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EXAMINING SOCIAL ACCEPTANCE OF LARGE-SCALE SOLAR PROJECTS IN INDIA

by

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INDIAN INSTITUTE OF TECHNOLOGY DELHI

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Examining Social Acceptance of Large-Scale Solar Projects in India

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&

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Dedicated to all first-generation female scholars. None of us would have had an easy journey, I am so glad we made it.

You may say I am a dreamer, but I am not the only one- John Lennon

Supervisor Certification

This is to certify that the thesis entitled " **Examining Social Acceptance of Large-Scale Solar Projects in India**" being submitted by **Ms. Simran Agarwal** to the Indian Institute of Technology Delhi and The University of Queensland for the award of degree of **Doctor of Philosophy** is a record of *bonafide* research work carried out by her. **Ms. Simran Agarwal** has worked under our guidance and supervision and has fulfilled the requirements for the submission of this thesis, which to our knowledge has reached the requisite standard. The results contained in this thesis are original and have not been submitted, in part or full, to any other University or Institute for the award of any other degree or diploma.

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Abstract

This thesis studies social acceptance of large-scale solar projects by using principles of social justice. Three major stakeholders in the current energy transition- the community; the market (end consumers of energy); the state and the civil society provide various point of departure in studying the key debate around sustainability of the renewable energy transition. Each of these stakeholders form the focus of analysis in one of the studies conducted for the thesis thus providing a holistic understanding of the justice implications through different perspectives. The research applies principles of procedural justice (Burningham et al., 2006; Cass & Walker, 2009) distributional justice (Cowell et al., 2011; Brady & Monani, 2012) and recognition justice (Gross 2007; Walker & Day, 2012) to study the implementation of large-scale solar infrastructures. The thesis is also a step in the direction of providing an integrated understanding of the social, economic and political dynamics of the transition. It bridges the gap between distinct strands of literature on transition and justice, by studying concerns of social justice integrated with the concerns of the environment. By providing a deeper insight into the dynamics of India's solar transition, the research unpacks the dynamics of policy that promotes the development of large-scale centralised solar uptake and the implications of the model for a sizeable majority of the population that face socio-economic vulnerability. Adopting a mix of quantitative and qualitative research methods, this research provides important academic and policy contribution towards highlighting justice concern in renewable energy transition and providing recommendations for its remediation.

Abstract in Hindi

यह थीसिस सामाजिक न्याय के सिद्धांतों का उपयोग करके बड़े पैमाने पर सौर परियोजनाओं की सामाजिक स्वीकृति का अध्ययन करती है। वर्तमान ऊर्जा परिवर्तन में तीन प्रमुख हितधारक- समुदाय; बाजार (ऊर्जा के अंतिम उपभोक्ता); अक्षय ऊर्जा संक्रमण की स्थिरता के आसपास प्रमुख बहस का अध्ययन करने में राज्य और नागरिक समाज विभिन्न प्रस्थान बिंदु प्रदान करते हैं।इनमें से प्रत्येक हितधारक थीसिस के लिए किए गए अध्ययनों में से एक में विश्लेषण का ध्यान केंद्रित करता है और इस प्रकार विभिन्न दृष्टिकोणों के माध्यम से न्याय के निहितार्थों की समग्र समझ प्रदान करता है।अनुसंधान प्रक्रियात्मक न्याय (बर्निंघम एट अल।, 2006; कैस एंड वॉकर, 2009) वितरणात्मक न्याय (काउल एट अल।, 2011; ब्रैडी एंड मोनानी, 2012) और मान्यता न्याय (सकल 2007; वॉकर एंड डे, 2012) के सिद्धांतों को लागू करता है। बड़े पैमाने पर सौर अवसंरचना के कार्यान्वयन का अध्ययन करने के लिए। थीसिस संक्रमण के सामाजिक, आर्थिक और राजनीतिक गतिशीलता की एक एकीकृत समझ प्रदान करने की दिशा में भी एक कदम है। यह पर्यावरण की चिंताओं के साथ एकीकृत सामाजिक न्याय की चिंताओं का अध्ययन करके, संक्रमण और न्याय पर साहित्य के अलग-अलग पहलुओं के बीच की खाई को पाटता है। भारत के सौर परिवर्तन की गतिशीलता में गहरी अंतर्दृष्टि प्रदान करके, अनुसंधान नीति की गतिशीलता को खोलती है जो बड़े पैमाने पर केंद्रीकृत सौर ऊर्जा के विकास को बढ़ावा देती है और सामाजिक-आर्थिक भेद्यता का सामना करने वाली आबादी के एक बड़े हिस्से के लिए मॉडल के प्रभाव को बढ़ावा देती है। मात्रात्मक और गुणात्मक अनुसंधान विधियों के मिश्रण को अपनाते हुए, यह शोध प्रदान करता हैअक्षय ऊर्जा संक्रमण में न्याय की चिंता को उजागर करने और इसके उपचार के लिए सिफारिशें प्रदान करने की दिशा में महत्वपूर्ण शैक्षणिक और नीतिगत योगदान।

Declaration by author

This thesis is composed of my original work, and contains no material previously published or written by another person except where due reference has been made in the text. I have clearly stated the contribution by others to jointly authored works that I have included in my thesis.

