

Supply chain risks of the small scale bioenergy projects in India

Vimal Kumar Eswarlal

Supervisors

Prof. Prasanta Dey
Prof. Pawan Budhwar



Aston Business School

Content

- ▶ Background
- ▶ Significance of the sector
- ▶ Research gap
- ▶ Research overview
- ▶ Research approach
- ▶ Findings
- ▶ Practical implications





Aston Business School

The Case for India – A nation on the rise

▶ Economy

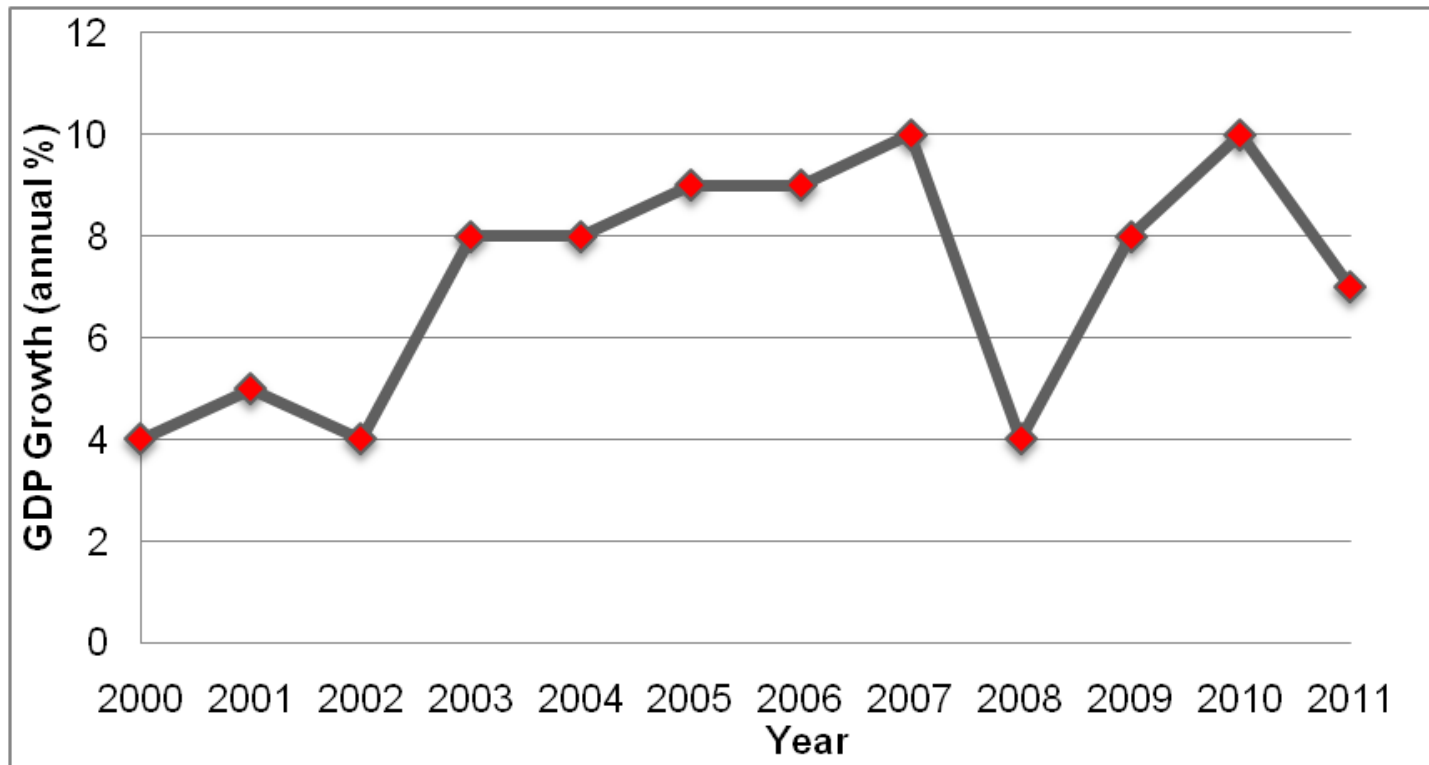




Aston Business School

The Case for India – Economy

- ▶ Nominal GDP was \$ 1.848 trillion (in 2011)
- ▶ GDP - Average growth rate of 7 % for a decade before the crisis





