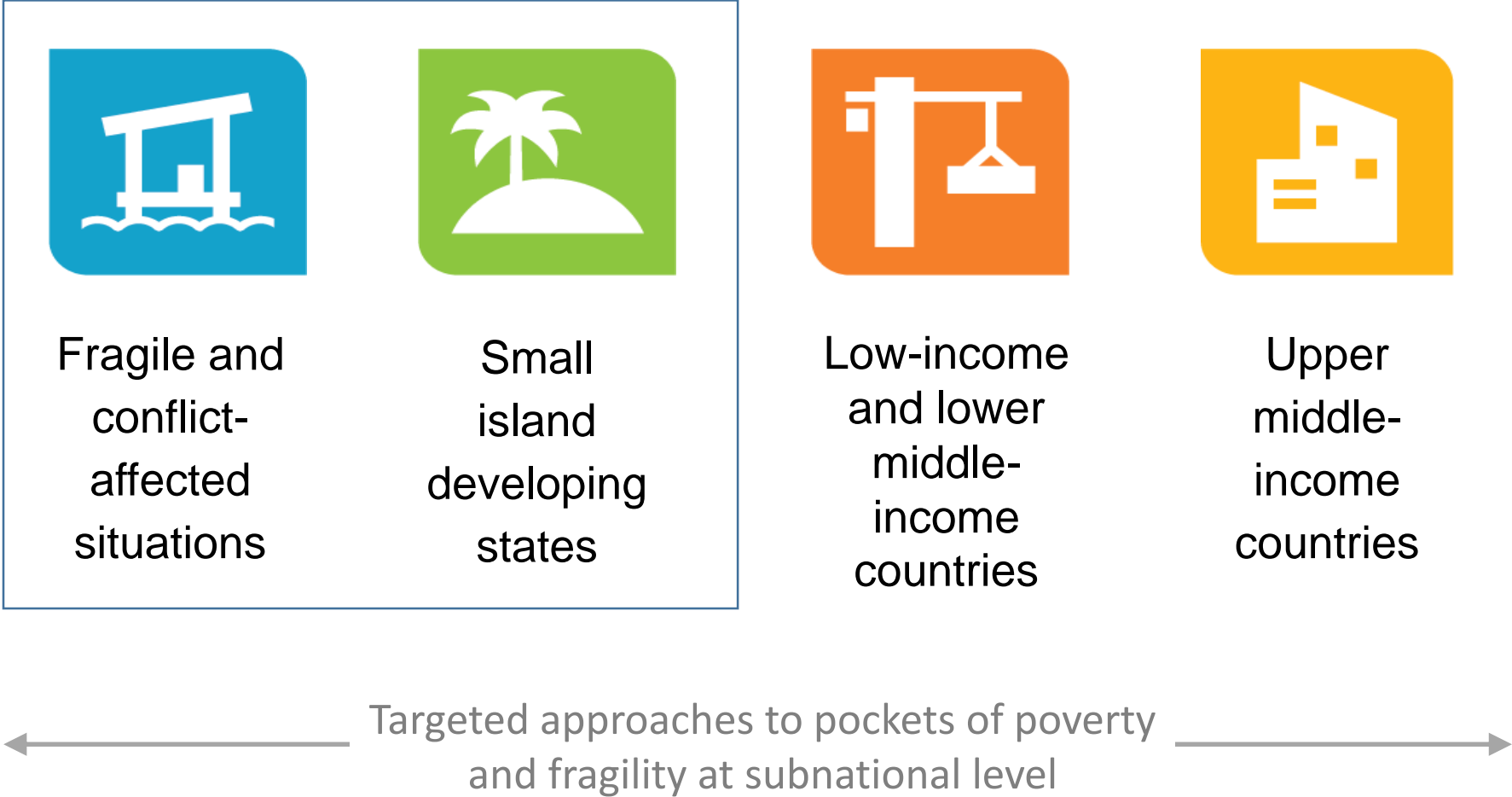


Strengthening governance and institutional capacity



Fostering regional cooperation and integration

Differentiated approaches



Evolving Trends in Energy Sector

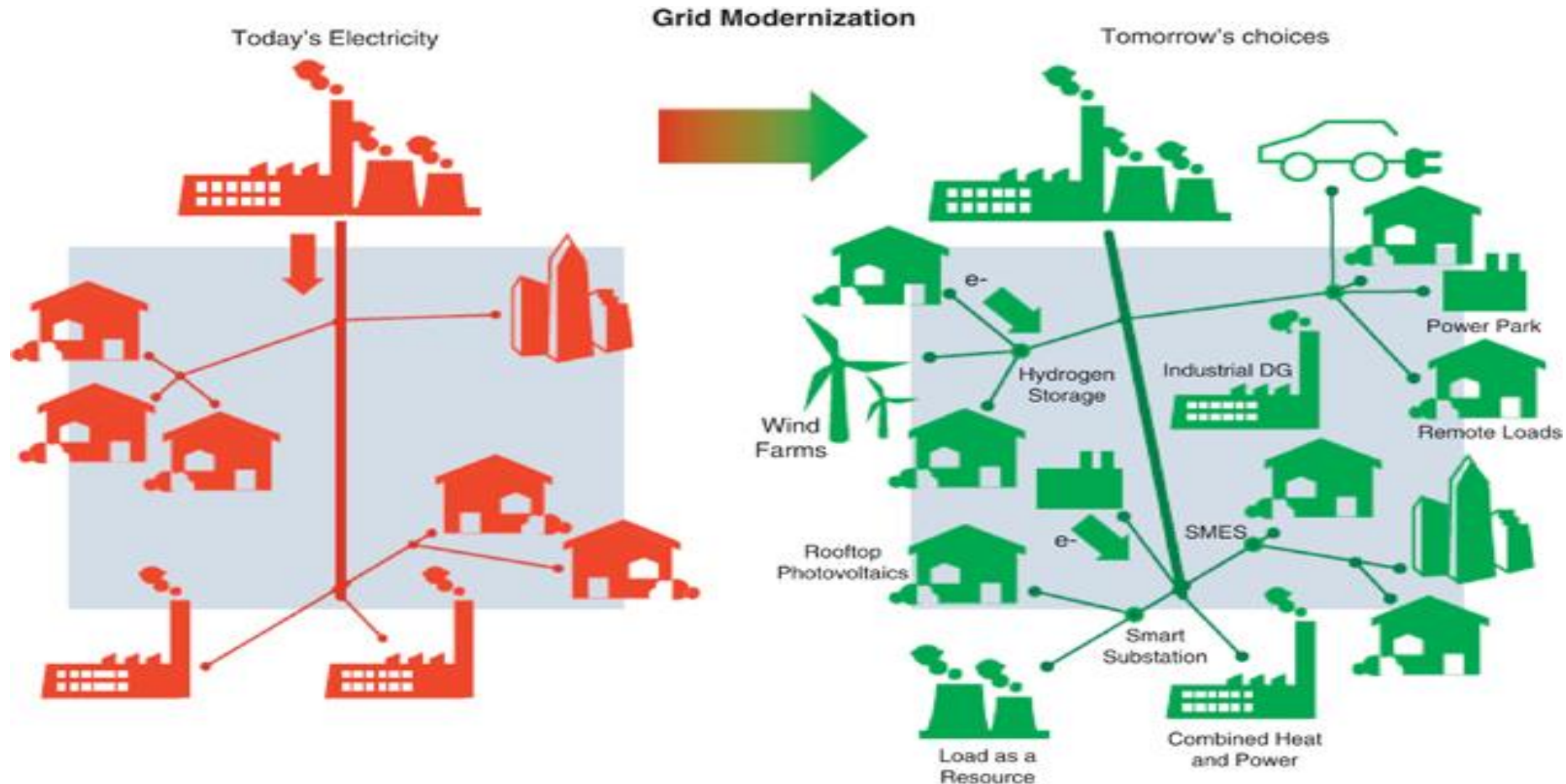


Energy Sector Financing

Three decades of evolving priorities...

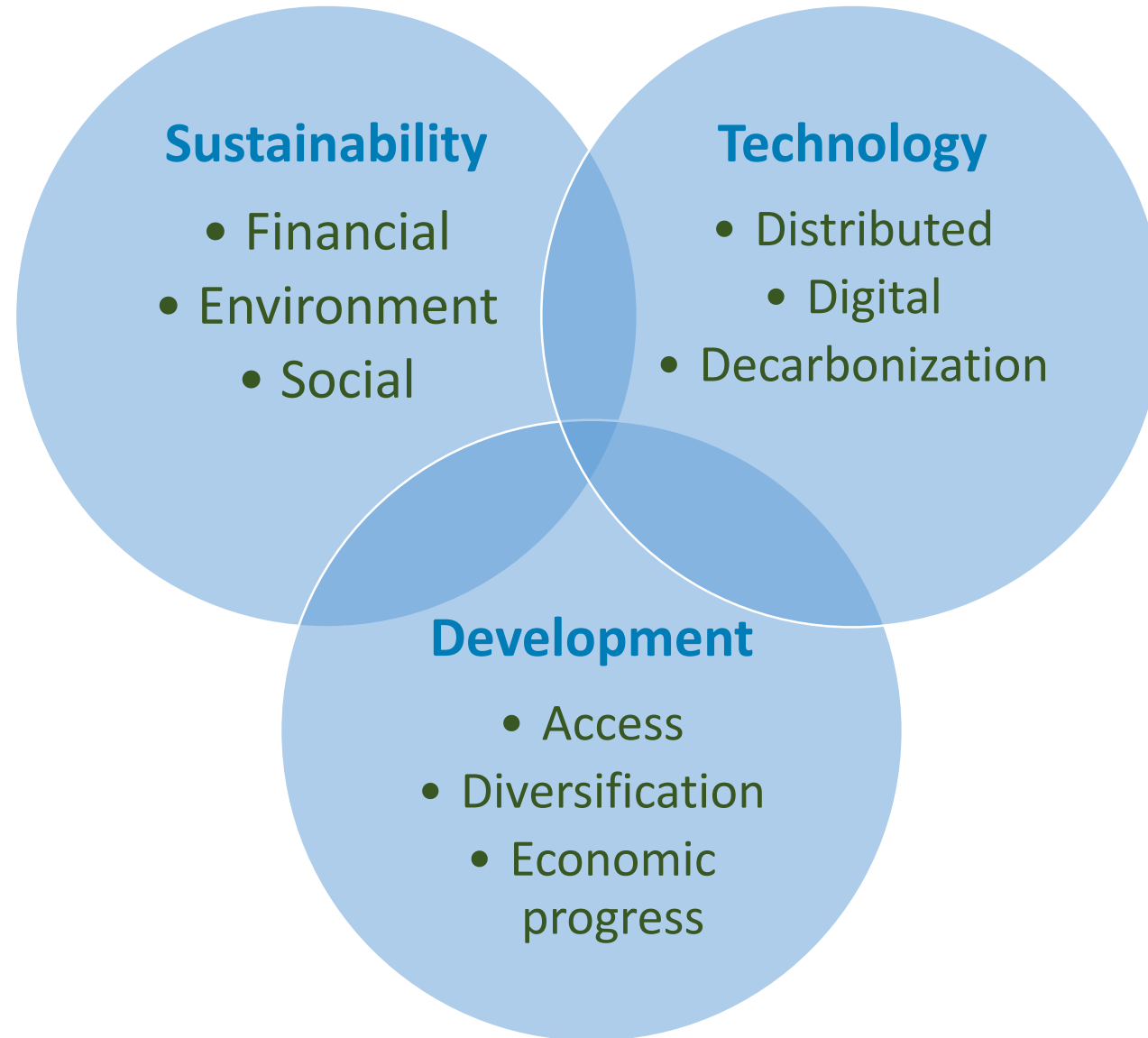
- 1990-2000 “ $a \cdot x + b = c$ ”
 - Developing large conventional power systems to support economic growth
 - Private sector investments through IPPs (BOT contracts, “take-or-pay”)
- 2000-2010 “ $a \cdot x + b \cdot y^2 = c$ ”
 - Economic growth vs. inclusive growth: poverty reduction is overarching goal
 - Investments prioritized in rural electrification by public sector concessional funding
- 2010-2020 “ $a \cdot x + b \cdot y^2 + c \cdot z^3 = d$ ”.
 - Paris Agreement: climate change mitigation
 - Sustainable Development Goal: towards universal clean energy access
 - Sustainable inclusive economic growth!

