

Hourly emission profile in the tropical region



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Agenda

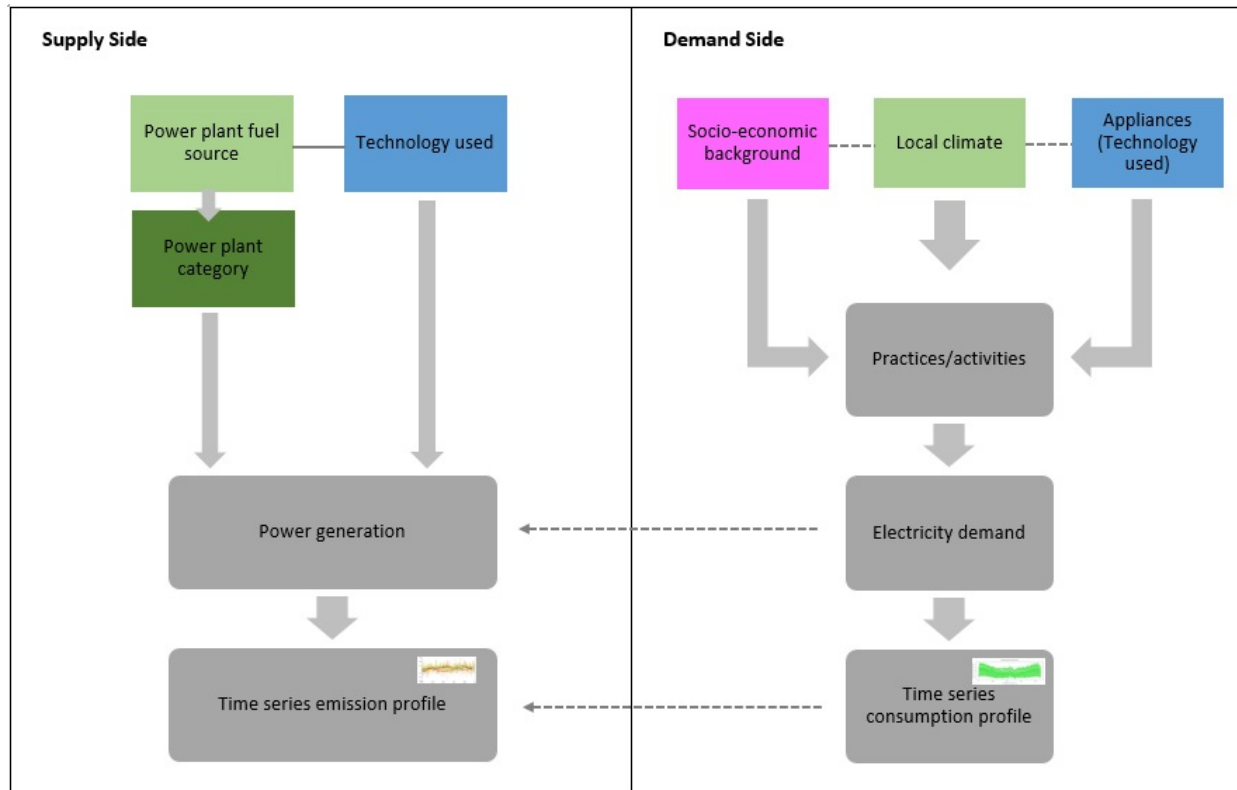
- Introduction
- Related works
- Methodology
- Data sources



Introduction



Energy consumption, production and emission



Related works

Modeling national or regional emission profile

1. Time series analysis

Antonakakis 2017, Mirza 2017, Dogan 2017, Liu 2016, Ito 2017, Ahmad 2016, Shahbaz 2016, Alam 2016, Hasan 2012

Mostly analyzing the causality of energy energy consumption, emission and economic factors

2. Household energy consumption and CO₂ emission (HECCE)

Motawa 2015, Oladokun 2015

Focus on dwellings, occupants and environment in the residential sector

3. Specific works in Indonesia

Alam 2016, Shahbaz 2016, [Hasan 2012](#)

Hasan 2012: Electricity power generation and emission

Related works

Some key points of the existing related works:

- Most studies perform annual energy consumption and emission profile. Our work focuses on **hourly** emission profile per capita.
- Most emission studies enclose economic factors, in this stage we focuses on the relationship between electricity consumption and emission.
- Most of related works provide recommendations or scenario tools for government to develop more efficient policy regarding the goal of emission reduction.