Aston Business School

The Case for India – A nation on the rise

- ▶ Economy
- ▶ Demography

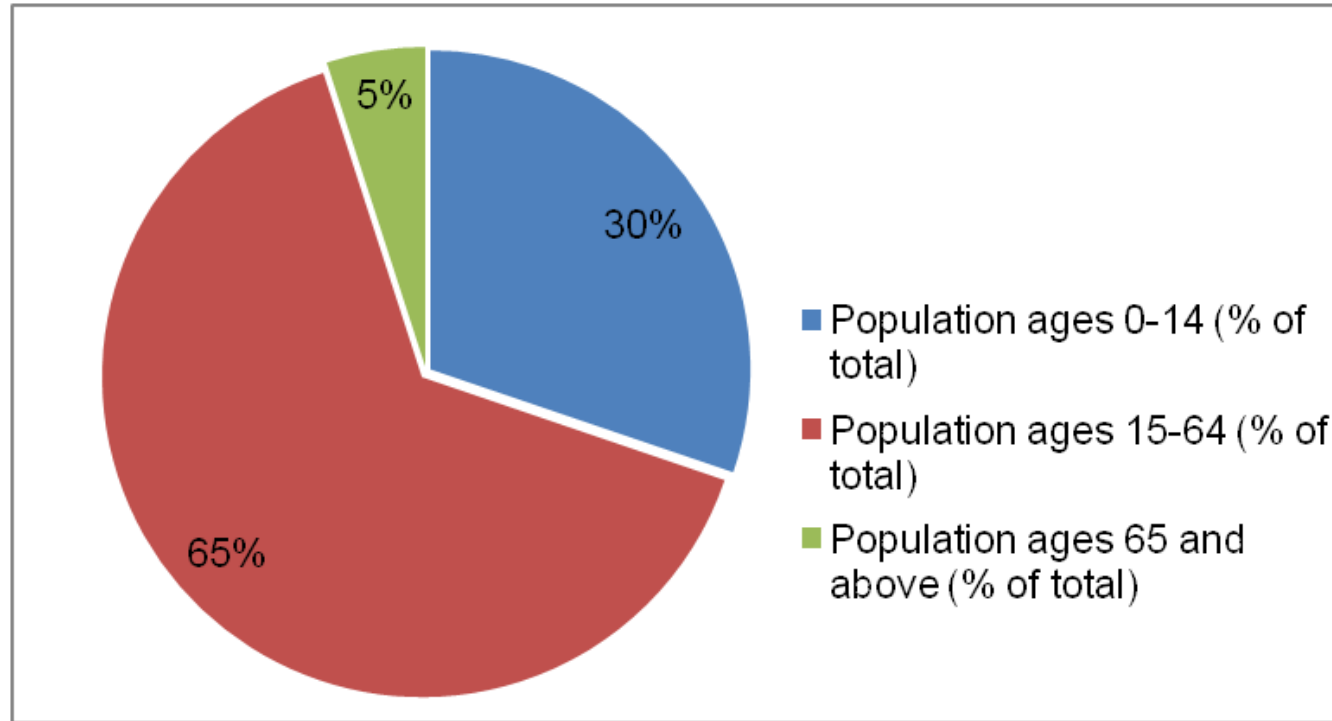




Aston Business School

The Case for India – Demography

- ▶ The second most populous country in the world with the population of **1.24 billion** (in 2011) – With a huge young human resource





