Climate TRACE Ownership Information: Global Energy Monitor Methodology for Ownership Data

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1. Introduction

As part of a collaboration with Climate TRACE, Global Energy Monitor (GEM) has contributed data sets with technical and ownership data for combustion power plants (those burning coal, gas, oil, and/or bioenergy), steel plants, coal mines, and small oil "teapot" refineries in China. GEM's technical data includes detailed information on the various plants such as plant capacity, location, and operating status. GEM's ownership data includes information on the project-level ownership for various plants and the interested party that owns the project-level owner. On the rationale for tracking ownership and emissions totals by ownership, see Climate TRACE's broader methodology document on ownership (Gans et al, 2023).

With the exception of the teapot refineries in China, GEM releases these data sets as stand-alone trackers, which are spreadsheets with project-level data:

- Global Coal Plant Tracker
    - The Global Coal Plant Tracker provides information on coal-fired power units around the world generating 30 megawatts and above. The tracker catalogues every operating coal-fired generating unit, every new unit proposed since 2010, and every unit retired since 2000.
- Global Oil and Gas Plant Tracker
    - The Global Oil and Gas Plant Tracker is a worldwide dataset of oil and gas-fired power plants. It includes units with capacities of 50 megawatts or more (20 megawatts or more in the European Union and the United Kingdom). The tracker catalogs every oil and gas power plant at this capacity threshold of any status, including operating, announced, pre-construction, construction, shelved, canceled, mothballed, or retired.
- Global Bioenergy Power Tracker
    - The Global Bioenergy Power Tracker is a worldwide dataset of utility-scale bioenergy power facilities. It includes bioenergy units with capacities of 30 megawatts or more. The tracker includes every bioenergy unit at the 30 megawatt capacity threshold for operating, announced, pre-construction and in construction power station units.

- Global Coal Mine Tracker
    - The Global Coal Mine Tracker is a worldwide dataset of coal mines and proposed projects. The tracker provides asset-level details on ownership structure, development stage and status, coal type, production, workforce size, reserves and resources, methane emissions, geolocation, and over 30 other categories.
- Global Steel Plant Tracker
    - The Global Steel Plant Tracker provides information on global crude iron and steel production plants and includes every plant currently operating with a capacity of five hundred thousand tonnes per year or more of crude iron or steel.

The data GEM contributed on China's small oil refineries is released by Climate TRACE as part of the Fossil Fuel Operations sector, in the subsector Oil Refining.

GEM has enhanced, updated, and expanded the ownership data in the trackers above. In revamping this data, we have organized the data following Open Ownership's Beneficial Ownership Data Standard, or BODS (Open Ownership, 2023). We adopted BODS because it is considered the only widely used standard for organizing data on ownership structures. The data has been enhanced by adding missing ownership data, bringing other ownership data up to date, making the ownership data consistent across the trackers listed above, and adding additional details on entities, as described below.

2. Methods

The terminology used conforms with BODS whenever relevant. Accordingly, by "entities," we are referring to companies, governments, government agencies, and other bodies that are involved in ownership.

GEM's ownership data is stored in a custom PostgreSQL database, which allows for representation of hierarchical relationships between various entities involved in ownership of projects or assets. Here, we use "project" and "asset" interchangeably, to refer to power plants, steel plants, and other such facilities.

Each piece of GEM's ownership data is for one of two types of relationships:

- Particular entities to each asset that they own (such as a power plant), including the percentage owned by the given entity
- Particular entities to other entities that they are owned by. The lower-level entity is referred to in BODS as the "subject," and the higher-level entity as the "interested party."

In addition, the database stores various attributes of the entities, as described below. This additional data helps to provide unambiguous identification of the entities and can also enable certain types of analyses.

2.1 Types of Entities

In the database, each entity is assigned a "type", as either a legal entity, state, state body, or arrangement, following the definitions in BODS. Each type is defined below.

2.1.1 Legal Entity

As defined by BODS, a legal entity is an organization created with a memorandum of incorporation or similar registration documents, and which is registered by a government. There are many types of legal entities, including Corporation, Limited Liability Corporation, and Company Limited. For GEM's ownership work, we define "legal entity" in line with BODS terminology.

