

How many green jobs are there in electricity generation?

A replicable quantification method for developing countries under data constraints

Lilia Caiado Couto

PhD Candidate, UCL Institute for Sustainable Resources

Tiago Barbosa Diniz

PhD Applied Economics, Shareholding and Investment Manager, Eletrobras CHESF

IOP Publishing Environmental Research Conference, 17th November 2021

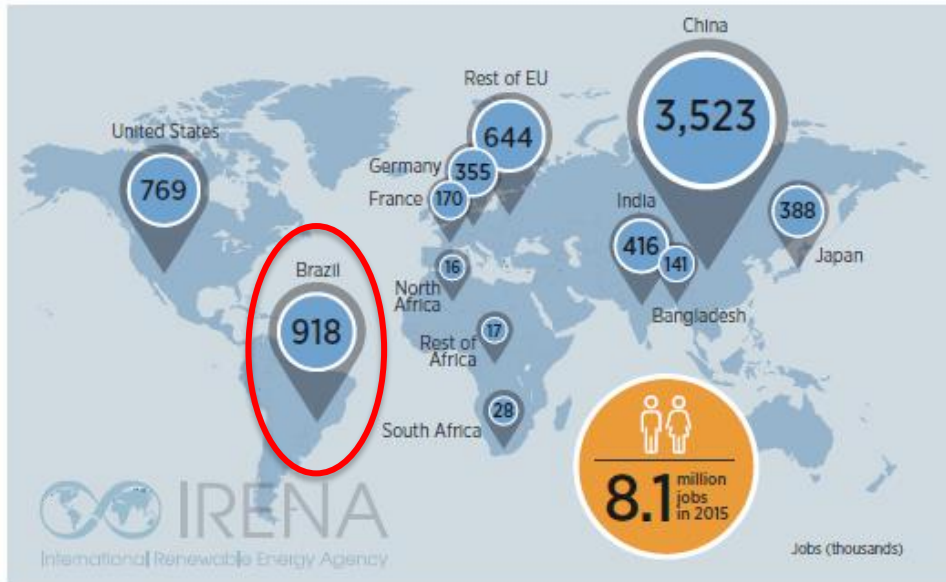
Just Transitions and measuring the Green Economy

- Assessing the **scale of green jobs** and the **socioeconomic effects** of the **energy transition** is relevant and timely;
- While lacking **clear, comparable methodologies**.
- The discussion around **just transitions**, and **the extent to which renewable energy creates more positive socioeconomic impacts than fossil fuels**, increasingly attracts attention.
- However, **data constraints** expose a relevant **gap** in providing **quantitative evidence** for such discussions, especially relevant in **developing economies**.

Example of data challenge – Brazil

IRENA, 2016

FIGURE 3: RENEWABLE ENERGY EMPLOYMENT IN SELECTED COUNTRIES AND REGIONS



- Brazil's official data (CEMPRE 2015) total employment in electricity generation (all sources), transmission and distribution is of **122,843** full-time equivalent jobs.
- **IRENA:** Wind 41,000; Solar 4,000 and Large Hydro 195,000 in 2015 in Brazil
- For modelling and policy purposes, there must be an account for each sector with **no double counting.**

⁷ This does not include the jobs in improved cookstoves, charcoal and fuelwood (see Box 1).
 ■ This section analyses the job estimations excluding large hydropower.