Aston Business School

The Case for India – A nation on the rise

- ▶ Economy
- ▶ Demography

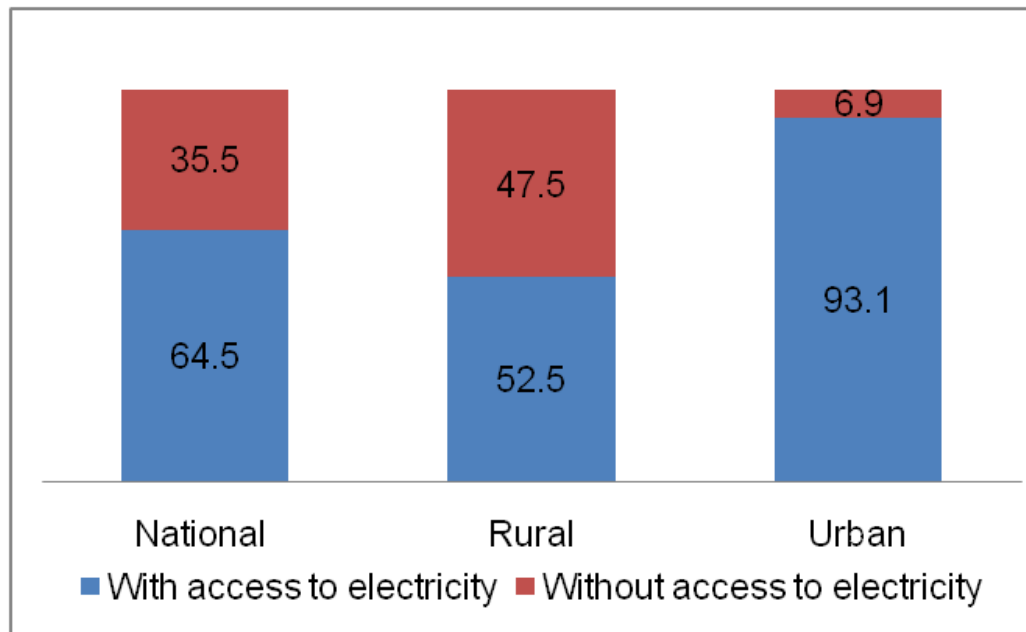
But
Energy ???





Access to Energy - India

- ▶ The official electricity shortage in normal and peak loads were 10% and 13% respectively (in 2009-10) (Source: Central Electricity Authority, 2012)
- ▶ 35.5% of the population don't had access to electricity (in 2008)



