# China, People's Republic of: Qingdao Rural Waste-to-Energy Project

<table>
<thead>
<tr>
<th><strong>Project Name</strong></th>
<th>Qingdao Rural Waste-to-Energy Project</th>
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<tbody>
<tr>
<td><strong>Project Number</strong></td>
<td>50089-001</td>
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<tr>
<td><strong>Country</strong></td>
<td>People's Republic of China</td>
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<tr>
<td><strong>Project Status</strong></td>
<td>Active</td>
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<tr>
<td><strong>Project Type / Modality of Assistance</strong></td>
<td>Technical Assistance</td>
</tr>
<tr>
<td><strong>Source of Funding / Amount</strong></td>
<td>TA 9186-PRC: Qingdao Rural Waste-to-Energy Project</td>
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### Description
In rural Shandong Province, straw and coal are traditional fuel for heating and cooking. They are burned in inefficient heating and cooking stoves, which poses serious indoor and outdoor air pollution and emission of carbon dioxide. Over the decades, the Government of the People's Republic of China (PRC) provided large amount of financial support to promote comprehensive utilization of agricultural and livestock waste in rural areas such as setting up household based biogas digesters, small scale biomass heating boilers, and conversion of agricultural waste to pellet fuel which are operated by farmers or small enterprises. Household based bio digesters have shown good results in terms of economy and technology. However, household biogas digesters often cannot produce enough gas in the middle of winter due to lack of feed stock, which compels rural people to use coal for heating. Establishing medium and large scale livestock industry based biogas plants were actively promoted during the Twelfth Five-Year Plan of the PRC (2011-2015), however there were mixed success in biogas production due to poor design of plants and lack of human capacity in operation of the plants. Moreover, the current practice of biomass briquette production involves low level of mechanization in the process and poor quality of equipment causing low quality of pellet fuel.

To overcome these issues, a new policy is being issued under the Thirteenth Five-Year Plan (2016-2020) of the PRC to encourage large energy service providers, such as national level power generation companies, and municipal state-owned gas and heating services providers, entering to rural energy market and exploit untapped biomass to energy. Consistent with this, the proposed project will demonstrate a comprehensive utilization of agricultural and livestock waste to energy for heating and cooking in 60 new rural communities in rural Qingdao to be implemented and operated by the Qingdao Energy Group (QEG), the largest local state-owned energy company in Qingdao, thereby improving the quality of energy access, and reducing air, soil, and water pollution in rural areas. The proposed project will not only directly benefit about 660,000 people in the project area (20% of total rural population in project area), but indirectly benefit the residents of the other parts of Qingdao by removing some of the sources of pollution now emanating from the project area.

The project will complement Asian Development Bank (ADB)-funded Beijing-Tianjin-Hebei (BTH) Clean Air Program. Upon project completion, similar technical application and business model can be replicated in other similar rural areas in the greater BTH region by turning agricultural and livestock wastes to cleaner and low-carbon heating and cooking fuel.

### Project Rationale and Linkage to Country/Regional Strategy
Biomass burning from agriculture sector is one of the main causes of air pollution in the greater BTH region. Farmers in the greater BTH region traditionally burn agricultural waste after the harvest, and plough to bury the ashes in the ground to fertilize farmland. A recent satellite survey by the Ministry of Environmental Protection observed 400 straw burning sites in the greater BTH region, mainly in Hebei and Shandong Provinces, which contribute 15% of fine particulate matter emission in the greater BTH region. An effective way to prevent farmers from burning agricultural waste is to turn the waste into briquette which is carbon neutral and clean fuel for heating and cooking. As food production demand grows in tandem with economic growth, livestock wastes also became one of the worst water pollution hazards in the country. The total organic pollutants in water from intensive livestock production already exceed that from municipal and industrial sources. Livestock wastes also generate harmful gases such as ammonia, carbon dioxide, and methane. Instead, by turning livestock waste into biogas, it can be used for cooking and heating. Also, biogas systems can produce a nutrient-rich fertilizer, called biogas-slurry, which is a safe, organic, liquid fertilizer that can be applied to crops, hence reducing utilization of chemical fertilizer.

Shandong Province, which is a part of the greater BTH region, is one of the largest granary and livestock industry provinces in the PRC. Qingdao is in eastern Shandong Province, where winter temperatures drop to as low as -17 degrees Celsius, and are typically below zero for 5 months a year. Heating is therefore an essential service for public health and well-being and sustaining people's livelihoods in Qingdao. Like the rest of Shandong (or country), rural urban income gaps are quite high. Per capita net income of rural Qingdao is only 40% of urban income. In January 2014, the Government of the PRC issued a new national urbanization plan which stipulates to upgrade infrastructure, and improve public services in the rural areas to narrow down the income and living conditions gap between rural and urban areas. Consistent with this plan, Qingdao is planning to consolidate 5,983 administrative villages into 1,043 new rural communities with a total population of 3,000 to 5,000 in 1.5 kilometer radius. These new rural communities will have modern social service and infrastructure including energy system.

