

An Indian-Australian research partnership

Project Title: **Understanding the electricity access-development linkages of centralised and decentralised supply schemes using system dynamics framework**

Project Number **IMURA0879**

Monash Main Supervisor
(Name, Email, Phone) Robert Thomson
Professor of Political Science, School of Social Sciences
robert.thomson@monash.edu *Full name, Email*

Monash Co-supervisor(s)
(Name, Email, Phone) Roger Dargaville, roger.dargaville@monash.edu,

Monash Head of Dept/Centre (Name, Email) *Full name, email*

Monash Department:

Monash ADGR
(Name, Email) *Full name, email*

IITB Main Supervisor
(Name, Email, Phone) Anand B. Rao, a.b.rao@iitb.ac.in *Full name, Email*

IITB Co-supervisor(s)
(Name, Email, Phone) Jayendran Venkateswaran, jayendran@iitb.ac.in, *Full name, Email*

IITB Head of Dept
(Name, Email, Phone) Satish B. Agnihotri, sbagnihotri@iitb.ac.in *Full name, email*

IITB Department: Centre for Technology Alternatives for Rural Areas (CTARA)

Research Clusters:

Research Themes:

Highlight which of the Academy's CLUSTERS this project will address? <i>(Please nominate JUST <u>one</u>. For more information, see www.iitbmonash.org)</i>		Highlight which of the Academy's Theme(s) this project will address? <i>(Feel free to nominate more than one. For more information, see www.iitbmonash.org)</i>	
1	Material Science/Engineering (including Nano, Metallurgy)	1	Advanced computational engineering, simulation and manufacture
2	Energy, Green Chem, Chemistry, Catalysis, Reaction Eng	2	Infrastructure Engineering
3	Math, CFD, Modelling, Manufacturing	3	Clean Energy
4	CSE, IT, Optimisation, Data, Sensors, Systems, Signal Processing, Control	4	Water
5	Earth Sciences and Civil Engineering (Geo, Water, Climate)	5	Nanotechnology
6	Bio, Stem Cells, Bio Chem, Pharma, Food	6	Biotechnology and Stem Cell Research
7	Semi-Conductors, Optics, Photonics, Networks, Telecomm, Power Eng	7	Humanities and social sciences
8	HSS, Design, Management	8	Design

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The research problem

Define the problem

Access to electricity is seen as an important catalyst and often, an enabler to achieve a better quality of life, both at individual and at the community level. The per capita electricity consumption is typically used as a proxy to the progress made by a society or a region. Many studies have shown the strong correlation between electricity consumption and HDI (and GDP), at the state and/or national level. However, the knowledge of the manifestations of development due to electricity infrastructure and consumption is limited, both at the macro and micro level. It is important to understand the linkages between electricity access (and/or consumption) and the development of consumers or households or a region as a whole. It is equally important to understand the development and electricity access linkage as a system, unlike in isolation by parametrising the only the quantifiable variables. There are multiple socio-economic and cultural contexts apart from various electricity supply technologies exists in India. Broadly, electricity supply systems could be categorised into 4, a solar home lighting system (SHS), a decentralised mini-grid, centralised grid connection and combination of all. The available literature and field experience are limited to either one of contexts or at the macro level, failing to understand the forward and backward linkages of the system. Most of this knowledge is essential for a comprehensive and inclusive policymaking.

To bridge the gap, the proposed project attempts to develop a comprehensive framework to analyse the backward and forward linkages of electricity-livelihood-development as a system. Further, the study intends to validate the system at a micro level from selected locations in India while including the social, cultural, economic and political contexts with the help of a system dynamic modelling platform.

Project aims

Define the aims of the project

The primary aim of the proposed research is to develop a framework to model and analyse the electricity access-livelihood-development as a system with forward and backward linkages to the socio-economic, cultural and political context. Broadly, the proposed study tries to understand whether and (if yes) how the electricity access enables or enhances the opportunities for better livelihood and development, while adopting the systems thinking. This would give valuable insights on the effectiveness of policy implementation and adaptability of the stakeholders and its effect on development. This will also help us to understand the impact of electricity access and the need for the energy-plus approach in policy formulation.

Expected outcomes

Highlight the expected outcomes of the project including likelihood of patents

A system dynamic framework and a framework to understand the electricity and development linkages at the micro-level. Further the understandings and the validated results could be used to make concrete policy recommendations and on course corrective measures.

How will the project address the Goals of the above Themes?

Describe how the project will address the goals of one or more of the 6 Themes listed above.

The project goals are in line with energy theme. The outcomes are expected to bridge the existing knowledge gap in the thematic area and more importantly contribute to evidence based policy making.

Capabilities and Degrees Required

List the ideal set of capabilities that a student should have for this project. Be as specific or as general as you like. These capabilities will be input into the online application form and students who opt for this project will be required to show that they can demonstrate these capabilities.

Basic understanding of the system dynamics modelling (or willing to take the course on system dynamics in the coming semester) or, understanding of input-output modelling, reviewing literature.

The student is required to be science or engineering background during their UG/PG.

Potential Collaborators

Please visit the IITB website www.iitb.ac.in OR Monash Website www.monash.edu to highlight some potential collaborators that would be best suited for the area of research you are intending to float.

Select up to **(4)** keywords from the Academy's approved keyword list (**available at <http://www.iitbmonash.org/becoming-a-research-supervisor/>**) relating to this project to make it easier for the students to apply.

Energy, Energy Storage, Energy Materials; Modelling and Simulation; Miscellaneous/Uncategorised