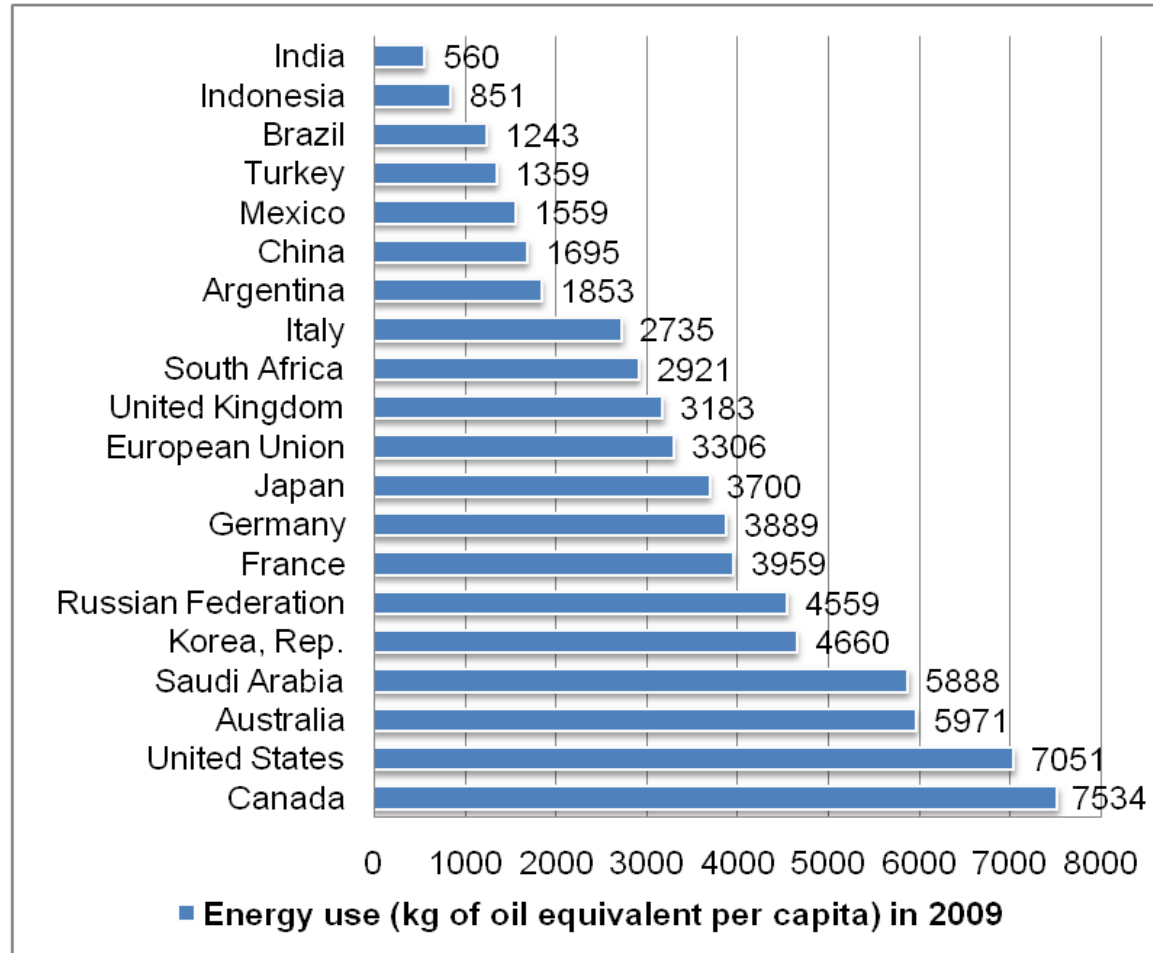
Source: IEA & OECD, 2009



Energy Consumption - India

- ▶ The lowest energy consumption per capita among G20.

Source: Enerdata, 2012





Aston Business School

The Case for India – A nation on the rise

- ▶ Economy
- ▶ Demography

Energy ??? →then
Development ???

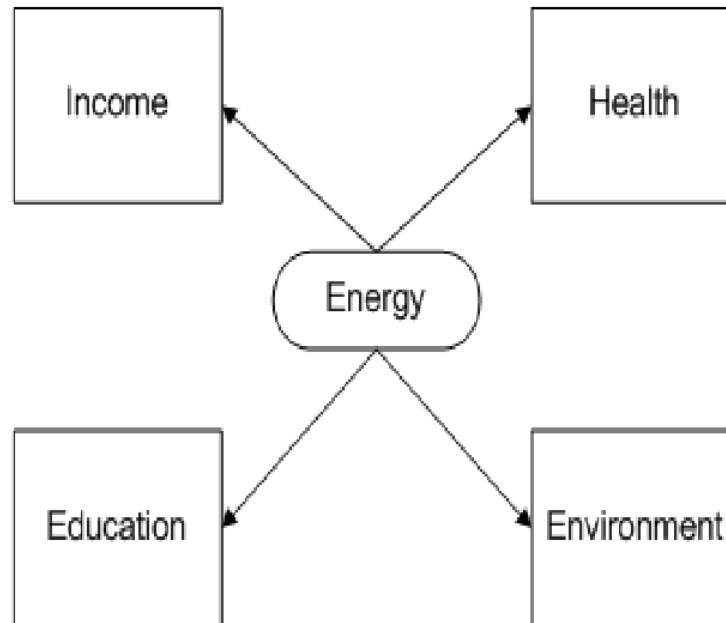




Aston Business School

Energy Linked to Development - India

- ▶ “Without access to sustainable energy, there can be no sustainable development” (Source: UN, 2012)
- ▶ The 69 % of the population in 2010, was living on less than \$2.00 a day (Source: World Bank, 2012)



Based on Kanagawa & Nakata, 2007



Role of Bioenergy in India

- ▶ “Our next target is to **provide electricity to each and every household** in our country in the next 5 years and to also **improve the supply of electricity.**” – Prime Minister of India (15/08/2012)
- ▶ “Our experience in India suggests that **renewable energy can be an excellent tool in providing energy access.**” - Minister of New and Renewable Energy (09/10/2012)
- ▶ “Biomass based decentralized generation has **the largest potential for rural energy access.** In fact, biomass power in India has become an industry with a cumulative generation capacity of over 3600 MW.” - Minister of New and Renewable Energy (05/09/2012)