Methodology

1. Develop **hourly electricity consumption** profiles in the selected region

2. Determine **hourly emission profiles for each power plant** in selected region

3. Analyze **the relationship between electricity consumption and emissions**



Per Sieverts Nielsen, Xiufeng Liu, Angreine Kewo, etc

Data sources

Data (Variables)

- National hourly electricity consumption
- National population
- Power plants

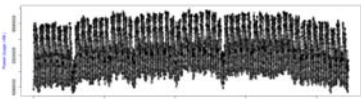
Period

- Year 2015

Data sources:

- Energy Market Authority (EMA) Singapore
- Indonesia Central Bureau of Statistics
- Indonesia Directorate General of Electricity

Modeling hourly emission profile



Electricity Consumption

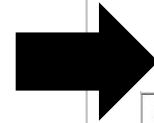
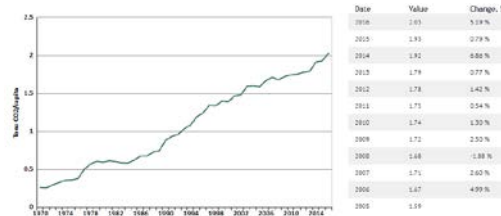
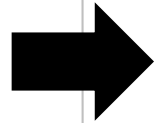
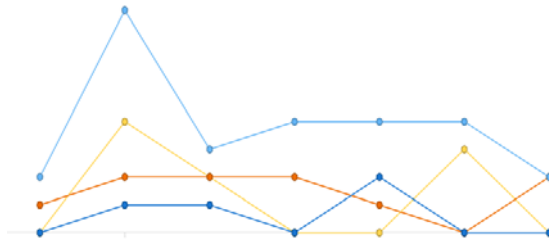


Population

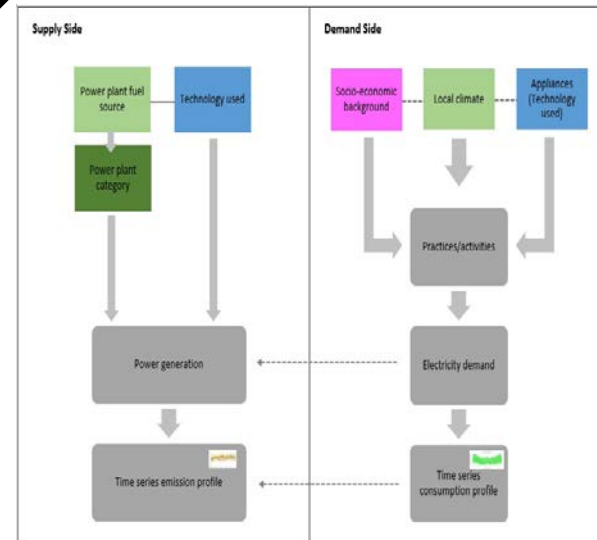
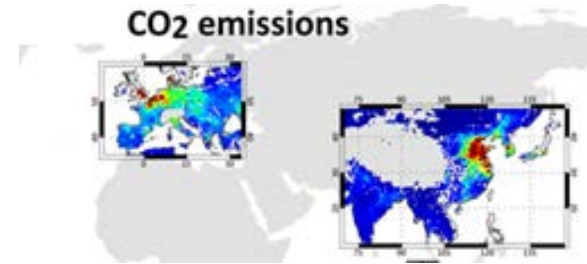


