



IEA-EGRD Workshop “Social Impacts of Clean Energy Policies”

How can energy efficiency programs mitigate energy poverty and socioeconomic disparities?

Energy Economic Studies Department

May 2023

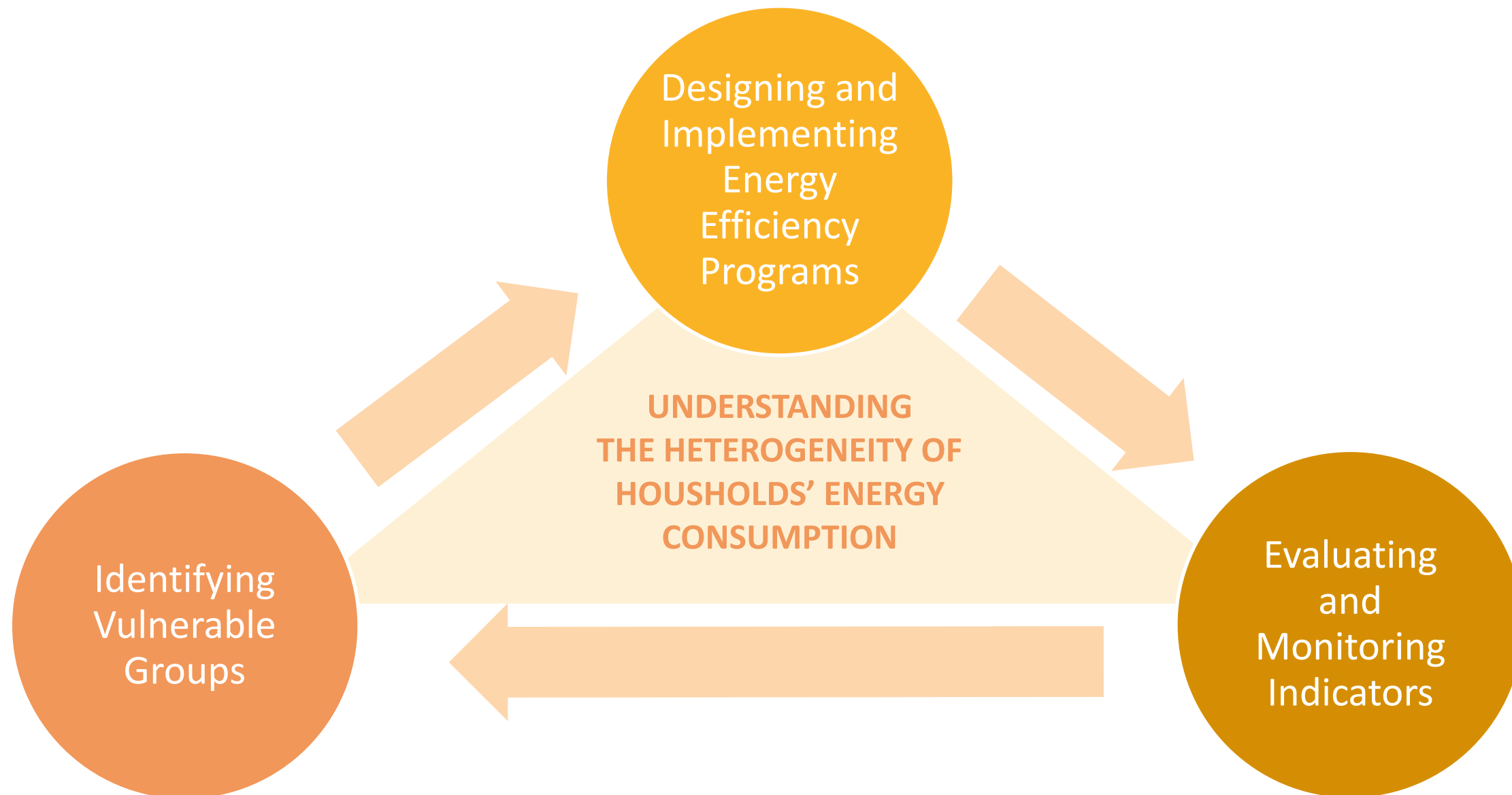
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Steps for Implementing Energy Efficiency Programs



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EPE's Fact Sheet

Residential Electricity Consumption by Income Classes

Methodology:

- Bottom-Up Estimation Approach
- [EPE's Energy Demand Model](#)

Data:

- National Electrical Energy Conservation Program (PROCEL)
 - Survey on Ownership and Usage Habits of Home Appliances in the Residential Sector – PPH (2005 and 2019)
- Brazilian Institute for Geography and Statistics (IBGE)
 - National Household Sample Survey - PNAD (2005 – 2015)
 - Continuous National Household Sample Survey - PNADC (2016 – 2019)

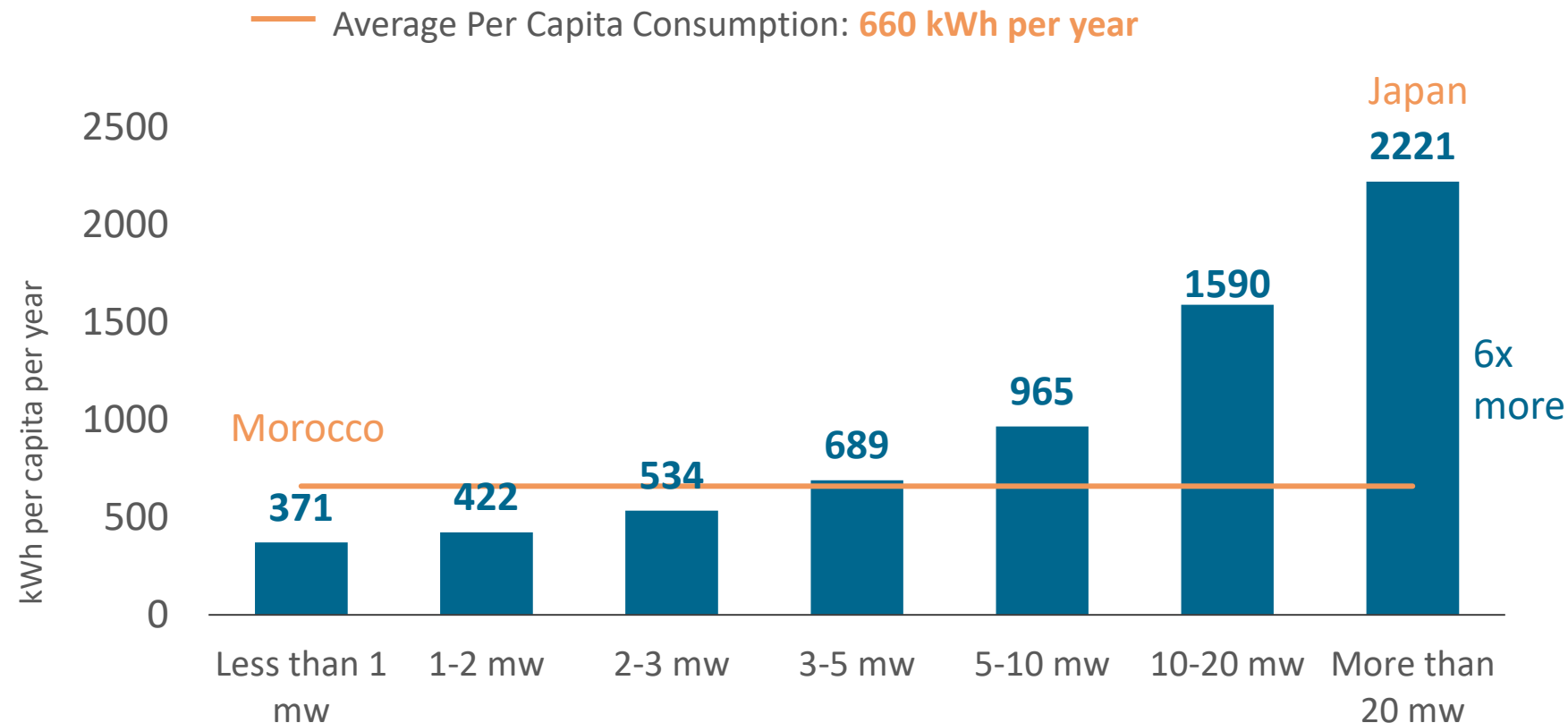
Electricity Per Capita Consumption in Brazil 2019



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By Income Classes (KWh per capita per year)



Note: By mw, please interpret it as “minimum wage(s)”.
In January 2019, the Brazilian minimum wage was BR\$ 998, equivalent to US\$ 273.

Source:

EPE (2023) Fact Sheet
Residential Electricity
Consumption by Income
Classes.