Aston Business School

Significance of Small scale Bioenergy in India

- ▶ Huge potential - **18000 MW** from agro-residues & **5000 MW** from raising dedicated plantations on degraded lands (MNRE, 2010)
- ▶ Transmission and Distribution (T&D) losses are nearly 33% (in 2009)
- ▶ Bioenergy has a wide range of benefits, including
 - ❑ very cost-effective energy, relative to other renewable technologies
 - ❑ mitigate climate change by reducing greenhouse gas emissions
 - ❑ controllable energy supply
 - ❑ reliance on imports of fossil fuels, giving a more secure energy supply
 - ❑ creating green jobs across the fuel supply chain (Source: DECC, 2012)
 - ❑ Socio economic development in the rural areas





Aston Business School

Research Gap

- ▶ **For the success of bioenergy it is critical to address the supply chain issues.** - Mr B K Chaturvedi, Member (Energy) of the Planning Commission (05/09/2012)
- ▶ “The sector is battling several challenges in the areas of policy development, **feedstock supply chain, availability of appropriate technologies, financing and market linkages.**” - Mr Pramod Chaudhari, Co-Chairman, CII National Committee on Renewable Energy (05/09/2012)
- ▶ **Lack of information about the supply chain and operational issues** is one of the important barriers – (Rao & Ravindranath, 2003; McCormick & Kaberger, 2007)





Aston Business School

Research Gap

- ▶ Scant work on supply chain risks of the small scale bioenergy sector

“Although the vast majority of the studies in the field of biomass-to-energy production examine the system from a purely technological or ecological point of view, there is a **subset of the literature** body that addresses **the relevant and highly critical supply chain management issues.**” (Iakovou, Karagiannidis et al. 2010, p.1868)





Aston Business School

Research Overview

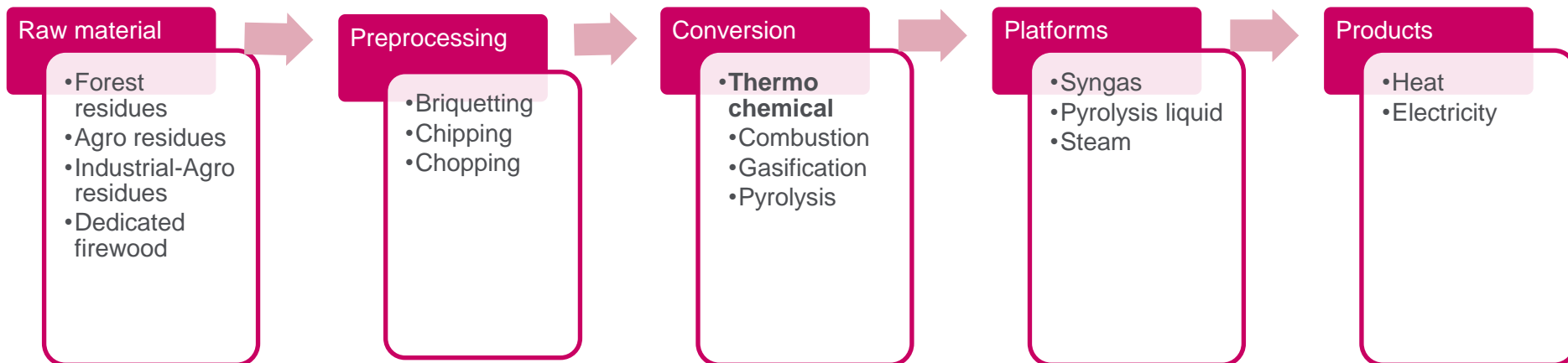
- ▶ **Research aim:** to identify the **supply chain risks**, their **causes** and **effects** of the small scale bioenergy sector in India
- ▶ **Research methodology:** Data collected in (visiting & participative) case setup using interviews, focus groups, observation and secondary evidence
- ▶ **Research output:** A knowledge base with information about the risks
- ▶ **Research impact:** Better understanding of the risks - lead to preventive measures - lead to better management and cost saving





