China-US Collaboration on Promoting Renewable Energy through Belt & Road Initiatives

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Global Environmental Institute (GEI)
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US-CHINA COOPERATION IN CHINA AND BEYOND

CCS, GEI, GiEC, CAS-ISD
2009 to Present
Global Environmental Institute (GEI)

**Mission:** Design, execute and support market-based models and policy recommendations that solve environmental problems in order to achieve development that is economically, ecologically and socially sustainable.

**Quick Facts:**
- Chinese, non-profit, NGO
- Founded & based in Beijing
- Est. 2004
- Partners and Projects active across 10 countries & in China *(see map)*

**Expertise:**
Energy and Climate Change, Overseas Investment, Trade & the Environment; Ecosystem Conservation & Community Development; Marine Conservation
Outline

- **Why** are we doing projects in BRI countries (Southeast Asia and South Asia)?

- **How** are we applying REI Toolkit for renewable energy planning?
  - South Asia: Sri Lanka
  - Southeast Asia: Myanmar

- Lessons learned from overseas projects
1. Renewable Energy Development in BRI Countries

Challenges & Opportunities

- *Paris Agreement*: Clear Renewable Energy Targets in Nationally Determined Contributions (NDCs)

- *Developing countries’ needs*: international support, including RE planning, technology, financing and capacity building, to achieve their RE development goals.

- *Abundant RE resources and rapid growth of renewable power*: e.g., Solar Power Potential in Southeast Asia and South Asia
**GEI’s Insights:** Out of 70 BRI countries, 57 countries (82.4%) have clear carbon peaking goals, and 30% of all BRI countries propose renewable energy/power targets in NDCs
GEI Insight: China’s solar installment is shifting to developing countries (especially BRI Countries)
2. Collaboration on Renewable Energy Assessment & Implementation

Objectives:

Provide technical support for developing renewable energy & achieving NDCs’ commitment

Ongoing Pilots:

1. Sri Lanka: Solar power planning t to establish a Low-Carbon Demonstration Town
2.1 Sri Lanka Pilot:

NDC Target:
- 20% emission reduction in energy sector & 50% renewable power by 2030

Current Energy Structure:
- Coal & Oil (52%) mainly imported
- Hydropower (44%), vulnerable to climate change
- Renewable Power (solar, biomass, wind) very low (4%)

Conclusion:
RE development is needed for achieving NDC’s commitment
REI Toolkit for RE Planning

1. GIS tool for RE Potential Assessment
2. RE Sector/Technology Scoping
3. Technology Application MCA Screening
4. Microeconomic Analysis for RE Technology/Policy
5. Financial Mechanism and Risk Analysis
Sri Lanka: Rooftop Solar Power Generation Potential
Gampola Town:

- **Area:** 0.518 Km² in Kandy City, central province;  
  **Population:** 50,000, but 300,000 travel to Kandy and Nuwara Eliya through Gampola town
Solar Power Planning for Gampola Town:

**Solar Resource of Gampola:**
- *Average solar radiation:* 6.51kWh/m²/day, and is identified as the optimal for solar power development (China’s ranking system of solar energy resources)

**Technology Selection (Rooftop solar PV):**
- Identify 8 Public buildings (2 hospitals, 4 schools, 1 bus station and 1 train station) for installing rooftop solar PV
- Estimate the areas of each building by using GIS tool

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**Table:**

<table>
<thead>
<tr>
<th>Base Hospital</th>
<th>Area (square meters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>G101</td>
<td>197</td>
</tr>
<tr>
<td>G102</td>
<td>393</td>
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<td>G103</td>
<td>463</td>
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<td>G104</td>
<td>996</td>
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<td>G105</td>
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<td>G106</td>
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<td>G107</td>
<td>266</td>
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<td>G108</td>
<td>377</td>
</tr>
<tr>
<td>G109</td>
<td>358</td>
</tr>
<tr>
<td>sum</td>
<td>4543</td>
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</tbody>
</table>