Accordingly, energy systems also evolving.....



New energy systems in “7 Ds” ---
deregulated, decentralized, distributed, decarbonized, diversified, democratized, digitalized.

Mega-trends affecting the Energy Sector



Regional Challenges

Investment Needs

- Developing Asia will need to invest \$26 trillion from 2016 to 2030 (\$1.7 trillion per year) to maintain growth momentum, eradicate poverty, and respond to climate change
- \$14.7 trillion will be for power sector infrastructure investments

Energy Access

- Over 350 million people without access to electricity in Developing Asia¹
- Majority of this population (mostly in remote areas and islands) will depend on innovative technologies (e.g. renewable energy mini/micro grids/energy storage) to access electricity

Climate and Environment

- Increased impacts of climate change evident(storms, flooding, drought)
- Urban air pollution from power, transport and waste
- Multi sectoral interventions needed(energy, urban, transport, water, agriculture, etc.)

1. Source: IEA World Energy Outlook 2018



ADB's Approach to the Changing Energy Systems

ADB Strategy 2030: 7 Operational Priorities

Energy Sector's Contributions

Operational Priorities	Energy Sector Contributions
Addressing Remaining Poverty and Reducing Inequalities	Clean energy for meeting basic needs (lighting and cooking); skills development and job creation with renewable energy; productive use of energy to generate income; solar home systems
Accelerating Progress in Gender Equality	Clean energy access relieves women for fuel collection which allows women more time to pursue income-generating activities
Tackling Climate Change, Building Disaster Resilience	Integrating climate change mitigation (GHG reduction) and adaptation into project design
Making Cities More Livable	Supporting smart electricity supply to cities, energy efficient buildings and electric vehicles, rooftop solar for household and commercial buildings
Promoting Rural Development and Food Security	ADB will support use of solar powered pumps for smart irrigation to replace diesel or electricity powered pumps
Strengthening Governance and Institutional Capacity	Promoting energy sector reforms and developing institutional capacity for renewable energy development
Fostering Regional Cooperation and Integration	Promoting energy connectivity (power interconnections, gas pipelines), and sharing best practices and technologies in renewable energy development

ADB Energy Project Review: Strategic Considerations and Key Questions Asked

Three Strategic Considerations:

- How the project will contribute to the achievement of SDG 7 (universal energy for all by 2030)?
- How the project is aligned with the country's Nationally Determined Contribution under Paris Agreement and helps them in achieving their targets?
- How the project contributes to climate financing?

Three Key Questions Asked:

- Does the project include new and/advance technologies?
- Does the project include new business models/approaches (e.g. cross sectoral)
- Does the project include innovative financing instruments?

ADB's Approach to Promote Innovations

- Establishment of Pool of Experts:
 - IoT, smart grids, waste-to-energy, gas-to-power...
- Establishment of High Level of Technology Fund
 - Piloting new and advanced clean technologies
- Reforming Procurement Guidelines
 - Giving more weight to quality and innovations
- Application of Shadow Carbon Price
 - About \$37/ton of CO2 equivalent

Yongping Zhai



Chief of Energy Sector Group, Sustainable Development and Climate Change Department

Dr. Yongping Zhai has been working on energy development in Asia and Africa for 25 years. He is currently in charge of overall energy policy coordination and technical support to ADB energy sector operations. He is also in charge of developing energy sector knowledge work for ADB and interacts with worldwide energy sector partners.

Blogs by this Author



Smart meters in rural India are a win-win solution for all

Published on Wednesday, 24 October 2018

Demand-side energy efficiency brings benefits to four key stakeholders amid India's low-carbon energy transition program.



Solving the Energy Trilemma in developing countries through innovation

Published on Tuesday, 16 October 2018

With innovative business models, financing and procurement, developing countries can leapfrog to secure, affordable, and clean energy systems.

