Clean energy challenges in developing countries: exploring international collaborative approaches

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Outline:

- Developing countries energy and technology needs
- Collaborating R&D options and approaches
- Beyond collaborative R&D: “Innovation Cooperation”
- Summary

Developing country energy and technology needs

Developing country clean energy needs:

- Developing countries will be facing a range of climate challenges relating to both mitigation and adaptation

- At the same time, they have pressing developmental challenges in terms of providing energy services and amenities
  - ✓ Adequacy
  - ✓ Affordability
  - ✓ Efficiency
  - ✓ Modernity

- These challenges are inter-linked and technology can play a major role in addressing them while contributing to economic development.

Developing country technology needs:

- Modification/adaptation of existing commercial and emerging technologies and products to render them suitable for local preferences/operating environment

- Development of technologies and products for meeting local needs (i.e., energy access) that may not be developed by global commercial markets ("ignored needs")

- Acceleration of deployment so as to better leverage the climate and developmental benefits of these(clean energy) technologies

- Exploration of technologies for longer-term needs

Collaborative R&D options and approaches

Exploring collaborative R&D options: key variables

- Focus of collaboration
  - sector; nature of activity
- R&D performers
  - firms, govt orgns, academia, non-profits
- Collaborative models
  - two-actor, consortia, networks
- Funding sources and models
  - public, private
  - project, programmatic

Key question: collaboration for what?

Sagar et al., 2010

Exploration of collaborative models: a taxonomy

Goals	Innovation stage	R&D Partners	Collaboration model	Funding
Adaptation/ modification of existing technologies and products	Middle-stage; Market-oriented	Industry, dedicated laboratories (some universities and national laboratories)	Industry-industry (horizontal and vertical)	Public/private
			Industry-national labs/universities	Public/private
			CGIAR-type networks	Public
New technologies and products for "unaddressed" needs	Middle-stage (and some early stage); End-user oriented	Industry, dedicated laboratories, universities, national laboratories, NGOs	Product-development partnerships	Public
			CGIAR-type networks	Public
			Innovation-prize- or advanced-market-commitment-induced collaborations	Public, philanthropic
			Industry-national laboratories	Public-private
Long term R&D	Early stage	Universities/national labs, Industry, dedicated facilities	University-University Collaboration	Public (Climate financing; bilateral, multilateral, philanthropy), private
			University- Industry collaboration	
			Industry-industry consortium	
			CGIAR-type networks	
			Global facility	

Sagar et al., 2010

Options for adaptation/modification of technology or products

- Industry-industry/Industry-national labs/universities
  - Actors working together to adapt specific product for specific countries/regions (e.g., household appliances, power plants)
- Publicly-funded networks
  - CGIAR-type approach of establishing centers that are focused on adapting technologies relevant to specific center or region

Sagar et al., 2010

Options for "ignored needs"

- Project Development Partnerships
  - Partnerships that are aimed at providing solutions in a very targeted manner
- Publicly funded networks
  - Established centers that would focus on multiple technologies and problems
- Innovation-prize induced partnerships
  - Leveraging 'innovation-prize" model to facilitate self-assembling partnerships
- Industry-national labs/universities

Sagar et al., 2010

Options for long-term R&D

- University/national lab-university/national lab collaboration (focused more on basic and applied research)
- University/national lab-industry collaboration (focused on technology development)
- Industry-industry consortium (focused on long-term pre-competitive technologies), with public co-funding
- Publicly-funded networks
- Global R&D facility

Sagar et al., 2010

Beyond collaborative R&D: “Innovation Cooperation”