Available at:



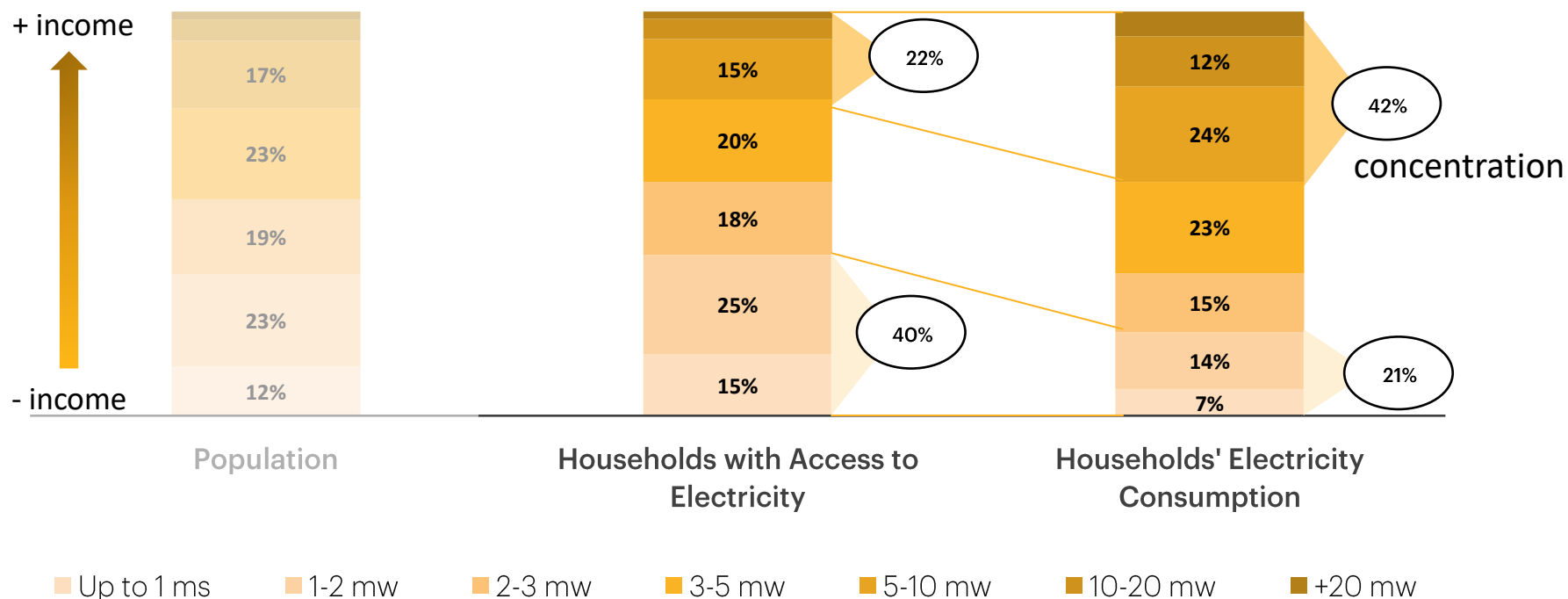
Electricity Consumption Concentration in Brazil 2019



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By Income Classes (KWh per capita per year)