In addition, in GEM's database, we differentiate privately owned and publicly traded companies (also known as a publicly held company, publicly listed company, or listed company). One reason is that in some jurisdictions, such as the United States, public companies are required to publish audited financial statements and information on beneficial ownership over 5% (Securities and Exchange Commission, 2023). Identifying public companies is also useful for guiding research, since publicly traded companies tend to have ownership information in their annual reports or in the U.S. Securities and Exchange Commission (SEC) filings.

2.1.2 State

The entity type "state" refers to national, subnational, and local governments. In BODS terminology, it is a country, nation, or community with legal sovereignty within a territory. In GEM's dataset, we follow a convention for naming states:

- National governments: "Government of X."
- State/regional governments: "State of X" or "Province of X" (for example), depending on the name of the type of country subdivision.
- City governments: "City of X" or "Municipality of X."

2.1.3 State Body

In BODS terminology, "state body" refers to a core administrative or legislative within a state's apparatus. For example, these could be ministries or government agencies. State bodies are entered in GEM's dataset as distinct from the state (the government) to make the ownership data as specific as possible.

When labeling state bodies in our dataset, we use the official name of the government agency or ministry as the entity name. In cases where ministry or government agency names are similar to

government agency names in other countries, we enter the country name in parentheses at the end of the entity name—for example, "Ministry of Energy (Iraq)."

2.1.4 Arrangement

For other cases of ownership that do not fit into any of the categories above, we have applied a general category "arrangement," based on advice from Open Ownership's staff.

One of the common cases of an arrangement is when an entity is a "group" of legal entities that are all publicly traded and are therefore not owned by the group. An example of this is Tata Group, which is an Indian multinational conglomerate of publicly traded companies. The various companies of Tata Group (Tata Chemicals Ltd, Tata Power Co Ltd, Tata Steel Ltd, etc.) are publicly traded and not owned by Tata Group. For this case, we have labeled Tata Group as an arrangement.

Another common example of an arrangement is when an entity is a general partnership and is an entity in which two or more people share all assets, liabilities, and profits. An example of this is ArcelorMittal Long Products Canada GP (General Partnership). For this case, we have labeled ArcelorMittal Long Products Canada GP as an arrangement in the GEM database.

2.2 Datasets employed

The availability of ownership data varies widely between countries, and GEM relied on the most authoritative open data that was available at the time of this work. This included diverse sources, such as government data sets, company reports, news articles, and other sources. On GEM.wiki, GEM publishes data for each asset (e.g., power plant) which shows the ownership data as well as the data sources whenever available.

Examples of the government data sets that GEM uses to compile ownership data include Form EIA-860 , which is an United States government agency energy dataset (EIA, 2023). Additionally, GEM gathers ownership data from various company reports, such as annual reports and financial statements, which can identify the subsidiaries of a company and/or the assets owned by a company. In some cases, GEM obtained ownership information from news articles from accredited sources (such as Reuters, Bloomberg, and S&P Global), and press releases from company websites.

2.3 Entity Data Structure

For each entity, GEM stores data in the following data fields, as available and as relevant:

- **Entity Type:** The options follow the definitions in BODS, as described above, with the most common types being:
    - Legal entity

    - State
    - State Body
    - Arrangement
- **Legal Entity Type:** This field is used only when the "Entity Type" is a "Legal entity." The entries are standardized; for example, a Limited Liability Company is standardized as "LLC."
- **Publicly Listed:** This indicates whether a company is "listed," that is, it has stock listed on a public stock exchange. (Such companies are also referred to as publicly traded or publicly held.) This option is available only for the entity type "legal entity."
- **Abbreviation**: The abbreviation of the entity name (if any), based on its primary name. This can be an acronym or other shortening of the name.
- **Name local**: The name of the company in the local language (e.g., for a Chinese company, the name in Chinese).
- **Name other**: Multiple names can be added, in English and/or other languages. When an entity was previously referred to by another name, we enter former names with "[former]" appended at the end. For example, "Anergi International Ltd" has the entry "Applied Energy Services [former]."
- **Registration Jurisdiction—Country & Subdivision.** If registration of legal entities is at the national level, which is most common globally, then only the country is listed. If the registration is at a subnational level (as is the case in the United States), then the subnational division is also listed.
- **Headquarters Jurisdiction—Country & Subdivision.** The location of the headquarters can be listed by country and by subdivision, as available.
- **Organization Identifiers:** This indicates an ID for an entity and are most commonly available only for legal entities. The ID systems currently in use in GEM's data set are listed below, with the short identifiers in parentheses as assigned by org-id.guide.
    - Global Legal Entity Identifier Index (XI-LEI)
    - Refinitiv PermID (XI-PID)
    - UK Companies House (GB-COH)
    - China's Unified Social Credit Identifier (CN-USCI)
    - China's State Administration for Industry and Commerce (CN-SAIC)
    - IDs assigned by the US Energy Information Administration, as published in Form EIA-860, for entities that own power-generating projects