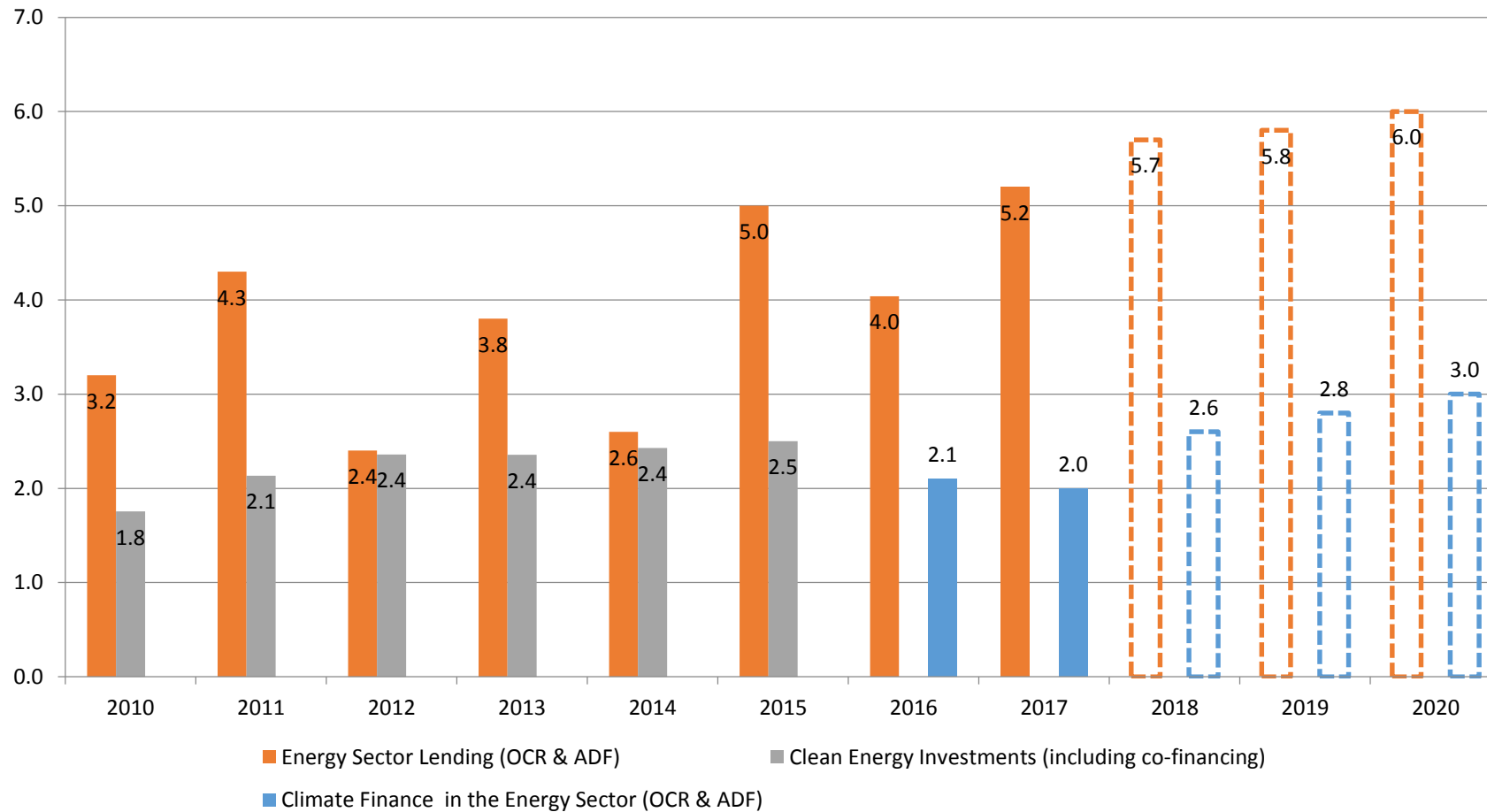


Can we achieve universal electricity access without coal?

Published on Friday, 31 August 2018

While coal will still keep the grid up and running for now, renewable energy-based distributed systems can meet growing demand in the near future.

ADB Energy Sector Achievement and Target (US\$ billion)

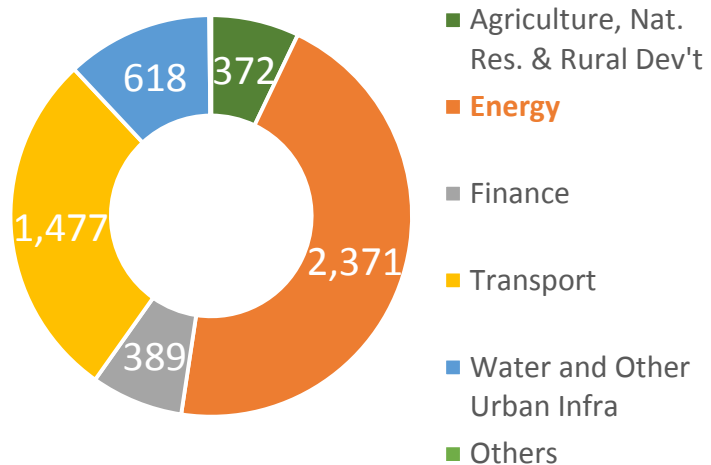


Climate Finance Investments

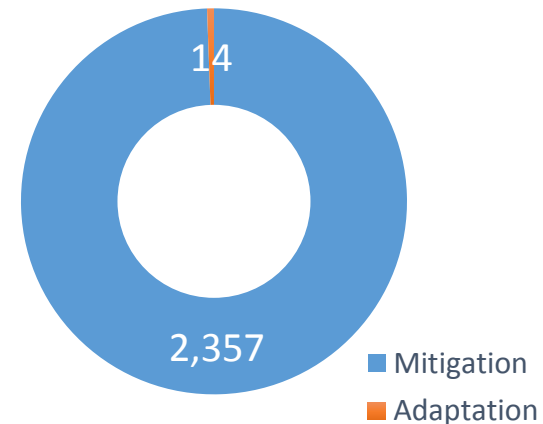
- 2020 target: \$4 billion mitigation \$2 billion adaptation
- 2019-2030 commitment \$80 billion (\$7.3 billion yearly)