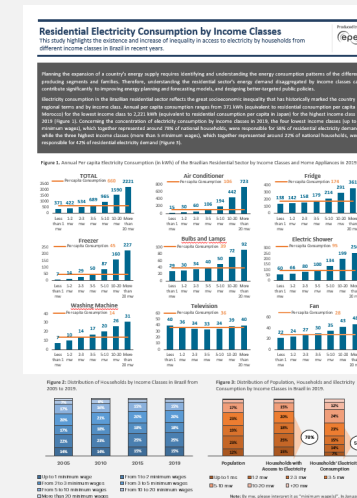


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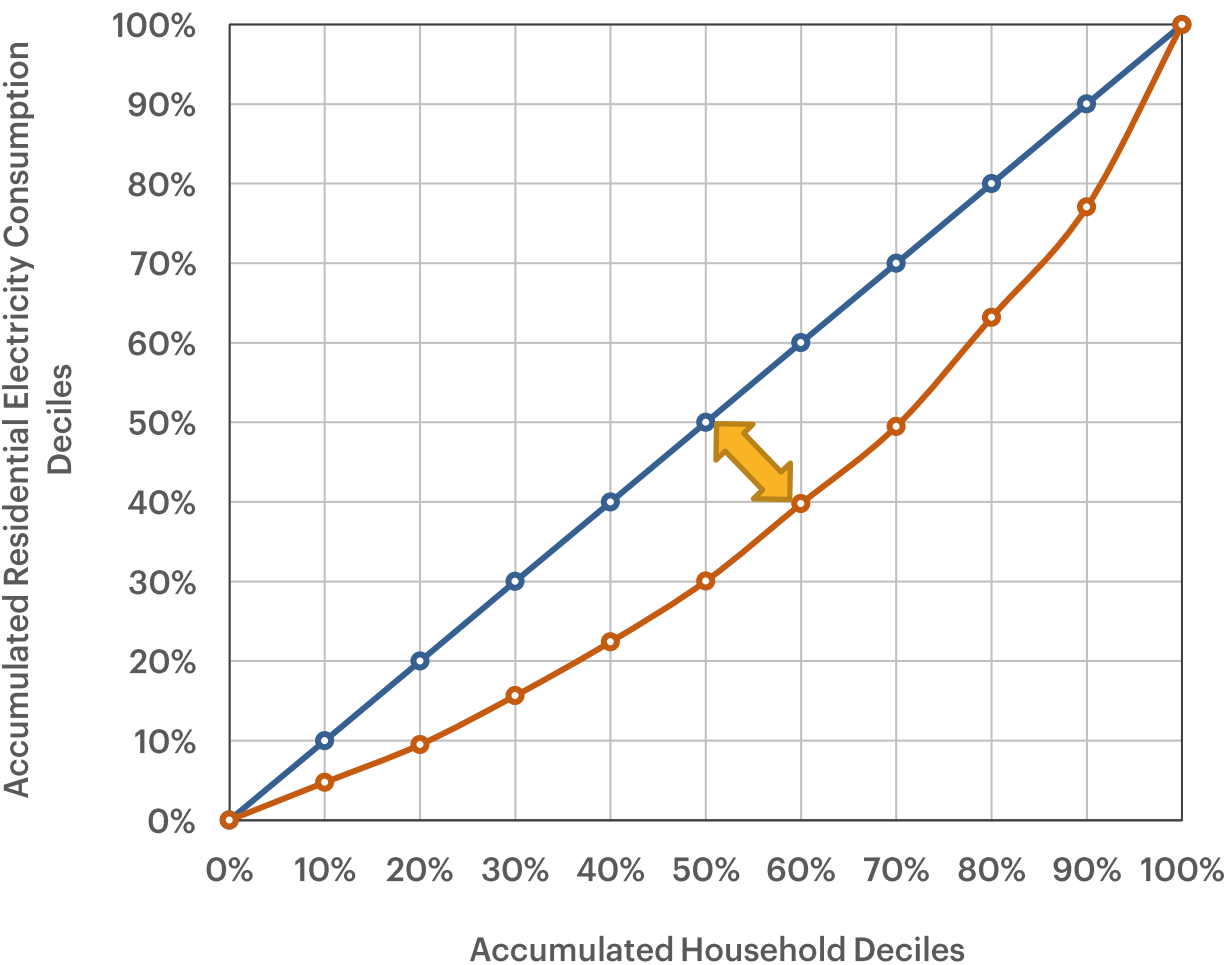
Residential Electricity Consumption Gini Index



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The Lorenz Curve for Brazil 2019



— 45-degree Straight Line -
Absence of Inequality

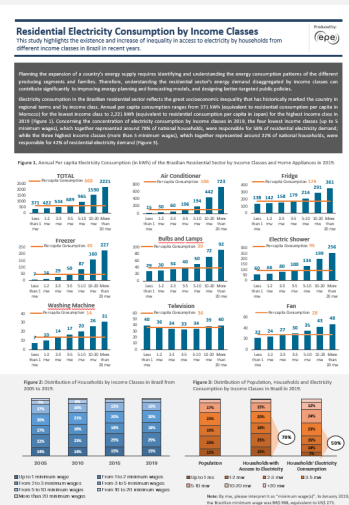
— Residential Electricity
Consumption Lorenz Curve

Area that enables to
calculate the Gini Index

Source:

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Residential Electricity
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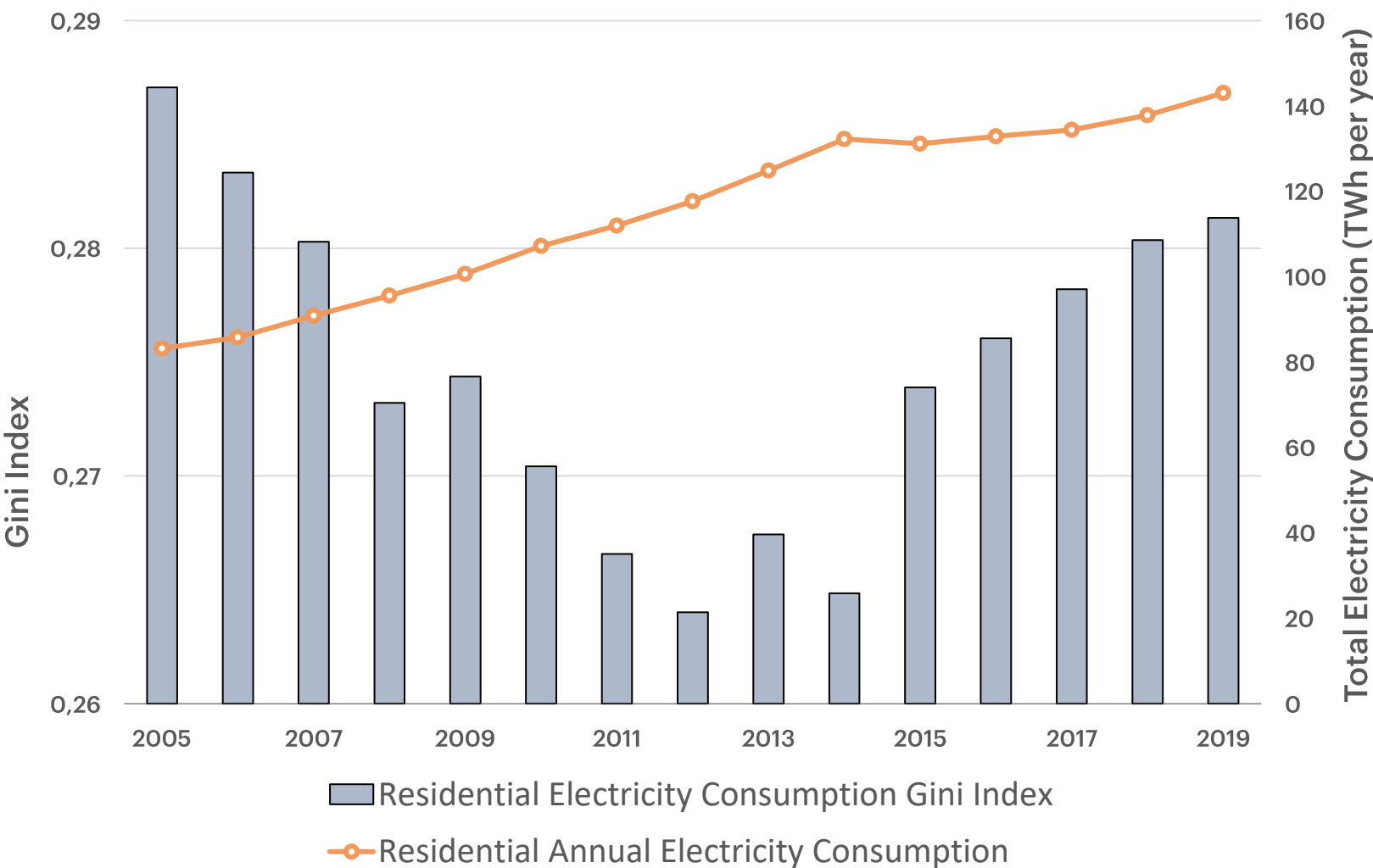
Residential Electricity Consumption Gini Index



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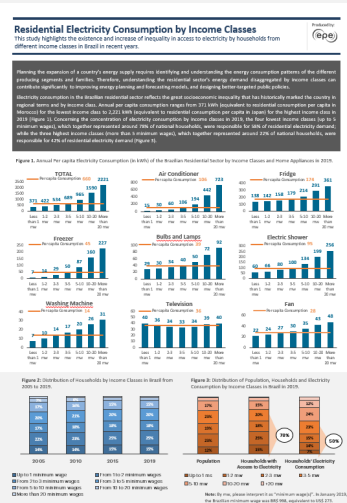
Gini Index and Electricity Consumption Evolution in Brazil 2005-2019



Source:

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Residential Electricity
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Classes.

