

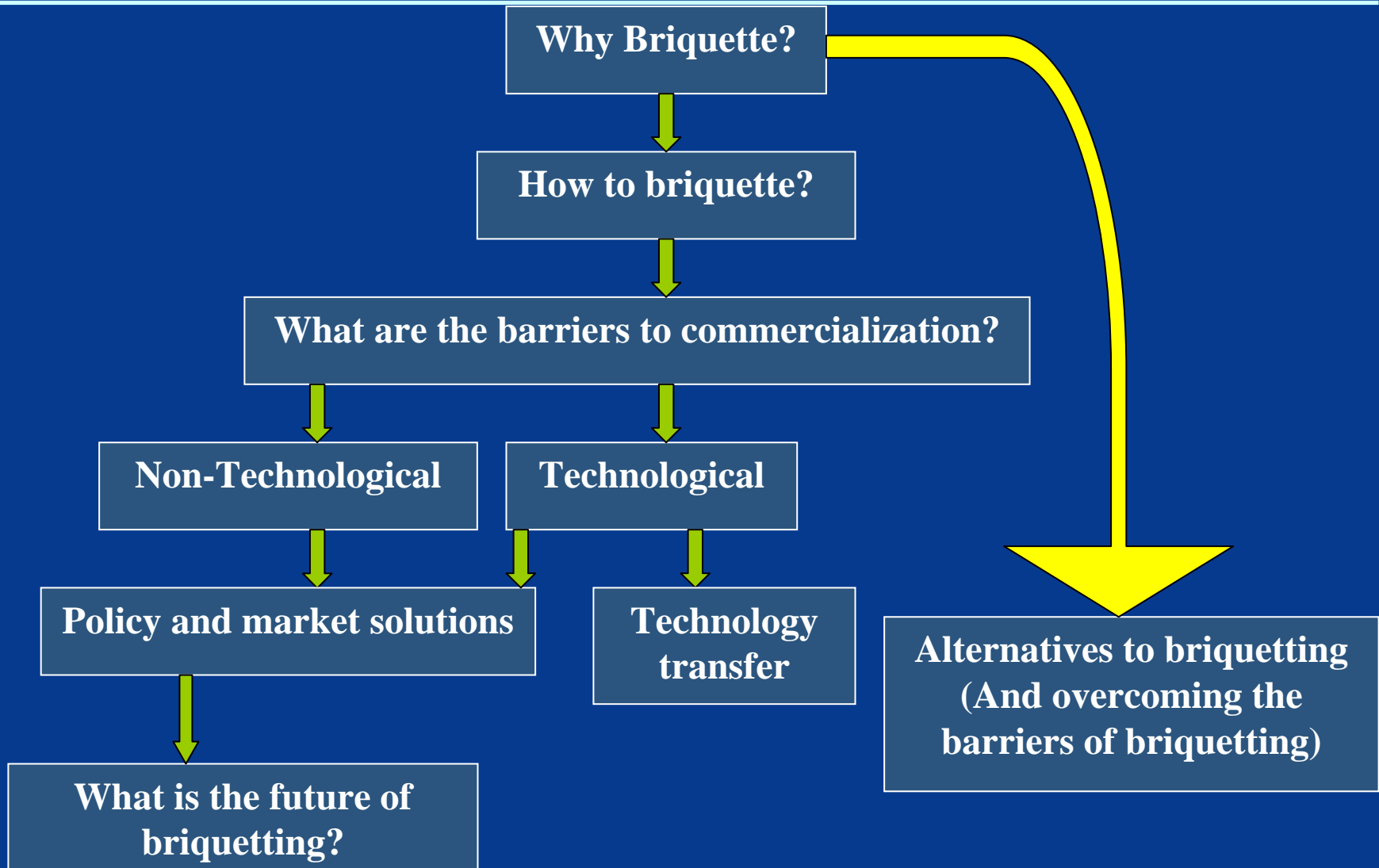
The “Waste to Wealth” Challenge:

Analyzing barriers to technology transfer
and commercialization in India’s biomass
briquetting industry

Dawn Lippert, Yale Fellow at TERI
VVN Kishore, Senior Fellow, TERI
Sunil Dhingra, Fellow, TERI