*Figure 2-1-3 Excel Calculation*
<table>
<thead>
<tr>
<th>Type</th>
<th>Area (m²)</th>
<th>Estimated output (kWh/day), η =15%</th>
<th>Estimated output (kWh/day), η =17%</th>
<th>Estimated output (kWh/day), η =21%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Hospital</td>
<td>4543</td>
<td>1798.3</td>
<td>2038.1</td>
<td>2517.7</td>
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<tr>
<td>CBT bus station</td>
<td>947</td>
<td>374.9</td>
<td>424.8</td>
<td>524.8</td>
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<tr>
<td>Int. School</td>
<td>1168</td>
<td>462.3</td>
<td>524.0</td>
<td>647.3</td>
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<tr>
<td>St Andrews School</td>
<td>1628</td>
<td>544.4</td>
<td>730.4</td>
<td>902.2</td>
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<td>Suwab hospital</td>
<td>1020</td>
<td>403.8</td>
<td>457.6</td>
<td>565.3</td>
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<tr>
<td>Train station</td>
<td>4897</td>
<td>1938.5</td>
<td>2196.9</td>
<td>2713.8</td>
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<tr>
<td>Wick National School</td>
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<td>2141.5</td>
<td>2427.1</td>
<td>2998.1</td>
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<tr>
<td>Zahira School</td>
<td>3065</td>
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<td>1375.0</td>
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<tr>
<td>合计</td>
<td>22678</td>
<td>8977.0</td>
<td>10174.0</td>
<td>12567.8</td>
</tr>
</tbody>
</table>
Conclusion for rooftop solar panel installation in Gampola:

- Total areas covered: 22.68m²
- Estimated power potential: 2.98MW (17%)
- Estimated investment: 2.33 million USD
- CO2 reduction is estimated as below:

<table>
<thead>
<tr>
<th>Solar Panel Type</th>
<th>Energy conversion efficiency of solar panel</th>
<th>Annual Energy Generation (GWh)</th>
<th>Annual GHG emission Reduction (tonne)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multicrystalline</td>
<td>Efficiency $\eta = 15%$</td>
<td>3.3</td>
<td>2909</td>
</tr>
<tr>
<td></td>
<td><strong>Efficiency $\eta = 17%$</strong></td>
<td></td>
<td><strong>3297</strong></td>
</tr>
<tr>
<td>Monocrystalline</td>
<td>Efficiency $\eta = 21%$</td>
<td>4.6</td>
<td>4073</td>
</tr>
</tbody>
</table>
Business Model Design for Rooftop Solar PV project

Banks
- Review and evaluate the system plan of the project
- Provide loans equal to 50-70% of total dynamic investment

Building Owner
- Provide 30-50% of total dynamic investment funds
- Submit on-grid application to power supply bureau
- Hire designing institute

Solar PV Company
- Provide system design and financial package
- Install solar PV system
- Provides operation and maintenance service

Designing Institute
- Conduct field research of the site
- Design solar system

Power Supply
- Measure and record actual solar power generation
- Purchase electricity from solar power system

Bureau of Finance
- Work with relevant agency to identify amount of subsidy
- Provides adequate subsidies to project developer

Loan
- Red represents Solar PV Company obtains loans from Banks
- Blue represents Factory owners getting loans directly from Banks

Subsidies
- Debt Service

Purchase Service
- Provide Design

Revenue Share
- Purchase electricity
- Purchase electricity

Work with relevant agency to identify amount of subsidy
- Provides adequate subsidies to project developer
2.2 Myanmar Pilot (2018.6-):

Adapt REI Toolkit for making data-based and implementable renewable energy plan (starting with solar power)

✧ **Multiple stakeholders’ engagement:**
  - Ministry of Electricity and Energy;
  - Department of Research and Innovation, Ministry of Education;
  - Ministry of Natural Resources and Environmental Conservation;
  - NGOs, companies...

✧ **Activities:** Workshop & Trainings in 2018

✧ **Next-steps:** Introduce green finance
  - Promote Myanmar’s experience
3. Lessons Learned from Overseas’ Projects

- **Challenges & Needs:**
  - Engage multi-stakeholders: local participation/partners
  - Flexibility: adapt tools for data and policy availability

- **Collaboration Approach:**
  - Identify local needs/situation for RE development
  - Capacity building
  - Pilot project
  - Introduce green finance / investment
Thank you!

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