I have clearly stated the contribution of others to my thesis as a whole, including statistical assistance, survey design, data analysis, significant technical procedures, professional editorial advice, financial support and any other original research work used or reported in my thesis. The content of my thesis is the result of work I have carried out since the commencement of my higher degree by research candidature and does not include a substantial part of work that has been submitted to qualify for the award of any other degree or diploma in any university or other tertiary institution. I have clearly stated which parts of my thesis, if any, have been submitted to qualify for another award.

I acknowledge that an electronic copy of my thesis must be lodged with the University Library and, subject to the policy and procedures of The University of Queensland, the thesis be made available for research and study in accordance with the Copyright Act 1968 unless a period of embargo has been approved by the Dean of the Graduate School.

I acknowledge that copyright of all material contained in my thesis resides with the copyright holder(s) of that material. Where appropriate I have obtained copyright permission from the copyright holder to reproduce material in this thesis and have sought permission from co-authors for any jointly authored works included in the thesis.

Publications included in this thesis

No Publications included

Contributions by others to the thesis

All chapters

Editorial suggestions were provided by the candidate's supervisors, Prof. Upasna Sharma; Dr Vigya Sharma; Prof Paul Lant; and PhD committee, Prof. Ambuj Sagar; Prof. Ankush Agarwal, Dr Tony Heynen.

Statement of parts of the thesis submitted to qualify for the award of another degree

No works submitted towards another degree have been included in this thesis.

Research involving human or animal subjects

All human subjects involved in this research formally consented to participate in the study.

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[social acceptance, social justice, renewable energy transition, justice in transition, solar policy, institutions, green electricity, energy policy, community acceptance]

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Fields of research classification

FoR code:1605: 50% Policy and Administration, 50%
FoR code: 9603: Environmental and Natural Resource Evaluation, 30%
FoR code: 1402: Applied Economics, 20%]

List of Tables

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List of Abbreviations

AC- Awareness of Consequences
ADB- Asian Development Bank
AEML- Adani Electricity Mumbai Ltd
AR- Ascription of Responsibility
AREPRL- Adani Renewable Energy Park Rajasthan Ltd
CEA- Central Electricity Authority
CEA- Central Electricity Authority
CEEW- Council of Energy, Environment and Water
CIF- Climate Investment Fund
CIF- Climate Investment Fund
CPR- Centre for Policy Research
CSIS- Centre for Strategic and International Studies
CSP- Concentrating Solar Plant
CSR- Corporate Social Responsibility
CTF- Clean Technology Fund
Discoms- Distribution Companies
DMF- District Mineral Foundation
EIA- Energy Information Administration
EIA- Environmental Impact Assessment
EJAtlas- Environmental Justice Atlas
EPA- United States Environmental Protection Agency
ESIA- Environmental and Social Impact Assessment
FiT- Feed-in-Tariff
GDP- Gross Domestic Product
GoI- Government of India
GSDP- Gross State Domestic Product
GW- Gigawatt
ICAR- Indian Council of Agricultural Research
IEA- International Energy Association
IIA- Independence of Irrelevant Alternatives
IJTC- India Just Transition Centre
INR- Indian National Rupee
IPCC- Intergovernmental Panel on Climate Change
IRENA- International Renewable Energy Agency
JNNSM- Jawaharlal Nehru National Solar Mission
kWh- kilowatt-hour

LADA- Local Area Development Authority

MLP Multi-Level Perspective

MNRE- Ministry of New and Renewable Energy

MRE-Marine Renewable Energy

MU- Marginal Utility

MW- Megawatt

NAT- Norm Activation Theory

NDC- Nationally Determined Contribution

NEP- National Electricity Policy

NGO- Non-Government Organisation

NIMBY- Not-in-my-Backyard

NSDP- Net State Domestic Product

NSSO- National Sample Survey Organisation

NTPC- National Thermal Power Corporation

OBC- Other Backward Castes

PIB- Press Information Bureau

PLPCs- Public Land Protection Cells

PPA- Power Purchase Agreements

PRISMA- Preferred Reporting Items for Systematic Reviews and Meta-Analyses

PV- Photovoltaics

RET- Renewable Energy Technology

RPO- Renewable Purchase Obligation

RRECL- Rajasthan Renewable Energy Corporation Limited

RSDCL- Rajasthan Solar Park Development Company Limited

RSP- Rajasthan Solar Policy

Saubhagya- Pradhan Mantri Sahaj Bijli Har Ghar Yojana

SC- Schedule Castes

SDG- Sustainable Development Goal

SECI- Solar Energy Corporation of India

SEZ- Special Economic Zones

SIA- Social Impact Assessment

SLO- Social License to Operate

SPPD- Solar Power Park Developer

ST- Schedule Tribes

SUCRL- Surya Urja Company of Rajasthan Ltd.

TERI- The Energy and Resource Institute

UNECE- United Nations Economic Commission for Europe

UNFCCC- United Nations Framework Convention on Climate Change

WEF- World Economic Forum

WRI- World Resource Institute

WTP- Willingness to Pay

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