**README for “China urban carbon offsets (CDM) dataset”**

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**DATASETS**

Between 2004 and 2014, China became the largest host country for Clean Development Mechanism (CDM) projects (Hale and Roger, 2017), or “carbon offset” projects under the purview of the larger carbon market,[[1]](#footnote-1) which is implemented principally in less economically developed countries. The primary database of CDM projects globally[[2]](#footnote-2) provides only the country- and provincial/state-level of individual projects, while significant variation exists in the city-level distribution of projects. To fill this gap, the three datasets provided here identify the city location of all CDM projects in China by referencing the individual Project Description Documents (via the UNFCCC) attached to each project. Through this method, all 3,764 Clean Development Mechanism projects at the city-level in China are identified out of a total of over 8,000 globally. Figure 1 maps the city-level distribution of the total CDM projects which took place in total in China from 2005-2012.

Figure 1. CDM projects in China, 2005-2012



The datasets operationalize two unique metrics for CDM activity, the CDM project counts and the Certified Emissions Reduction credits earned by those projects. “Project counts – China urban CDM data” contains the annual counts of CDM projects per city and “kCER – China urban CDM data” contains the annual amount of Certified Emissions Reduction (kCER) credits per city. A third dataset lists the individual projects that comprise the count values of the former two datasets, titled the “Individual projects – China urban CDM data” is project-level time series, which contains attribute data on each project summarized in Table 1.

Table 1. Variable summary for “Individual projects – China urban CDM data” dataset

|  |  |
| --- | --- |
| Variable name | Description |
| ID | Unique project ID number |
| Title | Title of CDM project |
| CITY | City location of CDM project |
| Province / State | Provincial location of CDM project |
| Host country | Host country (China) of CDM project |
| Type | Category of CDM project |
| Total issuance (kCERs) | Total amount (in thousands) of Certified Emissions Reduction (kCERs) credits issued to CDM project over project lifespan |
| Credit buyer | National origin of purchaser of credits from CDM project |
| Host LoA | Date of CDM project letter of approval (ad hoc start date of project) |

The following summarizes the individual CDM project types accounted for. Biomass projects generate power from biodegradable organic material originating from plants, allowing a lower-emitting alternative to existing power generation sources; coal mine methane projects capture methane draining from coal mine walls; energy efficiency projects generate electricity from waste gas or heat produced from various production processes; fossil fuel switch projects convert existing power generation facilities to use less emissions-intensive sources; landfill gas capture projects capture methane and other gases from landfills prior to entering the atmosphere; and methane avoidance projects reduce methane emissions from sources such as anaerobic wastewater treatment systems; and hydro, wind, solar power projects generate electricity respectively from water (hydroelectric dam, etc.), wind turbines and solar PV panels.

An example of a CDM project in China would be the “Yangquan Coal Mine Methane (CMM) Utilization for Power Generation Project” in Shanxi Province, which began in 2006 and was completed in 2014. The project activity took place in the coal mining concession area of Yangquan Coal Industry (Group) Company Limited, targeted three mines releasing resulting from mining operations and employed underground techniques to capture methane. The project estimated 2.05 million tons of CO2 emissions reductions achieved (UNFCCC, 2014).

An important observation is that many CDM projects have zero Certified Emissions Reduction credits issued to them, which is shown as blank cells. Given the process by which CDM project are approved, projects with zero credits issued may still be expected to be associated with local urban emissions reduction. For instance, in such a case that an association is found between the counts of CDM projects and urban emissions reduction, and those same CDM projects have no corresponding Certified Emissions Reduction credits issued, the association would be attributed to the presence of the project itself rather than any credits earned. Conversely, the amount of Certified Emissions Reduction credits earned may better detect an association between carbon market activity and emissions change, as credits correspond directly to the success of projects over time.

**BACKGROUND**

CDM projects are designed to achieve a downward deviation from greenhouse gas emissions along a business-as-usual trajectory, and the effect of a deviation may yield only lower emissions increases rather than reductions from a base year. These reductions sought by project developers in order to earn non-monetary “carbon credits”, or Certified Emissions Reductions (CERs), each credit representing one ton of CO2 equivalent gas, that may be sold into the larger carbon market for real money.[[3]](#footnote-3)

Project developers first establish emissions-reducing projects, then gain project approval by designated authorities, demonstrate emissions reductions achieved to authorities and obtain carbon credits commensurate with said reductions (UNFCCC, 2011). In this way, the carbon market commodifies carbon emissions to create a financial product (Lohmann, 2010), and assumes the incentives to private actors to generate profit from the system will be sufficient to allow emissions reductions that otherwise would not be achieved (Pulver et al., 2010).

**REFERENCES**

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1. Created by the Kyoto Protocol as a system of market-based climate change governance mechanisms, comprised chiefly of the European Union emissions trading system and the CDM. [↑](#footnote-ref-1)
2. The CDM Pipeline (Fenhann, 2019), a full listing of Clean Development Mechanism projects a dataset publicly available from Jørgen Fenhann of the UNEP-Denmark Technical University Partnership. [↑](#footnote-ref-2)
3. European Union emissions trading system-participating firms that fail to limit emissions to below the annual set cap face possible fines from their respective national registry and must purchase spare CERs (carbon credits) either from other participating firms selling them or from CDM projects offering CERs (Perrow and Pulver, 2015). [↑](#footnote-ref-3)