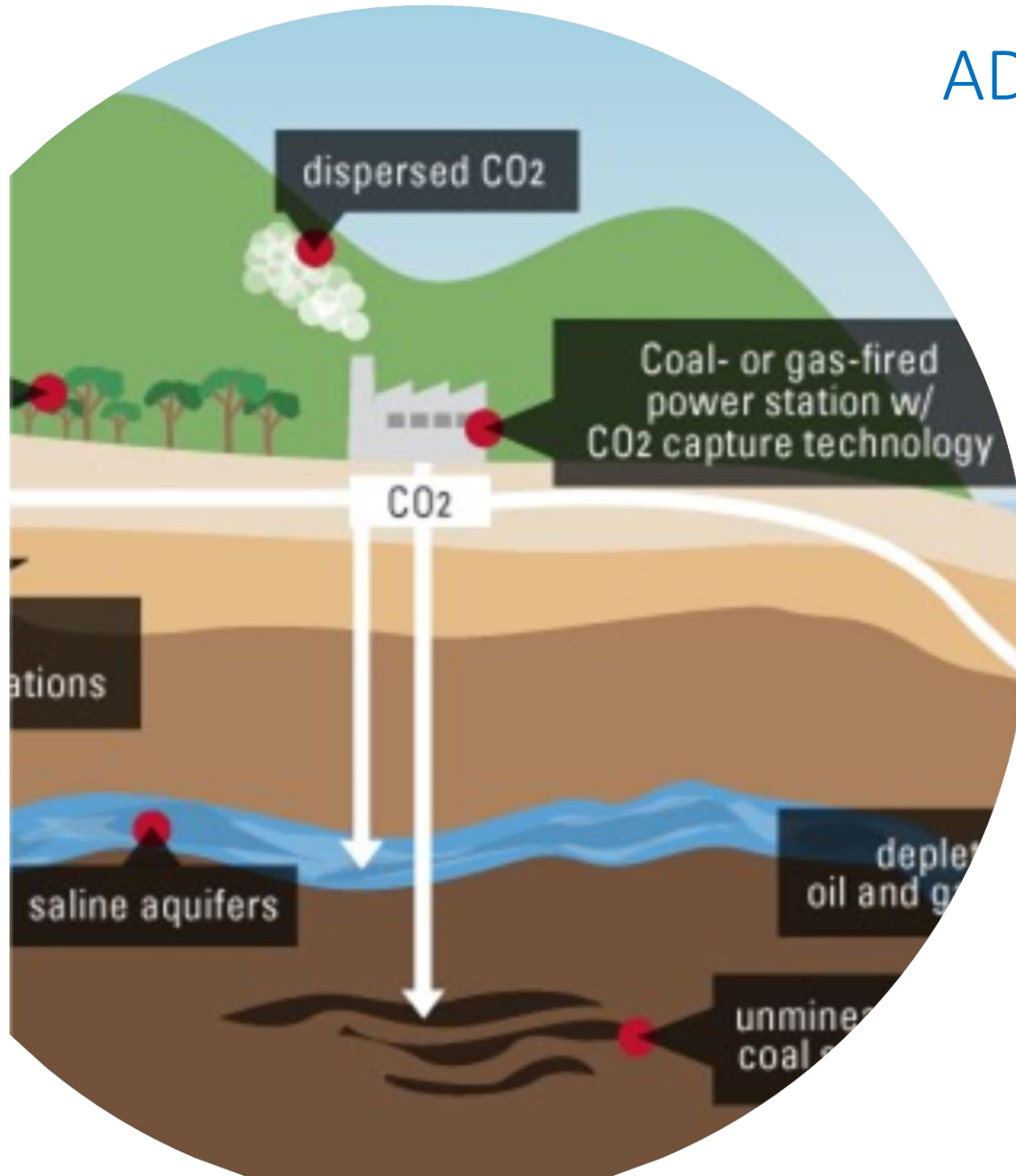
Climate Finance per Sector (\$m)



Energy Climate Finance (\$m)



ADB Activities on CCUS (including China)