Scope of the research

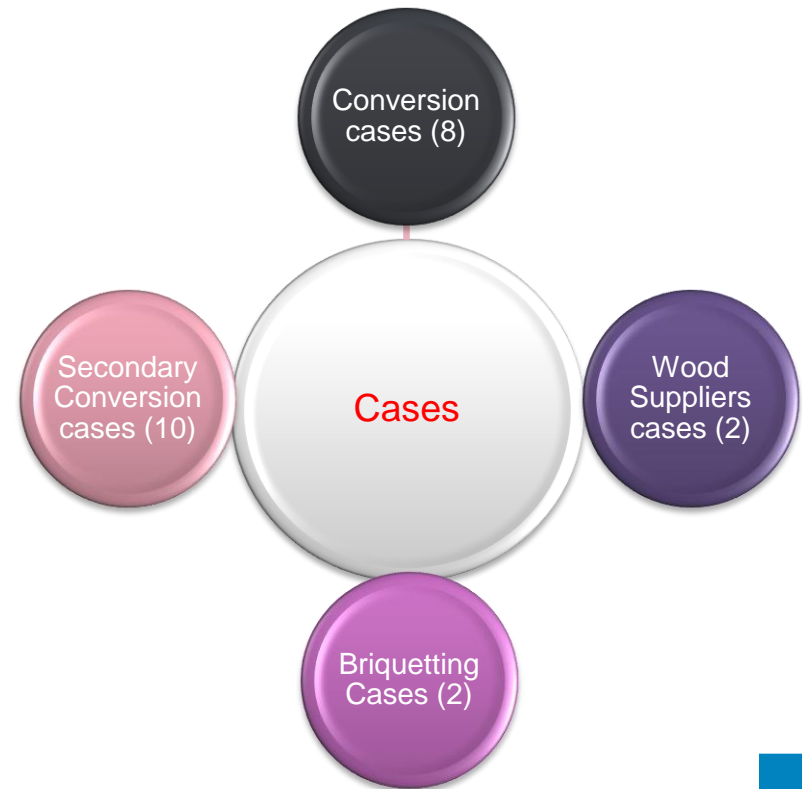
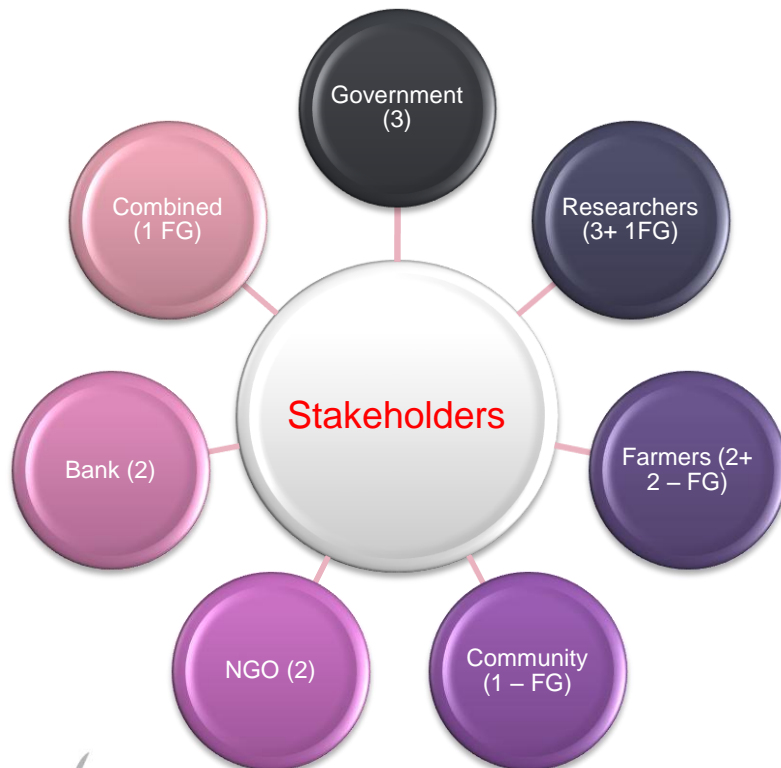
- ▶ The study included size up to 5 Mw including micro (10Kw-100Kw), mini (100Kw-1 Mw), small (1Mw-5Mw)
- ▶ Covered in 5 states of India – Tamilnadu, Karnataka, Rajasthan, Punjab & Bihar
- ▶ Limited to the elements of the classification below.