December 14, 2006
3rd Future Environmental Trends Conference

Framework



Methodology

- Literature Review
- 26 Interviews
 - Government Officials
 - Manufacturers
 - Briquetting Plant Entrepreneurs
 - Briquette Users
 - Academics
 - Consultants
- 6 Site Visits
- Qualitative and Quantitative Analyses



Benefits of Briquetting

- Transportation
- Handling
- Standard size
- Less Pollution

Drawbacks:

- *Difficult collection logistics*
- *Need energy to produce briquettes*



Background

Context for discussing technology transfer: Biomass densification in India vs. Europe

INDIA

1. Industrial applications
2. Primary fuel source
3. Diverse kinds of biomass
4. Regional variability
5. Marginalized by government

EUROPE

1. Domestic applications
2. Luxury market
3. Sawdust only (high quality input)
4. International Standardization
5. Key to government climate policy

Technology Transfer

- Screw press vs. Ram & Die press
 - Screw Advantages: Better combustion, carbonized outer layer, continuous output
 - Screw Disadvantages: High power use, wear & tear on machine parts, uses limited kinds of raw material
- University of Twente/IIT Technology Transfer Effort in Delhi
 - Technical Success
 - Commercial Failure

CONCLUSION: TECHNOLOGY TRANSFER IS NOT THE KEY BARRIER

 - Later developments: Jumbo press; coatings etc.

Agenda: Risk Analysis



Cost Analysis

- **Raw Material**
 - 50-75% of input cost (a large fraction due to transportation)
 - Seasonal variability
 - Increasing demand due to competitive uses



Cost Analysiscontd

- **Financial Risk**

- Easy to fund capital costs
- Difficult to fund working capital because of 1) banks' hesitancy to lend to rural entrepreneurs and 2) banks' reluctance to accept raw material as collateral



Cost Analysis ...contd

- Operation Costs
 - High Energy Use
 - Breakdowns (Because of power cuts)
 - Mechanical Breakdowns (Machines are much more reliable now, with lower maintenance costs, than in the 1980s and 1990s, problems of wear still not solved effectively)



Cost Analysis ...contd

“A briquetting machine is not such an easy thing; it always needs a little maintenance” –Entrepreneur

“People setting up plants are not experts in business or energy management” –Indian government official

Commercial Analysis

Market for Briquettes depends on:

Characteristics of Briquette Market

1. Price
2. Continuity of Supply
3. Quality

Price of Alternative/Competing Fuels

1. Coal
2. Wood
3. Oil



Research and Development Analysis

- **Barriers to R&D**
 - Entrepreneur Level
 - Manufacturer Level



Research and Development Analysis

...contd

- **Barriers to Collaboration**
 - Decentralized, Rural Industry
 - Mistrust of Competitors (among manufacturers and entrepreneurs)
 - Mistrust of Government
 - No Common Platform (from which to band together politically or physically conduct research)

Policy Analysis

- Social Considerations
- Government Action (by IREDA, MNES, DST, [IIT])
 - Grants for technology development somewhat effective
(but quite insignificant)
 - Loans for briquetting machines not effective



Conclusions

- Technology transfer is not the main barrier (rather the technology itself was a limitation)
- Policy interventions
 - Focus on
 1. R&D
 2. Overcoming non-technological barriers such as collaboration
 - No subsidies for hardware
- Look at alternative biomass technologies (ie pelletizing)
- Technology transfer from Europe?

Conclusions ...contd

In Order to Succeed with Biomass Pelletizing Technologies:

I. Overcome Briquetting Barriers

1. Raw Material Supply and Costs (evolve mechanisms to formalize biomass markets)
2. Financial Risk
3. Operation Costs (ie energy use, maintenance)
4. Market for Pellets
5. Technological Problems

II. Ensure Demand for Pellets

1. Social Acceptability of Pellets as a Fuel Source (Pellets for turbo stoves ?)
2. Infrastructure Adaptation
3. Non-agro Biomass as an alternative fuel (ie municipal solid waste)
4. Pellet gasification for LPG/furnace oil/diesel replacement