### Impact
- Rural-urban living standard gap in Qingdao narrowed
- Air quality and rural natural environment in Qingdao improved

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<tr>
<th><strong>Project Outcome</strong></th>
<th><strong>Description of Outcome</strong></th>
<th><strong>Progress Toward Outcome</strong></th>
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<tr>
<td><strong>Impact</strong></td>
<td>Carbon and pollutants emission from heating and cooking in rural areas in Qingdao reduced</td>
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<tr>
<td><strong>Implementation Progress</strong></td>
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Description of Project Outputs

A waste-to-energy system in rural areas in Qingdao demonstrated.

Status of Implementation Progress (Outputs, Activities, and Issues)

Geographical Location

Nation-wide

Summary of Environmental and Social Aspects

Environmental Aspects

Involuntary Resettlement

Indigenous Peoples

Stakeholder Communication, Participation, and Consultation

During Project Design

The project was originally designed to utilize agricultural and livestock waste-to-energy. In the course of the project's feasibility study preparation, it was established that several other components low-carbon and pollutants heating, cooling, and power supply service (tri-generation) have to be integrated into the project in response to the growing energy demand in the suburban and rural areas in Qingdao. While technical due diligence and system optimization for waste-to-energy components were conducted under TA 8920, the technical support for the newly added project components is needed to optimize the system design to prepare high quality technical specifications of the bid documents.

During Project Implementation

ADB has been facilitating the establishment of a knowledge and technical exchange platform between the QEG and advanced countries using biogas and biomass such as Germany, Japan, Sweden, and the United States to help Qingdao gain further knowledge and experience in the areas of (i) policies, institutional laws and regulations, technologies in biogas, biomass production and district heating and cooling, and (iii) relevant project experiences. Conferences, seminars, trainings, workshops, and overseas trainings have been conducted for the purpose of gaining advance knowledge relevant to the technologies in biogas, and biomass energy, and district heating and cooling. A capacity building event comprising workshop and knowledge exchange meeting was held in Qingdao on 12-13 December 2018. The workshop focused on Multi Energy Systems (MES) and Energy Efficient gas solutions, and included discussions on (i) Introduction to District Energy and Distributed Energy development in Qingdao, (ii) Introduction to Qingdao Energy Group and ongoing projects, (iii) International District Energy trends from a UN perspective, (iv) Experiences from an international utility company, (v) District Energy and Distributed Energy in Northern Europe, (vi) 4th Generation District Heating and District Energy 4.0, (vii) Heat recovery technologies and Heat-Pump/Chiller technologies, (viii) Gas-turbine, Co-generation and Combined Cycle technologies, (ix) Gas-engine, co-generation and tri-generation technologies, (x) Energy efficient Heat-exchanger technologies, (xi) Project development, (xii) Technologies, (xiii) Operation and Maintenance, (xiv) Tariff structures and regulations, and (xv) global and local trends.

About 120 participants attended the event, with representatives from leading international organizations in the District Energy and Distributed Energy sectors.

Business Opportunities

Consulting Services

As a result of the changes in the project's components, the composition of the consultant were revised accordingly. The TA will recruit 2 international consultants for 9 person-months and 8 national consultants for 25 person-months. All consultants will be recruited through individual consultants selection by ADB in accordance with ADB’s Guidelines on the Use of Consultants (2013, as amended from time to time). The project team and implementing agency will be responsible for coordination and administration, or fixing the collective responsibility. The proceeds of the TA will be disbursed in line with ADB’s Technical Assistance Disbursement Handbook (2010, as amended from time to time). Lump sum payments/output based contracts will be considered under the TA.

Responsible ADB Officer

Sakai, Atsumasa

Responsible ADB Department

East Asia Department

Responsible ADB Division

EASI

Executing Agencies

Qingdao Municipal Government

C/o Qingdao Mun. Devt. & Reform Commission

No. 11 Xiang Gang Zhong Road, Qingdao

People’s Republic of China 266071

Timetable

Concept Clearance

30 Sep 2016

Fact Finding

-

MRM

-

Approval

29 Sep 2016

Last Review Mission

-

Last PDS Update

26 Mar 2019

TA 9186-PRC

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<th>Approval</th>
<th>Signing Date</th>
<th>Effectivity Date</th>
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<tr>
<td>29 Sep 2016</td>
<td>01 Nov 2016</td>
<td>01 Nov 2016</td>
<td>31 Dec 2018</td>
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Financing Plan/TA Utilization

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