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Innovation in the Energy Sector

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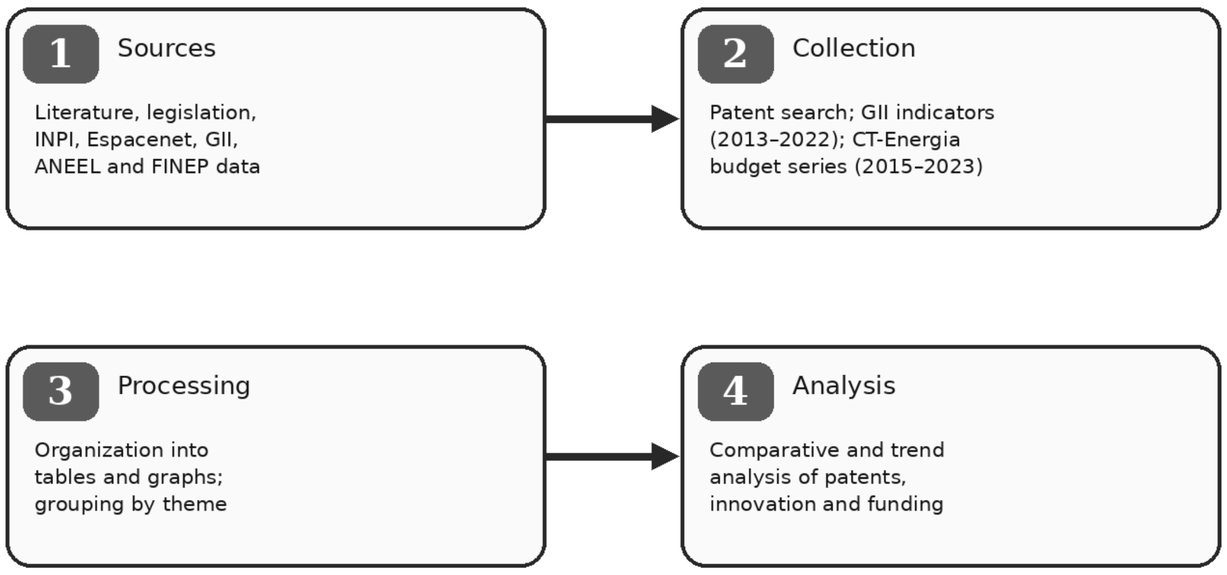
INTRODUCTION & AIM

- Energy is essential for economic and social development, and global demand continues to grow.
- Brazil has a privileged position in renewable resources but faces bureaucracy, technological bottlenecks and unstable funding that slow down innovation in the electricity sector.
- This study analyzes innovation in the Brazilian energy sector, quantifying patent applications in energy-related technologies, positioning Brazil in the Global Innovation Index (GII) and examining public investments in R&D for the electricity sector.

METHOD

- Qualitative and quantitative bibliographic research based on books, scientific articles, official reports and legislation on energy and innovation.
- Patent search in INPI and Espacenet using keywords related to renewable energy technologies and leading research centers such as CEPEL.
- Analysis of GII reports from 2013 to 2022, focusing on Electricity Generation, Innovation Linkages and Knowledge Creation, as well as Brazil's overall ranking and CT-Energia budget data (2015–2023) to assess long-term public support for energy R&D.

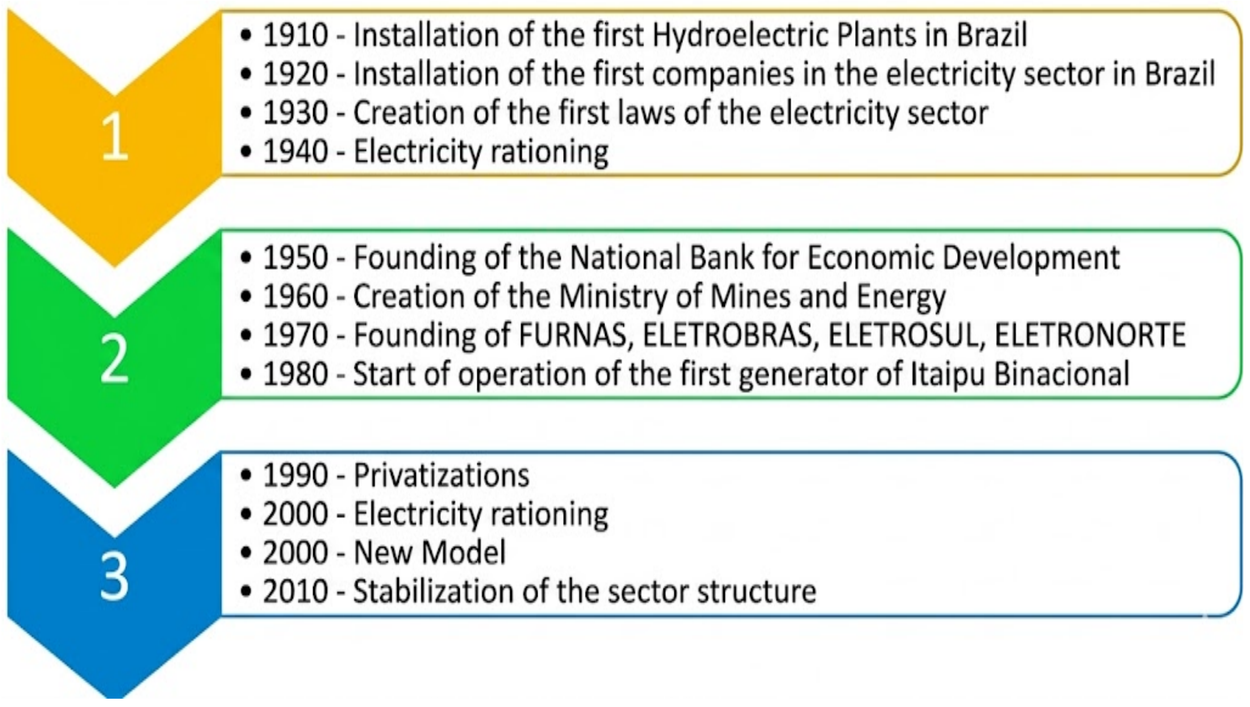
Methodological flow of the study



RESULTS & DISCUSSION

- Renewable-energy patents in Brazil are concentrated in public universities and research foundations, while CEPEL registers comparatively few patents.
- Patent activity is concentrated in the South and Southeast, whereas the Northeast has the highest wind and solar potential, revealing a regional mismatch in innovation.
- Brazil's average GII ranking from 2013 to 2022 was around 60th place, improving to 54th in 2022, driven by gains in knowledge and technology outputs.
- CT-Energia suffered continuous budget cuts from 2015 to 2021, with part of its resources redirected to COVID-19 projects, and remains one of the least funded sectoral programs of the FNDCT.

Renewable-energy patent applications in Brazil



CONCLUSION

- Brazil has strong renewable resources and growing knowledge production, but innovation outcomes in the electricity sector remain below its potential, as existing laws and funding mechanisms have limited impact because investments are restricted, volatile and unevenly distributed.
- More stable and better-coordinated incentives are needed to strengthen innovation across the energy value chain and turn research into cleaner and more reliable energy.

FUTURE WORK / REFERENCES

Future work

- Expand the analysis to include private-sector investment and venture capital focused on energy technologies.
- Investigate successful regional cases where renewable resources, local innovation and public policy are better aligned.
- Evaluate the social and environmental impacts of innovation projects supported by CT-Energia and other funding instruments.

References

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