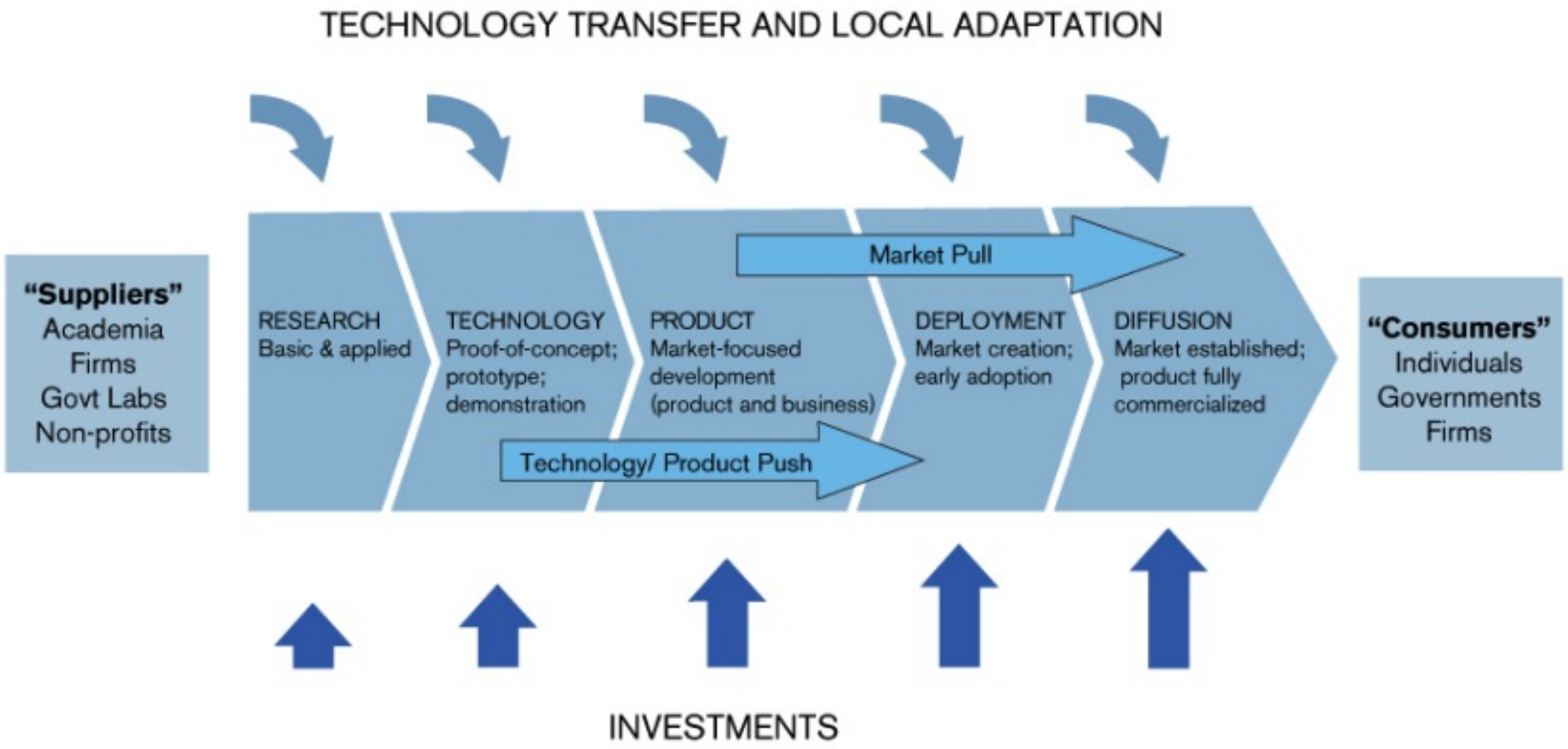
Developing country innovation needs for clean energy:

- Developing country innovation systems weak (or almost non-existent) – scale, scope, coordination
- In many cases, limited interest by commercial actors/ markets since market small or fragmented or low margins
- Deployment capabilities particularly important since diffusion at scale key to meeting objectives