See Figure 1 showing a subset of tables in GEM's relational database that pertain to data on entities, with the data fields for each. For more information about the database structure, please contact the methodology authors at GEM.

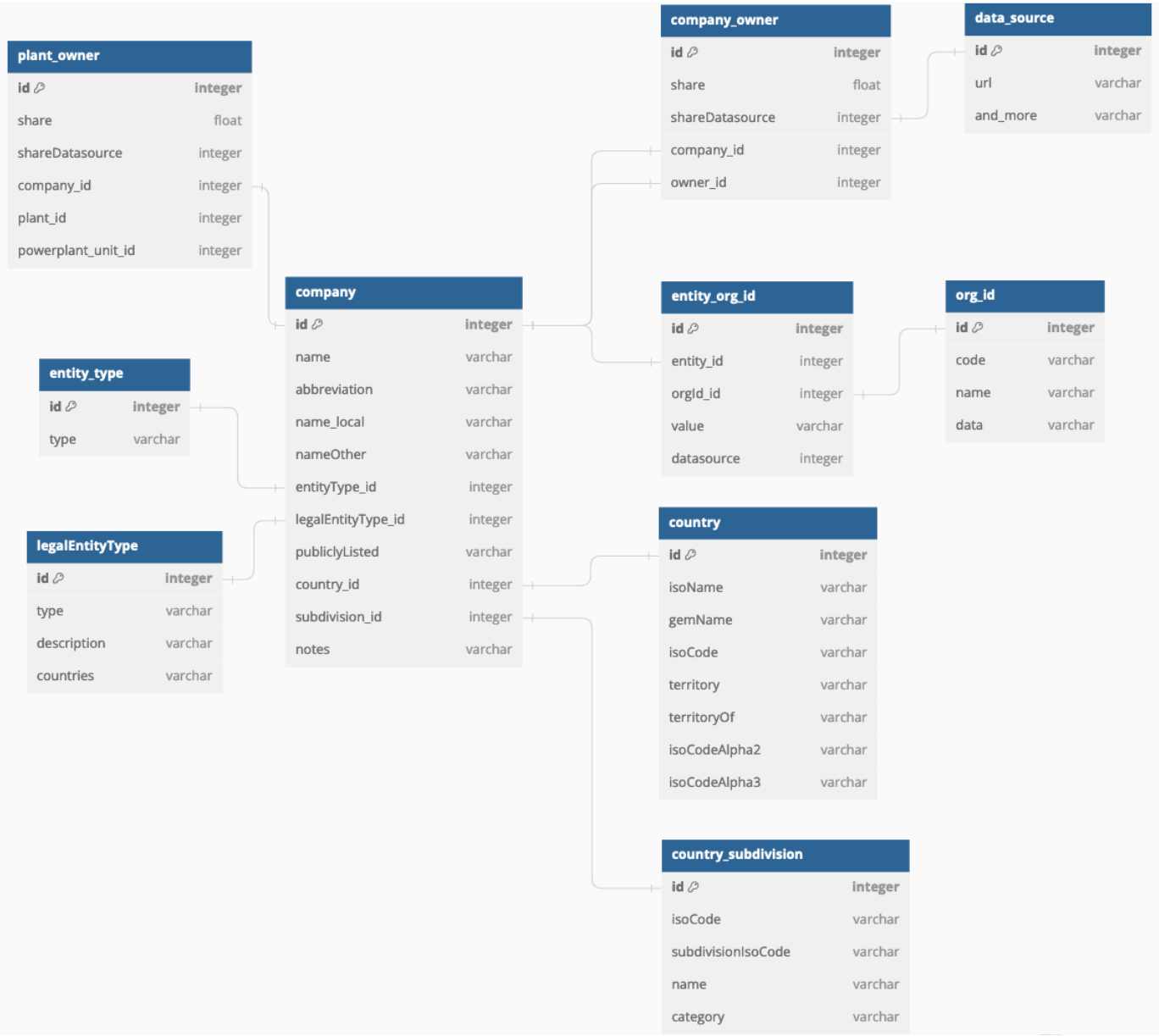

Figure 1 Diagram of a subset of tables in GEM's relational database, containing data on entities.