Benchmarks for Green Economy data

Occupational Employment and Wage Statistics Query System

Occupational Employment and Wage Statistics

Multiple occupations for one industry

Select a search type

- Multiple occupations for one geographical area
 One occupation for multiple geograp
- Multiple occupations for one industry
 One occupation for multiple industri

Select one industry sector

Sector 00 - Cross-industry, Private, Federal, State, and Local Government
 Sector 11 - Agriculture, Forestry, Fishing and Hunting
 Sector 21 - Mining
Sector 22 - Utilities
 Sector 23 - Construction
 Sectors 31, 32, and 33 - Manufacturing
 Sector 42 - Wholesale Trade
 Sectors 44 and 45 - Retail Trade
 Sectors 48 and 49 - Transportation and Warehousing
 Sector 51 - Information
 Sector 52 - Finance and Insurance

Select one industry

Sector 22 - Utilities

Utilities
 Electric Power Generation, Transmission and Distribution
 Hydroelectric Power Generation
 Fossil Fuel Electric Power Generation
 Nuclear Electric Power Generation
 Solar Electric Power Generation
 Wind Electric Power Generation
 Geothermal Electric Power Generation

Select one or more occupations



Category: Environment - economic issues



The category **Environment - economic issues** contains all articles in the [statistical theme Environment](#) on economic aspects of environmental impacts and protection.

Pages in category "Environment - economic issues"

The following 8 pages are in this category, out of 8 total.


- | | |
|--|--|
| <p>E</p> <ul style="list-style-type: none"> Environmental economy - statistics by Member State Environmental economy - statistics on employment and growth Environmental protection expenditure accounts Environmental tax statistics Environmental tax statistics - detailed analysis | <p>R</p> <ul style="list-style-type: none"> Renewable energy statistics <p>S</p> <ul style="list-style-type: none"> SDG 12 - Responsible consumption and production SDG 12 - Responsible consumption and production (statistical annex) |
|--|--|

Data approach for direct employment and income

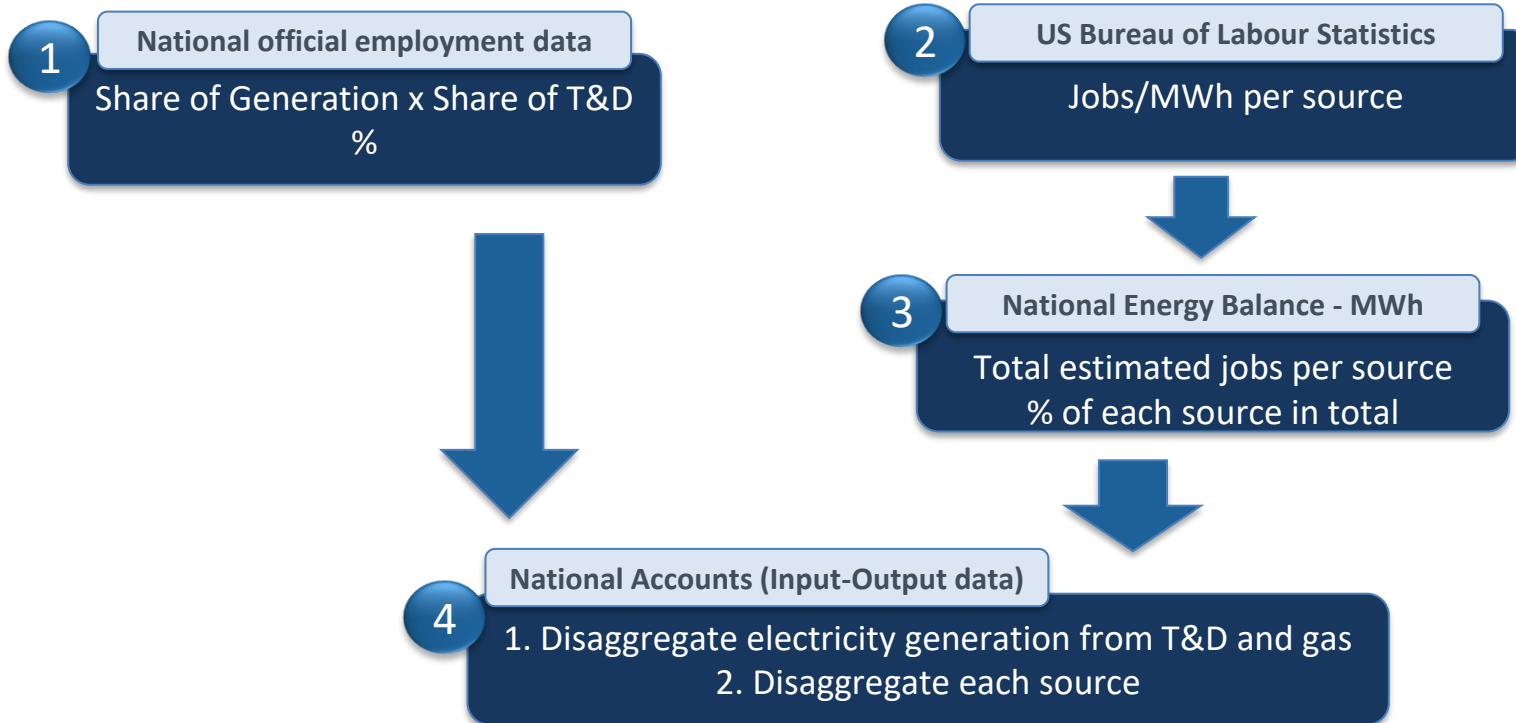
Aim: create a **dataset** of **jobs** and **wages** **disaggregated** by **electricity source** for Brazil in 2015 to **calibrate** a Computable General Equilibrium **model**.