Data Sources

- ▶ The data was collected from 12 primary Cases + 10 secondary cases + Stakeholders + Practitioner evidences
- ▶ 24 Interviews + 6 Focus groups + 7 Case observation + Secondary evidences



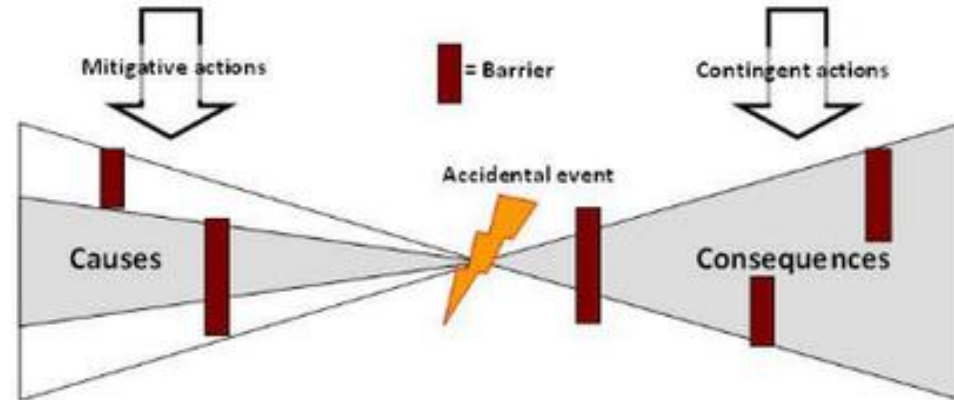


Aston Business School

Supply chain risk

“Supply chain risk is the damage that is caused by an event / member within its supply chain or its environment affecting the business process of at least one company in the supply chain negatively.”

Proactive versus Reactive



Mitigative actions address risk sources.

Contingent actions address risk consequences.

Asbjørnslett, B E and Rausand, M (1997) *Assess the vulnerability of your production system*. Report NTNU 97018. Norwegian University of Science and Technology NTNU, Department of Production and Quality Engineering, Trondheim, Norway.

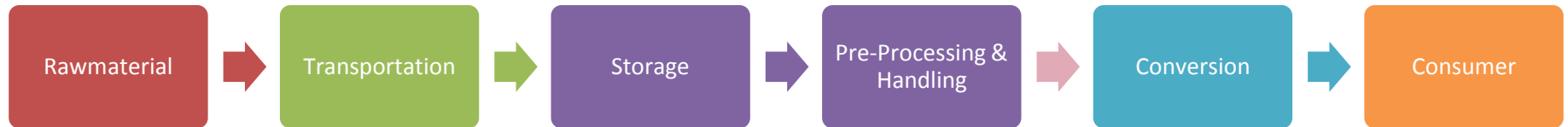
Tomlin, B. (2006) *On the Value of Mitigation and Contingency Strategies for Managing Supply Chain Disruption Risks*. Management Science, Vol. 52, No. 5, pp. 639-657

Ritchie, B. and Brindley, C. (2004) *Risk Characteristics of the Supply Chain – A Contingency Framework*. In: Supply Chain Risk. Ed. Brindley, C. , Ashgate Publishing, pp. 28-42,197-202



Aston Business School

Simple Supply Chain Adopted for Research





Aston Business School

Findings – Raw Material

- ▶ Availability of the raw material
- ▶ Price of the raw material
- ▶ Quality of the raw material





Aston Business School

Findings – Transportation

- ▶ Delivery Failure
- ▶ Cost of transportation
- ▶ Loss / damage during transportation





Aston Business School

Findings – Storage

- ▶ Unavailability of the storage space
- ▶ Cost of storage
- ▶ Loss / damage of the raw material during storage
- ▶ Fire Hazard





Aston Business School

Findings – Pre-processing & Handling

- ▶ Improper handling
- ▶ Relying on Manual Process
- ▶ Unavailability of labour
- ▶ Occupational Hazard





Aston Business School

Findings – Conversion

- ▶ Public perception
- ▶ Breakdown risk
- ▶ Low variation flexibility of heat & electricity mix ratio
- ▶ Low efficiency
- ▶ Risk from competition
- ▶ Financial risk
- ▶ Regulatory risk
- ▶ Skilled labour shortages