3. Research Practices

3.1 Assigning owners

When adding new entities to our database, GEM identifies the owner reported for each project in GEM's coal plant, oil and gas plant, coal mine, bioenergy plant, and steel plant trackers, and compares it against the GEM's database of entities to avoid duplicating entities under different names.

To ensure that GEM does not create duplicate entities for entities, GEM relies on the collection of various information including: company name in English, company name in local language, company abbreviation, entity type, legal entity type, publicly listed status, previous company names, location of registration and/or headquarters, and several organization identifiers such as the Legal Entity Identifier (LEI) issued by the Global Legal Entity Identifier Foundation (GLEIF), the Refinitiv Permanent Identifier (PermID), and national registration numbers. These identifiers and other information about the entities help GEM identify when one entity is being referred to in different ways.

The owners reported in authoritative data sources may not always be the lowest-level entity involved in an ownership chain—that is, they may not be the most direct owner of an asset. Many assets are directly owned by a special purpose vehicle (SPV), which are companies that are often set up to own one particular project (such as a power plant).

However, GEM's focus is on tracing ownership "upward" to the level of parent companies (as defined below), in order to show how ownership aggregates. GEM does not trace ownership "downward" to identify any lower-level direct owner that may be below the owner reported for a particular project.

3.2 Ownership trees

Starting from the entities that own projects, GEM researchers add additional data as available on the interested parties of the starting subject entities. This terminology follows BODS, in which each relationship between two entities has a lower-level "subject" and a higher-level "interested party."

In the GEM database, the levels of ownership for an entity are displayed in an ownership tree. The ownership tree of an entity provides a visual representation of the different levels of ownership for a given entity.

An example is shown in Figure 2 below for the ownership of JERA Co Inc., a Japanese power generation company.