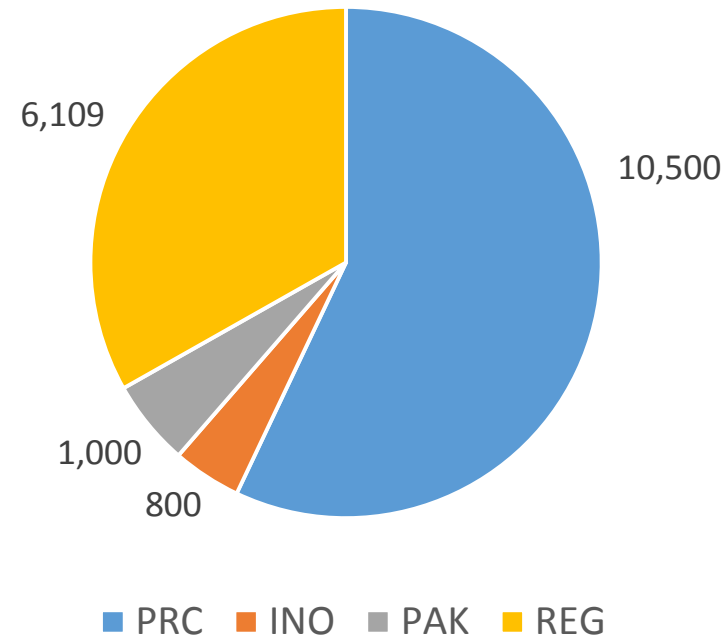
ADB's Views on CCUS

- Containing 1.5°C temperature rise needs CCUS technology. CCUS will help ensure smooth transition to low-carbon economy by minimizing abrupt change in technologies and hence, reduce the effects of stranded assets on the economy.
- CCUS must be put in the context of Paris Agreement and ADB's Strategy 2030 and address multiple operational priorities. Key priorities for CCUS:
 - Addressing remaining poverty and reducing inequalities
 - Tackling climate change, building climate and disaster resilience, and enhancing environmental sustainability
 - Fostering regional cooperation and integration
- ADB sees a role for itself in removing institutional, economic and technical constraints mentioned by IPCC on CCUS deployment. Economically viable utilization with permanent carbon dioxide storage is our objective.

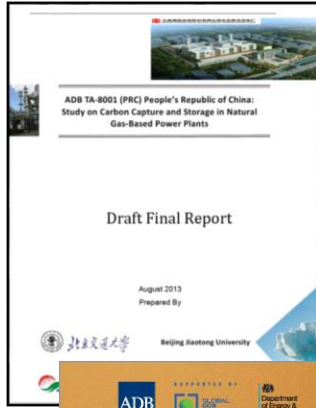
Carbon Capture and Storage Fund under Clean Energy Financing Partnership Facility

- Established in 2009
- Supported by the UK and the Global CCS Institute, Australia
 - Initial allocation of A\$ 21.5m and subsequent allocation of £ 37m
- **\$ 18.4m** total support to CCUS
- 2 projects amounting to **\$ 19.8m** await approval
- Utilization: regional studies, country studies, knowledge sharing activities, centers of excellence, project feasibility studies, and investment grants for pilots

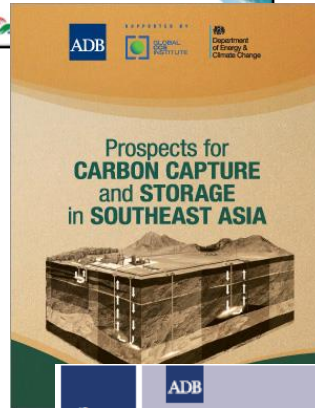
ADB CCS Fund Distribution per Country
(approved projects as of Sept. 2018, \$m)



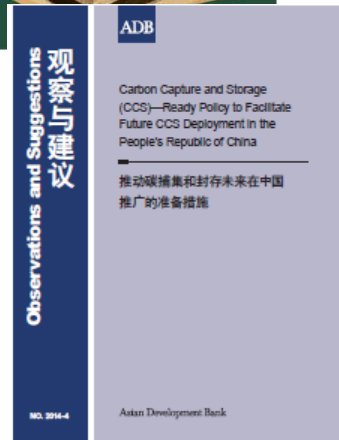
ADB's Knowledge Products on CCS



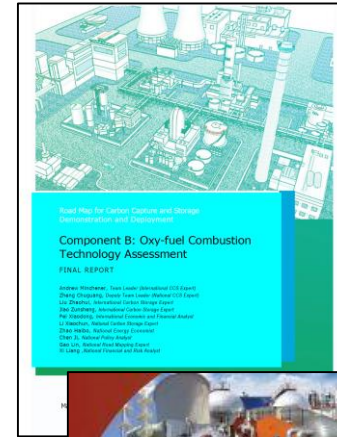
Study on Carbon Capture and Storage in Natural Gas-Based Power Plants (Aug 2013)



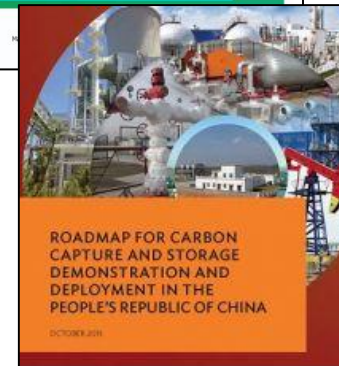
Prospects for Carbon Capture and Storage in Southeast Asia (Sept 2013)



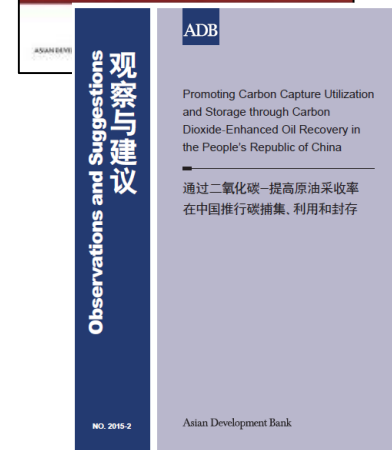
Carbon Capture and Storage (CCS) – Ready Policy to Facilitate Future CCS Deployment in the People's Republic of China (Dec 2014)