Available at:



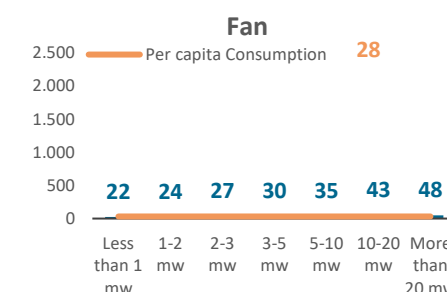
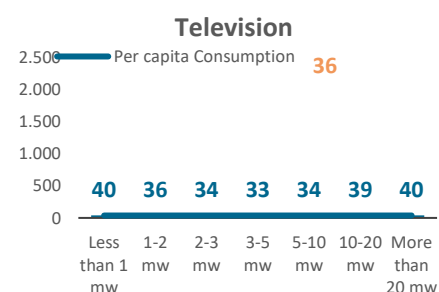
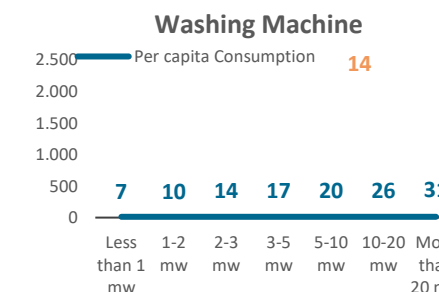
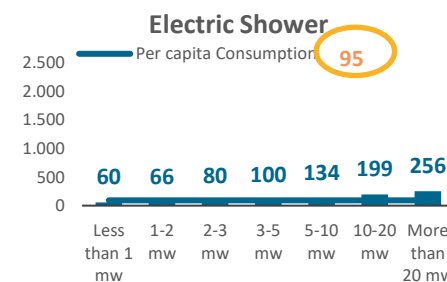
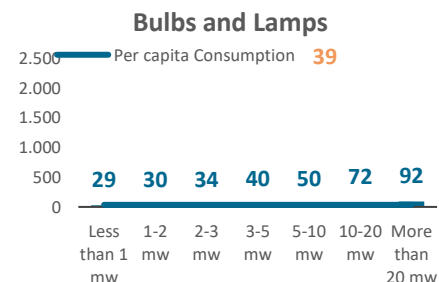
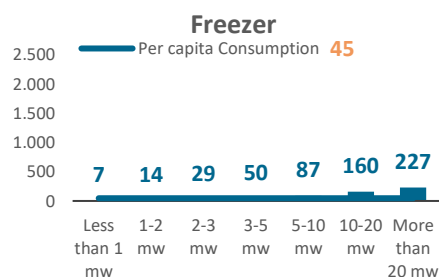
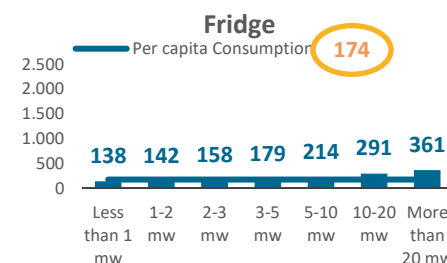
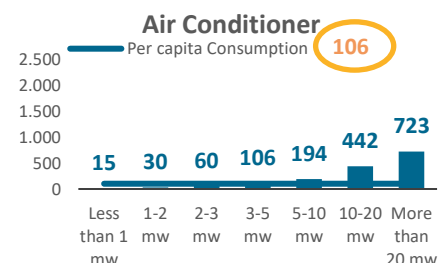
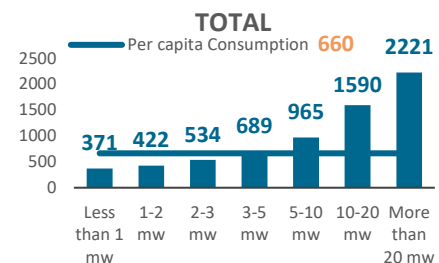
Electricity Per Capita Consumption in Brazil 2019



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By Home Appliances and Income Classes (KWh per capita)



Source:

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Residential Electricity
Consumption by Income
Classes.

Available at:



Note: By mw, please interpret it as “minimum wage(s)”.