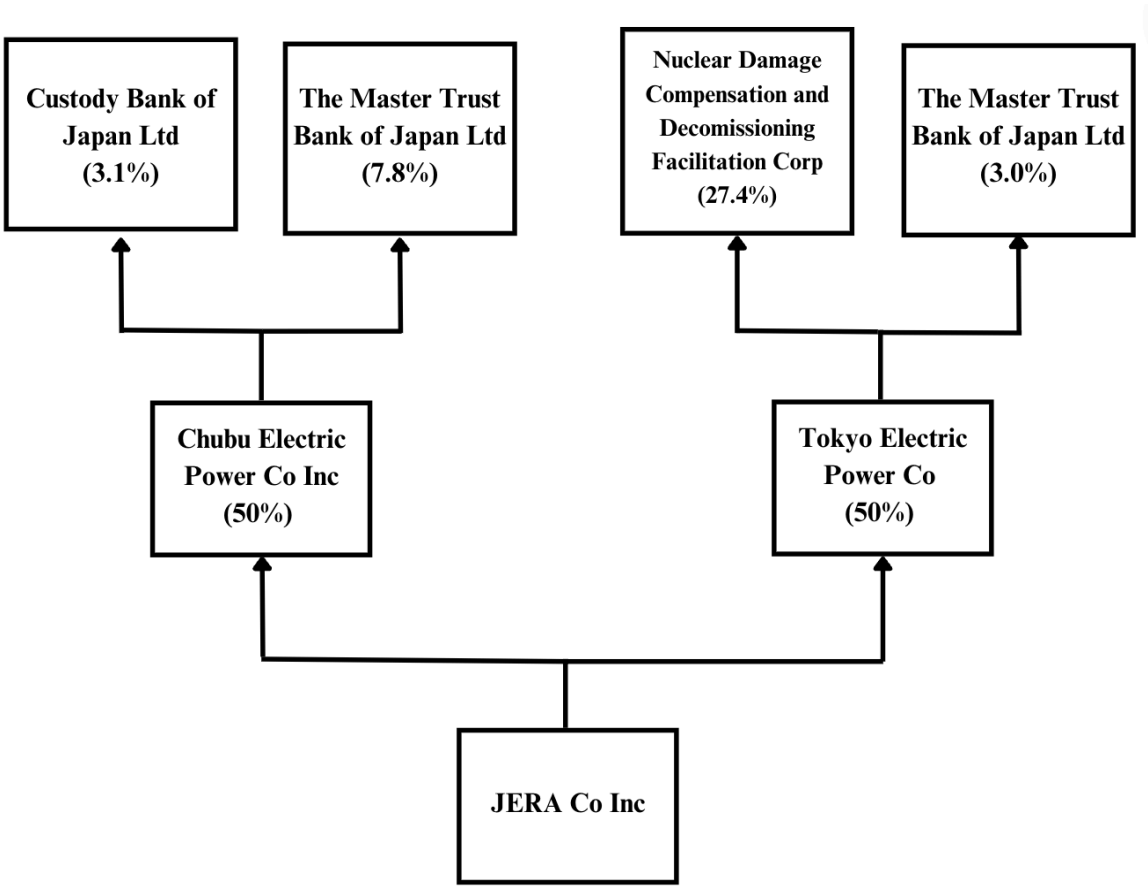

Figure 2 Ownership Tree of JERA Co Inc. The lower-level owners display the percent of direct ownership of JERA Co Inc. The higher-level owners display the next level of ownership and the percent of indirect ownership of JERA Co Inc.

3.3 Parents

To aggregate data at a high level, GEM has created a particular definition for the ultimate parent entities, referred to below as simply the "parent(s)." Within each ownership chain (or branch), GEM defines a parent following the rules described below:

- The lowest-level publicly listed company, if any.
- If there are no listed companies, then the highest-level state-owned enterprise, if any. That is, the parent is not assigned to a state or state body if there is a lower-level legal entity.
- If there are no listed companies or state-owned enterprises, then the parent is assigned to the highest-level privately owned company. Natural persons are not assigned as parents, as long as there is available data on lower-level entities. In certain cases, in which the highest-level owners are general investors, such as major banks, then we define the parent as the highest-level energy company in that chain or branch.

- One exception is for the case of China, in which certain entities are designated as central enterprises by the central government. The State-owned Assets Supervision and Administration Commission of the State Council (SASAC) has named 98 companies as central enterprises (SASAC, 2023). The Ministry of Finance has named an additional 27 companies as central enterprises (MOF, 2021). If an ownership chain (or branch) reaches one of these designated central enterprises, then that central enterprise is listed as the parent for that branch.

In the example ownership tree shown in Figure 2 for JERA Co Inc, the immediate interested parties are Chubu Electric Power Co Inc and Tokyo Electric Power Co Inc, which each hold 50% of JERA Co Inc. The next level of ownership displays the interested parties of these two entities. The Master Trust Bank of Japan Ltd and Custody Bank of Japan Ltd are the interested parties in the subject Chubu Electric Power Co Inc, and thus have indirect ownership of JERA Co Inc. The same can be said for Nuclear Damage Compensation and Decommissioning Facilitation Corp and The Master Trust Bank of Japan Ltd, which are the interested parties of the subject Tokyo Electric Power Co, and thus have indirect ownership of JERA Co Inc. However, Chubu Electric Power Co Inc and Tokyo Electric Power Co are both publicly listed companies, and therefore, following GEM's definition of parents, each of them are defined as parents of JERA Co Inc.

In tracing ownership chains upward from the reported owners, GEM stores data on all entities involved as long as they own at least 5% of a project or a subject entity. We have decided to track ownership of at least 5% to follow the practice of the U.S. Securities and Exchange Commission (SEC), which requires individuals or entities with at least 5% beneficial ownership in a company to publicly file this through a Schedule 13D form. By storing data on ownership of at least 5%, GEM is providing a nearly comprehensive view of ownership, going beyond the entities that have controlling interests in a project or a subject entity.

GEM's parent designations do occasionally list states or state bodies if there weren't any lower-level companies in a given ownership chain (or branch). An example of this is Bharat Aluminium Co Ltd (see Figure 3), which has two immediate interested parties: the Government of India and Vedanta Limited. For assigning the parents of Bharat Aluminium Co Ltd, the Government of India is listed as one of the parents, because there isn't any other legal entity to report as the parent on that branch of the ownership tree.