Roadmap for Carbon Capture and Storage Demonstration and Deployment - Component B: Oxy-fuel Combustion Technology Assessment (Mar 2015)

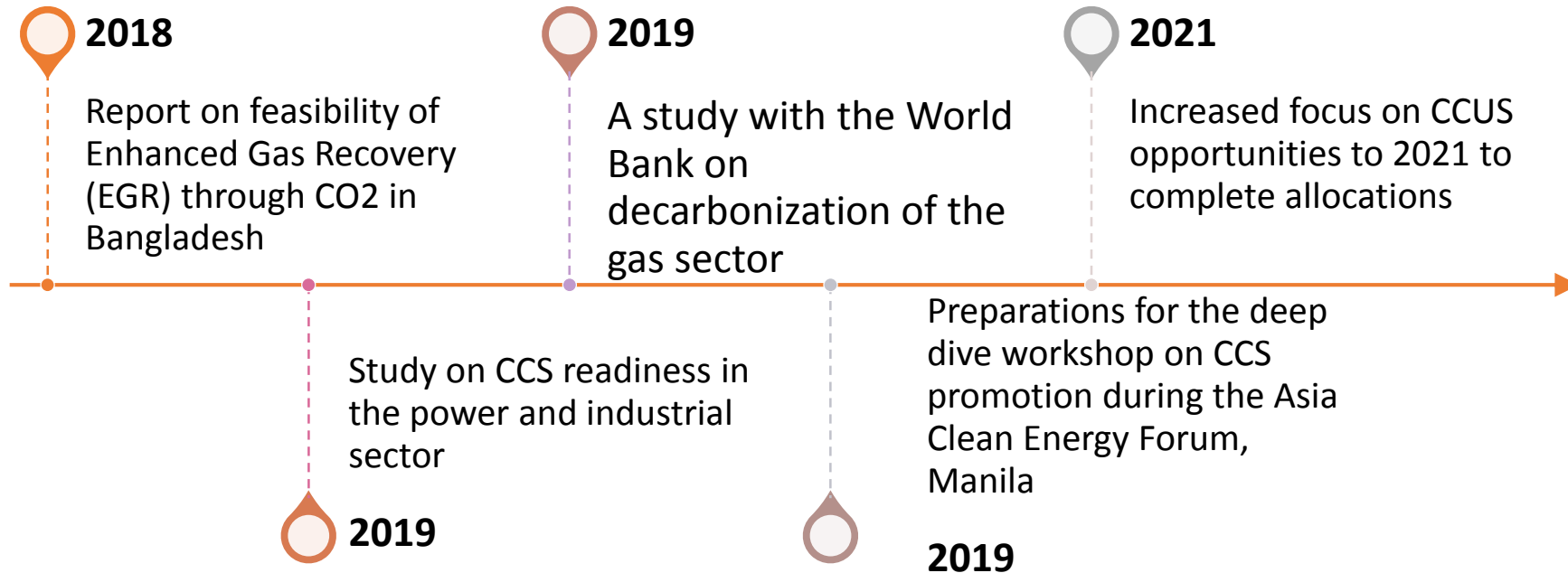


Roadmap for Carbon Capture and Storage Demonstration and Deployment in the People's Republic of China (Nov 2015)



Promoting Carbon Capture Utilization and Storage through Carbon Dioxide-Enhanced Oil Recovery in the People's Republic of China (Dec 2015)

Ongoing and Upcoming Activities on CCUS



- Creation of an international knowledge forum on CCUS following the Xi'An (PRC) initiative
- Assist in important CCUS projects
 - Gundih pilot project in Indonesia (USD 17 million),
 - Feasibility study for Yanchang Petrochemicals project (USD 5.5 million)
- Additional focus will be on CCU and industrial CCS
- Continued effort on building a set of countries with CCUS capacity

Ongoing CCUS Objectives in ADB

- Fostering cooperation on CCUS in Asia and the rest of the world
- Ensuring research and development in CCUS
- Expanding the menu of economically viable CCUS and future looking CCUS Ready opportunities
- Exploring industrial CCUS activities (such as in steel, cement, and petrochemical, power industries)
- Extending number of countries exploring CCUS – such as: Vietnam, Kazakhstan, Pakistan, India, Bangladesh, etc.
- Creating knowledge pool to promote CCUS in Asia through Centres of Excellence
- Supporting pilot projects on CCUS as a path to ultimate implementation of commercial CCUS projects
- Generating a pipeline of CCUS projects for ADB lending operations

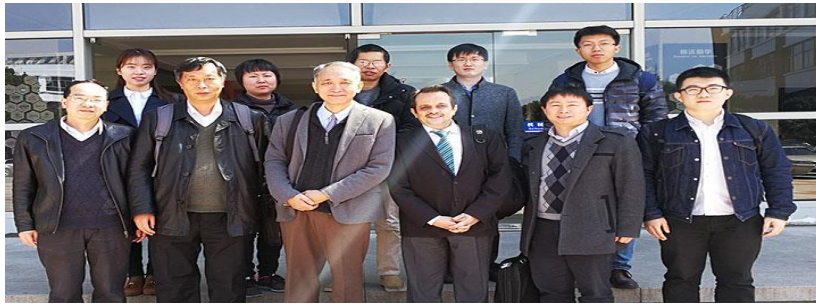
Opportunities for Collaboration

- Joint exercise to identify new CCUS opportunities in Asia
- Project and feasibility project co-funding
- Assistance to countries in legal and regulatory framework formulation
- Awareness building in Asia through conferences and knowledge products