Power

Indonesia hourly – CO2 emissions per capita

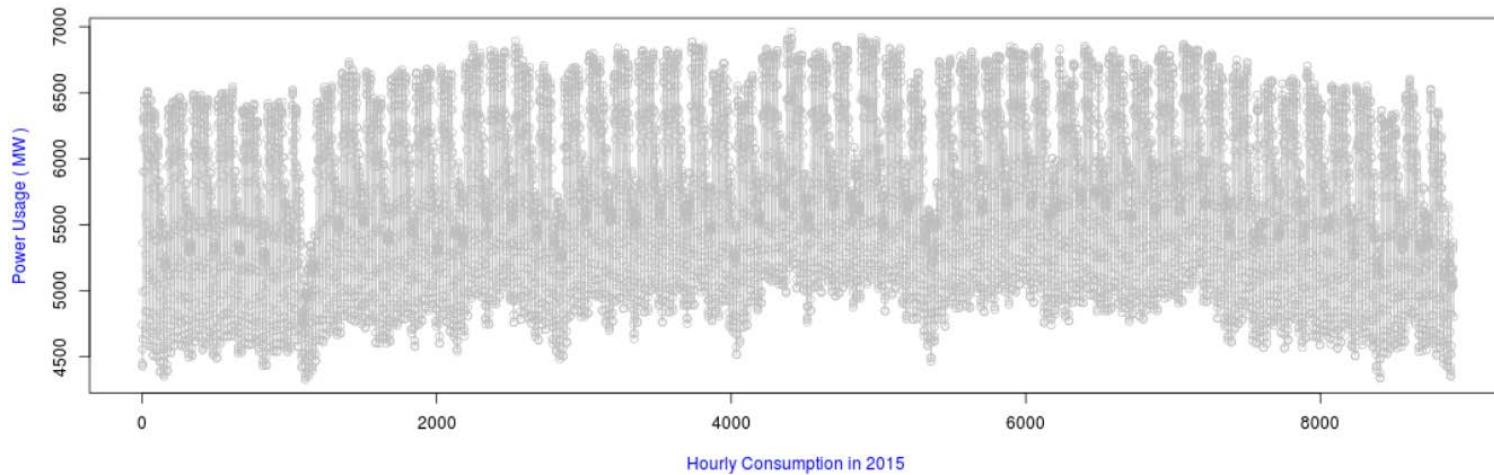


CO2 emissions

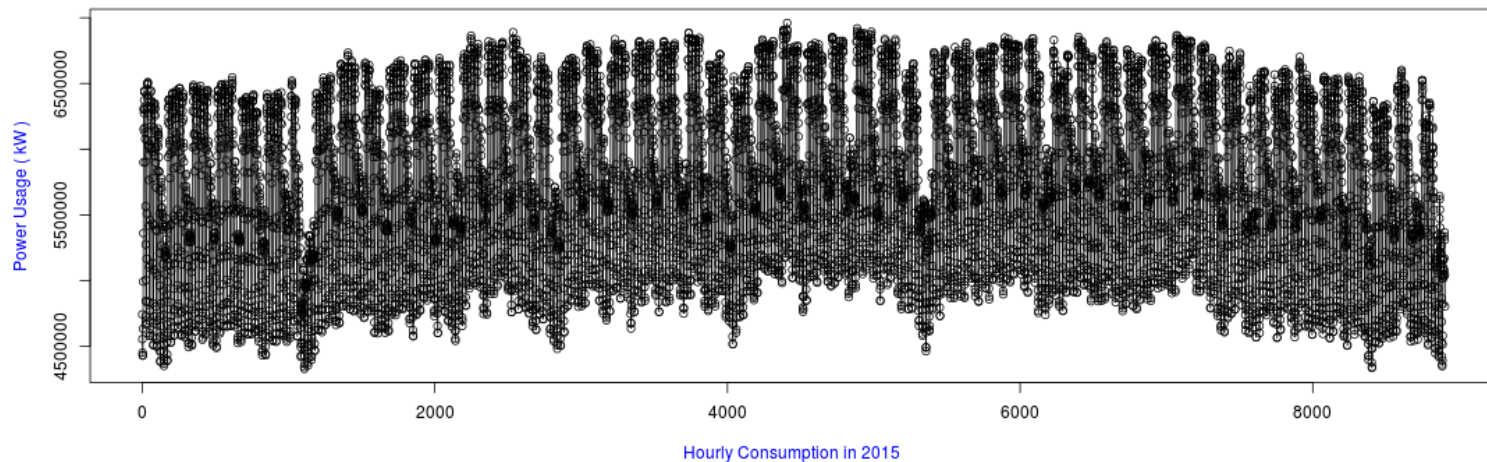


Develop hourly electricity consumption profile

Singapore hourly electricity consumption (MW)



Singapore hourly electricity consumption (kWh)



Develop hourly electricity consumption profile

Indonesian power plants capacity 2015 (Indonesia Directorate General of Electricity 2016)

National electricity installed capacity by power plant types					
No.	Pembangkit / Power plant fuel type		PLN (MW)	Privates (MW)	Total (MW)
1	PLTU	Steam pp	15.103,50	12.126,23	27.229,73
2	PLTG	Gas turbine pp	3.591,47	719,03	4.310,50
3	PLTGU	Combined cycle pp	8.894,11	1.252,00	10.146,11
4	PLTM-G	Machine-gas pp	684,54	134,20	818,74
5	PLTD	Diesel pp	5.889,88	384,91	6.274,79
6	PLTA	Hydro pp	3.511,49	1.567,57	5.079,06
7	PLTM	Mini hydro pp	36,99	114,18	151,17
8	PLTMH	Micro hydro pp	11,87	18,59	30,46
9	PLTP	Geothermal pp	575,00	860,40	1.435,40
10	PLT Bayu	Wind power pp	0,43	0,69	1,12
11	PLTS	Solar pp	8,96	0,06	9,02
12	PLTGB	Coal gasification pp	6,00	0,00	6,00
13	PLTSa	Waste		36,00	36,00
Total			38.314,24	17.213,86	55.528,10

Name	Category (R/nR)	Type of power plant	Electricity Capacity (MWe)	Heat Capacity (MWth)	Operated since	Location	Operated by	Displacing/Current status
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Some considerations of this approach

(If selected region/country hourly consumption data is unavailable)

1. Electricity consumption per capita of each country in the selected year

For example 2014 (Worldbank 2017):

Indonesia	812 kWh/capita
Singapore	8845 kWh/capita

2. National population of each country in the selected year

For example :

Indonesia (2016)	258,000,000 people
Singapore (2016)	5,600,000 people

3. National electrification rate

Indonesia (2017)	93%
Singapore (2017)	100%

Thank you