Aston Business School

Findings – Consumer

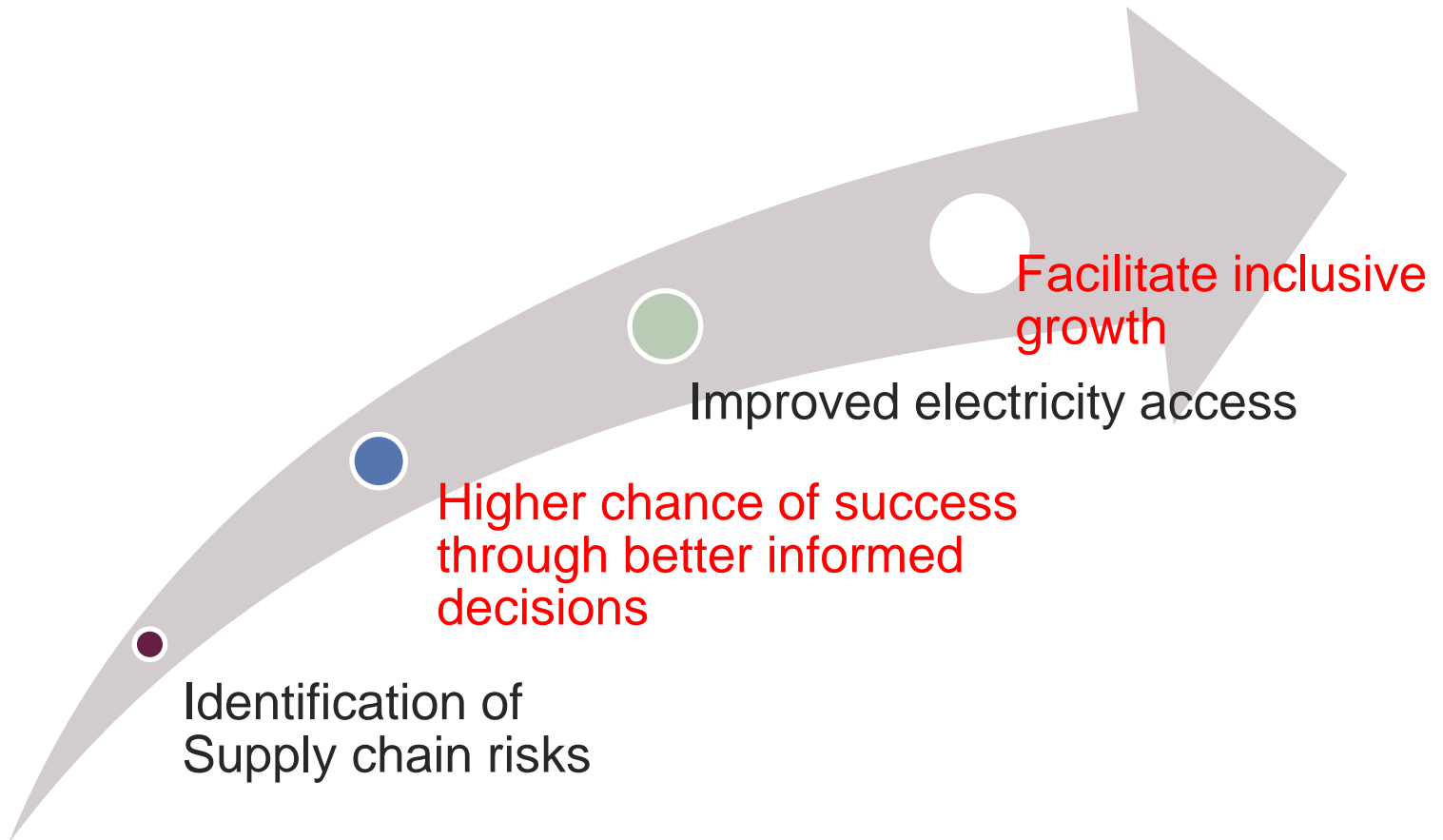
- ▶ Technical risk
- ▶ Infrastructure risk
- ▶ Requirement fluctuation
- ▶ Demand risk
- ▶ Marketability risk
- ▶ Regulatory / policy risk
- ▶ Community Involvement





Aston Business School

Practical Implication of the Research





Aston Business School

Thank You