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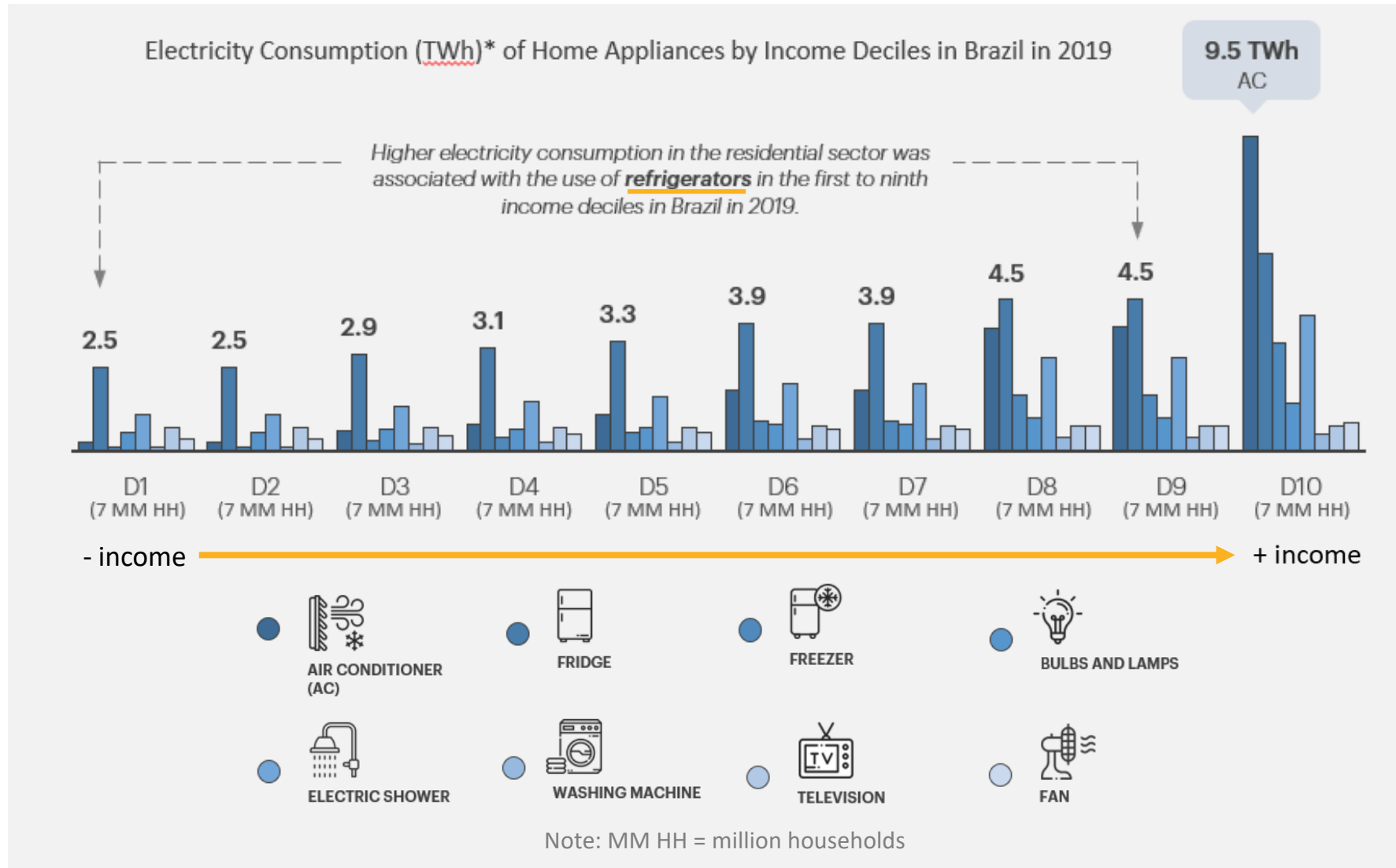
Total Electricity Consumption in Brazil 2019



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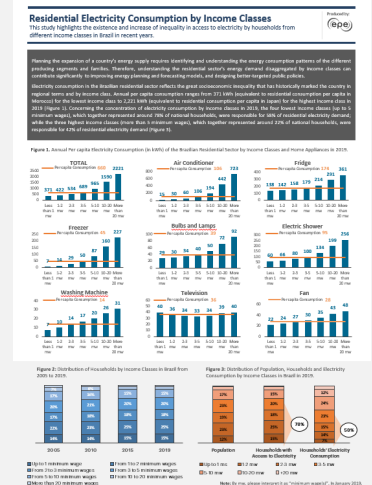
By Home Appliances and Income Deciles (TWh)



Source:

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Available at:



Key Research Findings



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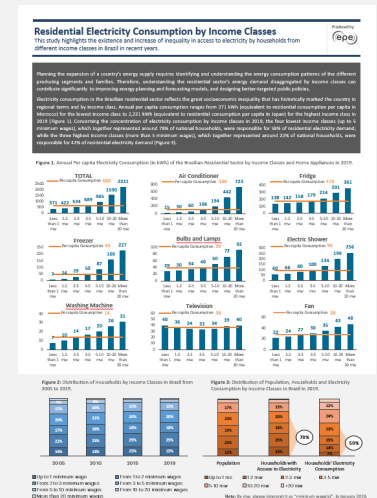


- Energy access does not depend only on the connection to the grid. Energy services also must be affordable, as highlighted in the SDG 7.
- Socioeconomic restrictions experienced by lower-income households lead to a restrained demand for energy services.
- Income distribution inequality is reflected in the households' electricity consumption patterns.
- Lower income households tend to present fewer home appliances with lower power or more restrictive usage habits in order to spend less money paying their electricity bill.

Source:

EPE (2023) Fact Sheet
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Available at:



Key Research Findings



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- Residential Sector's Electrical Gini Index is a powerful tool for monitoring the inequality in access to energy services.
- It is key to collect periodically data on the ownership, power and use habits of home appliances by income classes, regions and other household conditions.
- Understanding the residential sector's electricity consumption heterogeneity by income classes can help to :
 - design more effective and lower costly energy efficiency and subsidy policies.
 - improve energy demand forecasting models and energy planning.
 - address the national sustainable development agenda and achieve its established goals (as the SDG 7).

Residential Electricity Consumption by Income Classes

This study highlights the existence and increase of inequality in access to electricity by households from different income classes in Brazil in recent years.

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epe

Planning the expansion of a country's energy supply requires identifying and understanding the energy consumption patterns of the different producing segments and families. Therefore, understanding the residential sector's energy demand disaggregated by income classes can contribute significantly to improving energy planning and forecasting models, and designing better-targeted public policies.

Electricity consumption in the Brazilian residential sector reflects the great socioeconomic inequality that has historically marked the country in regional terms and by income class. Annual per capita consumption ranges from 371 kWh (equivalent to residential consumption per capita in Morocco) for the lowest income class to 2,221 kWh (equivalent to residential consumption per capita in Japan) for the highest income class in 2019 (Figure 1). Concerning the concentration of electricity consumption by income classes in 2019, the four lowest income classes (up to 5 minimum wages), which together represented around 78% of national households, were responsible for 58% of residential electricity demand; while the three highest income classes (more than 5 minimum wages), which together represented around 22% of national households, were responsible for 42% of residential electricity demand (Figure 3).

Figure 1: Annual Per capita Electricity Consumption (in kWh) of the Brazilian Residential Sector by Income Classes and Home Appliances in 2019.

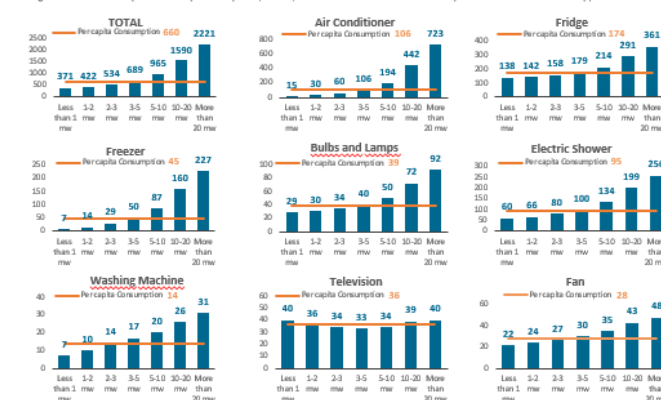


Figure 2: Distribution of Households by Income Classes in Brazil from 2005 to 2019.

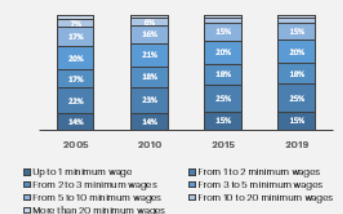
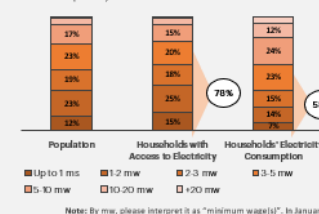


Figure 3: Distribution of Population, Households and Electricity Consumption by Income Classes in Brazil in 2019.



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The fact sheet is available at [EPE's Website](https://www.epe.gov.br/).

Thank you!



www.epe.gov.br

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