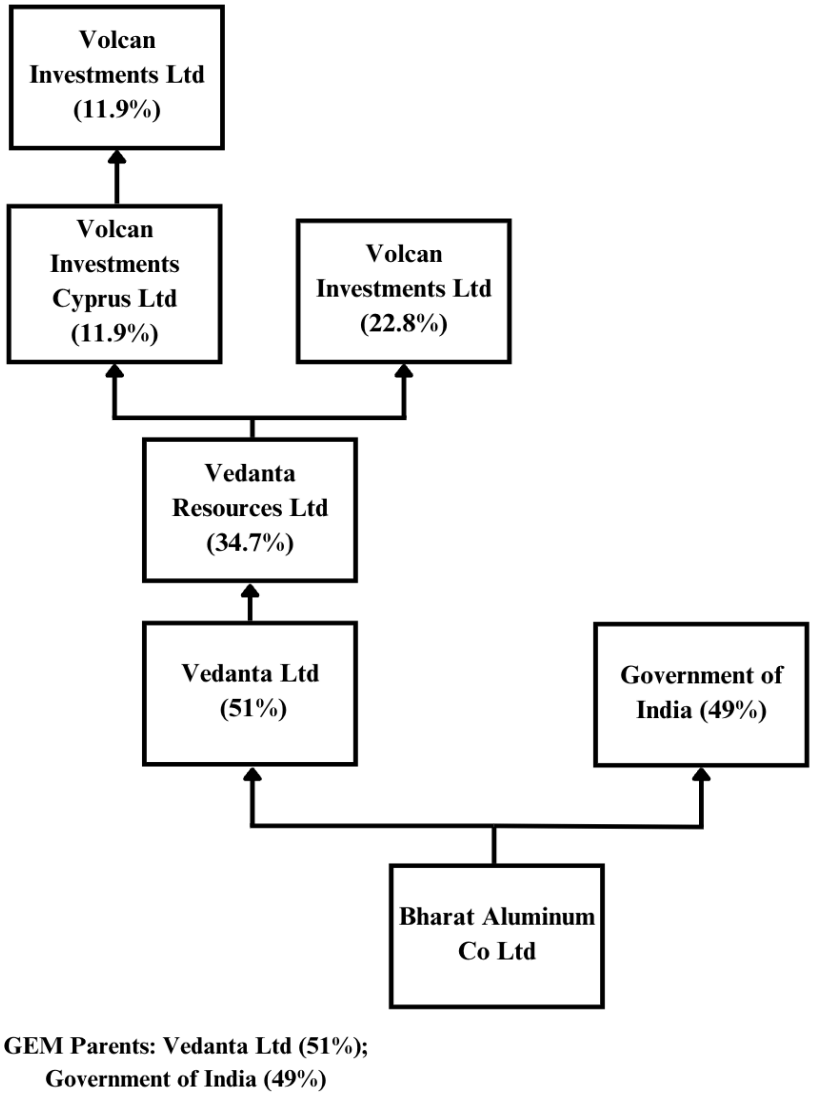

Figure 3 Ownership Tree of Bharat Aluminium Co Ltd. The lower-level owners display the percent of direct ownership of Bharat Aluminum Co Ltd. The mid-level owners display the next level of ownership and provide a percent of indirect ownership of Bharat Aluminum Co Ltd. The higher-level owners show the highest level of ownership and display a percent of indirect ownership of Bharat Aluminum Co Ltd.

Similarly, if the lowest-level owner in a particular ownership chain is a natural person, then a designation for natural persons in general is reported, rather than listing names of individual natural persons.

3.4 Mergers and acquisitions

In the case of a corporate acquisition, we have labeled the company that is the acquirer as the interested party and the acquired company as the subject (following the BODS terminology for

relationships between entities). In the case of a merger between companies, if one company survives and the other does not, we have labeled the surviving company from the merger as the interested party of the company that did not survive the merger.

4. Ownership data provided to Climate TRACE

In total, GEM contributed 12,018 assets to the Climate TRACE database to associate ownership to source-level emissions for the following sectors:

- Power sector - 7,883 power plants (those burning coal, gas, oil, and/or bioenergy)
- Manufacturing - 873 steel plants
- Fossil fuel operations - 3,161 coal mines and 101 small oil "teapot" refineries in China.

Refer to each sector's methodology on the Climate TRACE GitHub repository to understand how these assets were incorporated into each respective sector.

5. References

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