ADB CCUS Activities in the People's Republic of China

- Feasibility Assessment of Industrial Scale CCS Capacity Development TA Project (2017)
- Promoting Carbon Capture and Storage in the People's Republic of China and Indonesia (2014)
- Tianjin Integrated Gasification Combined Cycle Power Plant (2013)
- Road Map for CCS Demonstration and Deployment (2012)
- Study on Carbon Capture and Storage on Natural Gas-Based Power Plants (2011)
- Carbon Dioxide Capture and Storage Demonstration - Strategic Analysis and Capacity Strengthening (2009)

Carbon Capture and Storage Research Center (Shanghai)



- Established with the support of ADB, Global CCS Institute, and the UK Government in 2016
- Focuses to promote the CCS innovation and industrial development capacity building in Shanghai and Yangtze River Delta.
- Has worked on membrane technologies, optimization of energy consumption of CCS, worked on steel sector CCS, Life cycle assessment etc.
- Future plans involve work on Bio Energy CCUS as well as industrial CCS technologies.

ADB CCS Center for Excellence (Guangdong) Project

- Builds on the *Roadmap for Carbon Capture and Storage Demonstration and Deployment in the People's Republic of China*
- Project outcomes
 - to develop institutional capacity for researching and demonstrating CCS technologies,
 - enhance capacity development in the areas of CCS technology innovation, policy development
 - structure market-based financial mechanisms for CCS technology commercialization
- Programs
 - Applied R&D Programme
 - The Policy and Finance Expert Working Programme
 - The Knowledge Transfer Programme

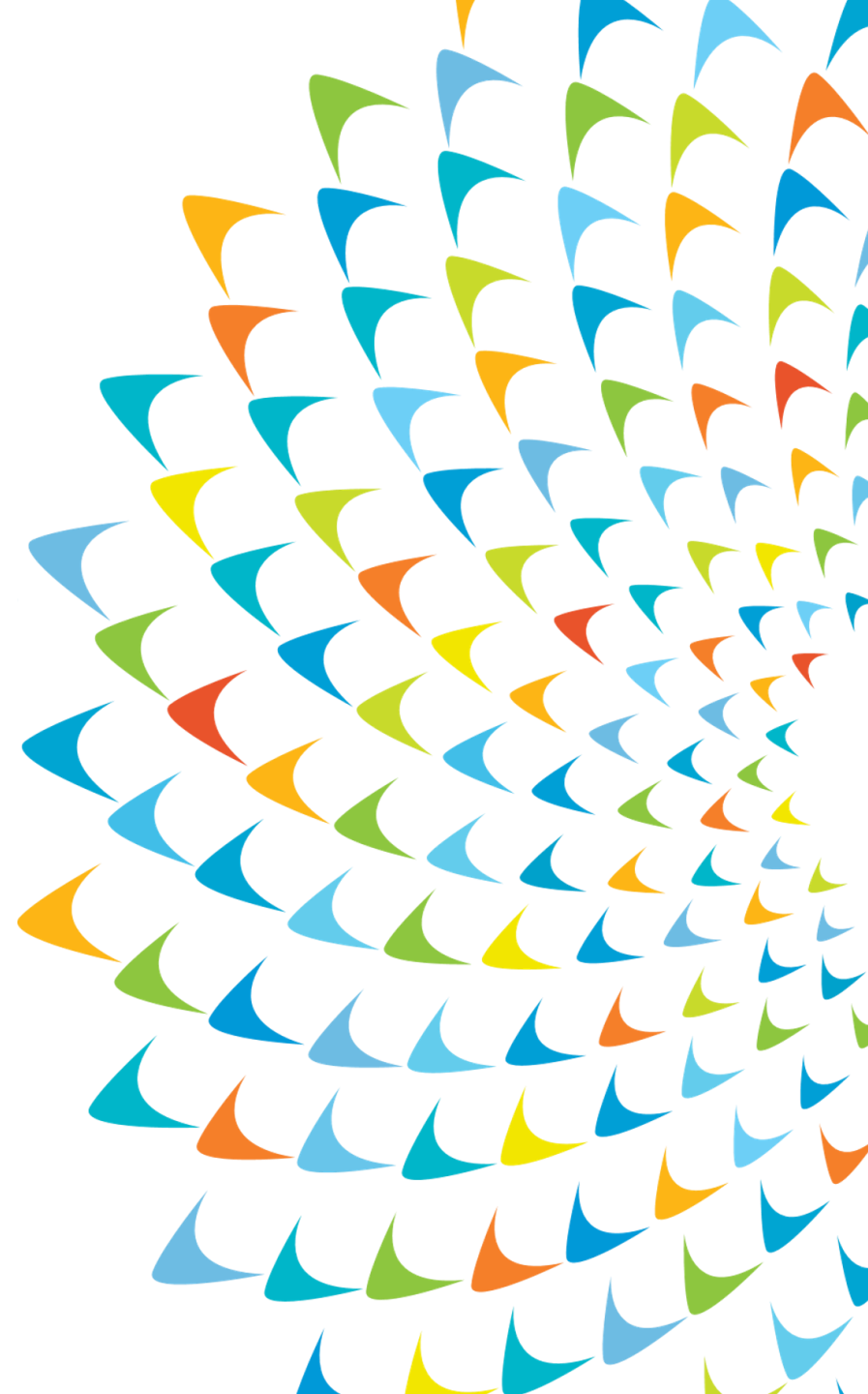
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Thank you.

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