Data approach for direct employment and income

Datasets used for Brazil:

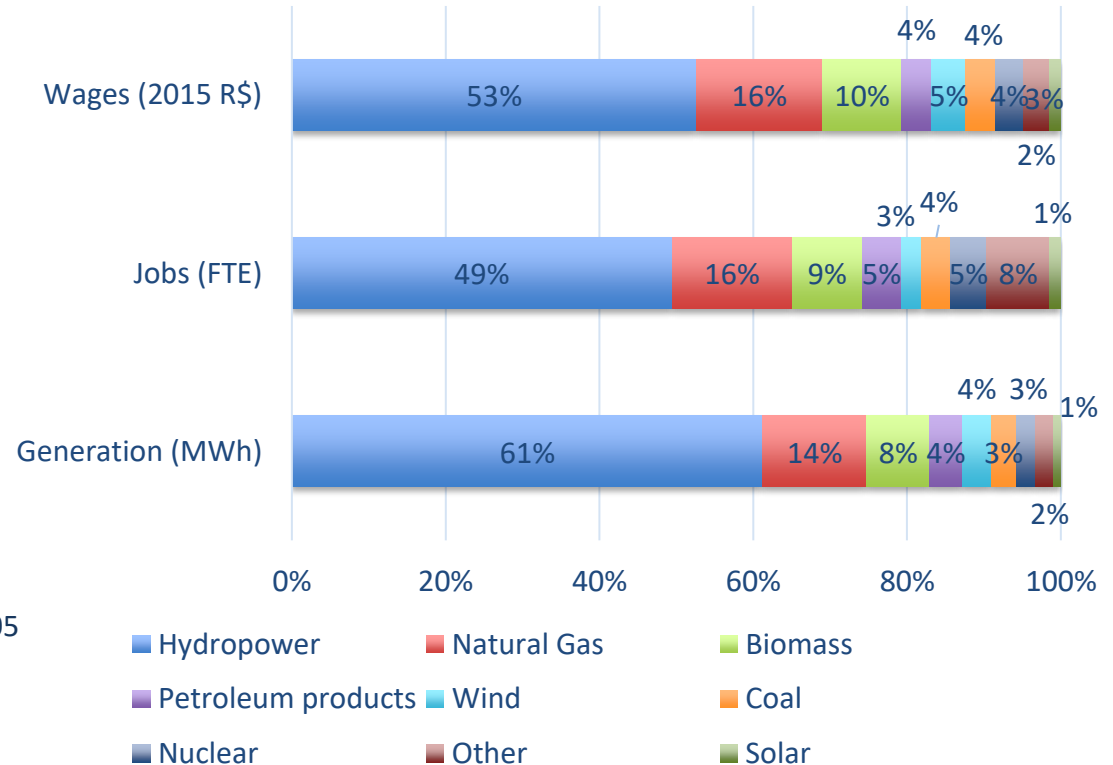
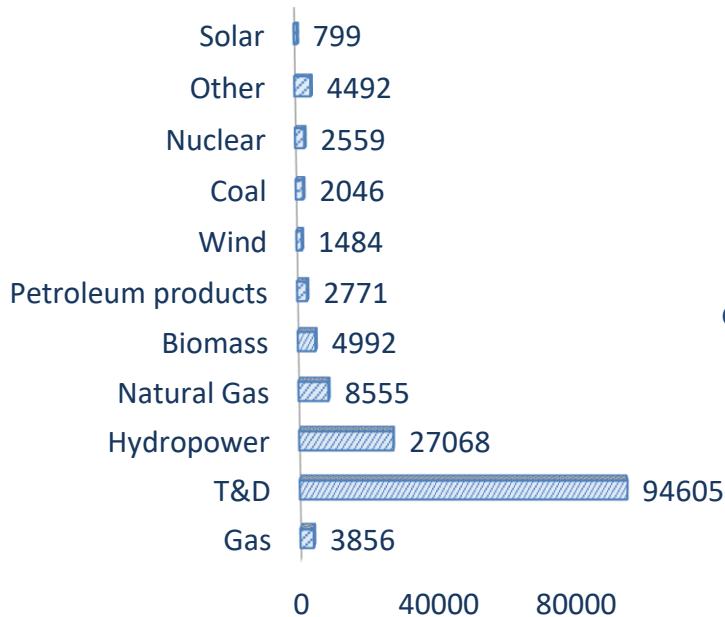
1. **National accounts (Input Output tables):** jobs and income data for the single aggregated sector: electricity generation all sources, Transmission & Distribution (T&D) and natural gas and other utilities;
2. **Official employment data (CEMPRE - Central Register of Enterprises)** disaggregated into (i) electricity generation (ii) Transmission and Distribution (iii) natural gas and (iv) other utilities;
3. **National Energy Balance:** Share of each source in electricity installed capacity;
4. **US Bureau of Labour Statistics:** Detailed data for number of workers employed in each electricity source - for calibration jobs/MWh per source  Could be other employment factors per source, as long as they are comparable.

Data approach for direct employment and income



Results: Brazil 2015

Jobs Total FTE T&D and Generation



Final remarks

- This **disaggregation** was conducted to calibrate a **Computable General Equilibrium (CGE)** with a **detailed electricity sector** disaggregated by **source** to analyse the **economic effects of renewable energy policy**;
- This simple **disaggregation methodology** could be **replicated** for **other developing countries** both to provide:
 - ✓ **The current scale of renewable and non-renewable electricity jobs** and income or
 - ✓ As the **database for further modelling** analyses.
- This is an estimate of the **existing jobs employed in generation**, more but using **intermediary consumption** data we can relatedly estimate indirect jobs along **supply chains**.
- Developing economies with larger data constraints may need to use an international default for percentage of T&D in total.



Thank you.

lilia.couto@ucl.ac.uk

Data approach for direct employment and income

Data triangulation steps:

1. Calculate the shares of generation and T&D in electricity sector total employment using the national official employment data;
2. Calculate employment factors for each source using US observed data (jobs/MW per source);
3. Apply step 2 to the total MW of installed capacity per source from the National Energy Balance;
4. Calculate shares of total generation employment per source from step 3;
5. Apply shares from step 3 to total generation employment from step 4: obtain number of jobs per source of electricity generation;
6. Apply shares to labour income from national accounts (calibrating to maintain shares of value added).

The challenge ahead...