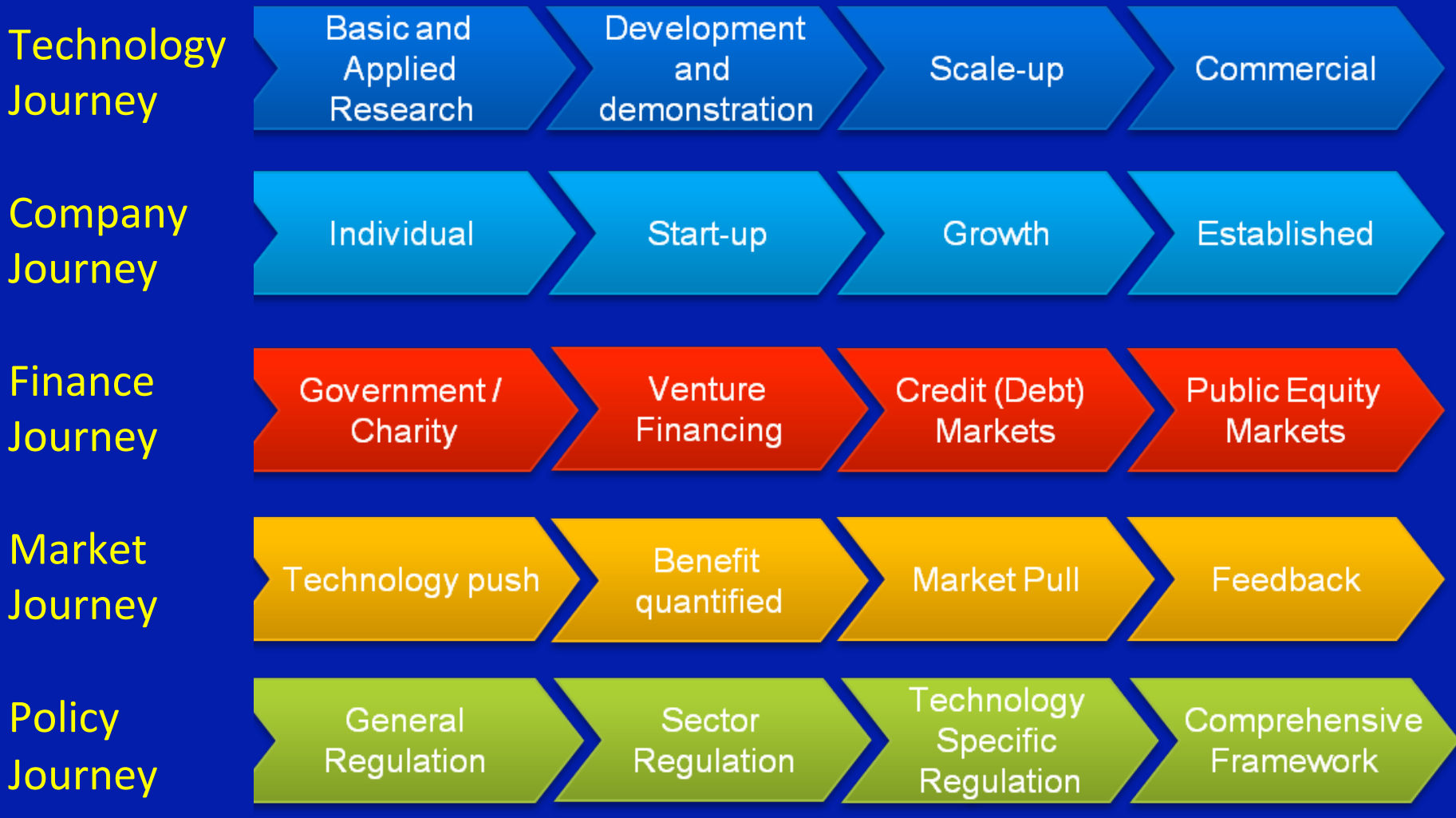
An "Innovation Cooperation" Perspective

- Must focus on both availability and implementability of technologies – an "innovation" perspective
- Need technology innovation capabilities that are shaped by local needs and rooted in local context to meet developmental AND climate challenges
- Need technology development & diffusion capacity in developing countries in order to meet these challenges effectively and efficiently in the long term

Elements of the innovation process



Key journeys for successful innovation:



Sagar et al., 2009, Sagar and BNEF 2010

Many activities may be necessary:

- TECHNOLOGY: Help improve the technology development process to ensure the availability of technologies for local markets
- COMPANY: Support entrepreneurial as well as existing ventures to succeed in the business of climate innovation
- FINANCE: Facilitate the expansion of financing options for climate innovation by both helping deepen the pool of funds available and enhance access for firms
- MARKETS: Promote demand through creation and strengthening of markets for climate technologies
- POLICY/REGULATION: Ensure that the policy/regulatory framework supports climate innovation
- COORDINATION: Streamline the innovation process through bird's-eye view of various activities

Sagar et al., 2009, Sagar and BNEF 2010

"Flexible specialization"?

- Innovation gaps will differ from technology to technology and country to country (but gaps do exist on multiple journeys)
  - √ Cannot use "one shoe fits all" approach – *flexibility in approach is key*
- Local and intl. engagement with a range of orgns./experts
  - √ Technology and product development (start-ups, large firms, academia..) Business and market development (incubation, policy devt.)
  - √ Finance (banks, VCs)
  - √ Domain knowledge experts (policy, regulations, tech analysts)
  - √ Policy makers
- Focus on scalable opportunities and development co-benefits

Need capacity to identify technological opportunities and innovation gaps; coordinate, facilitate, and support existing actors and networks to address these innovation gaps

=> need (and opportunity) for broadening cooperation agenda

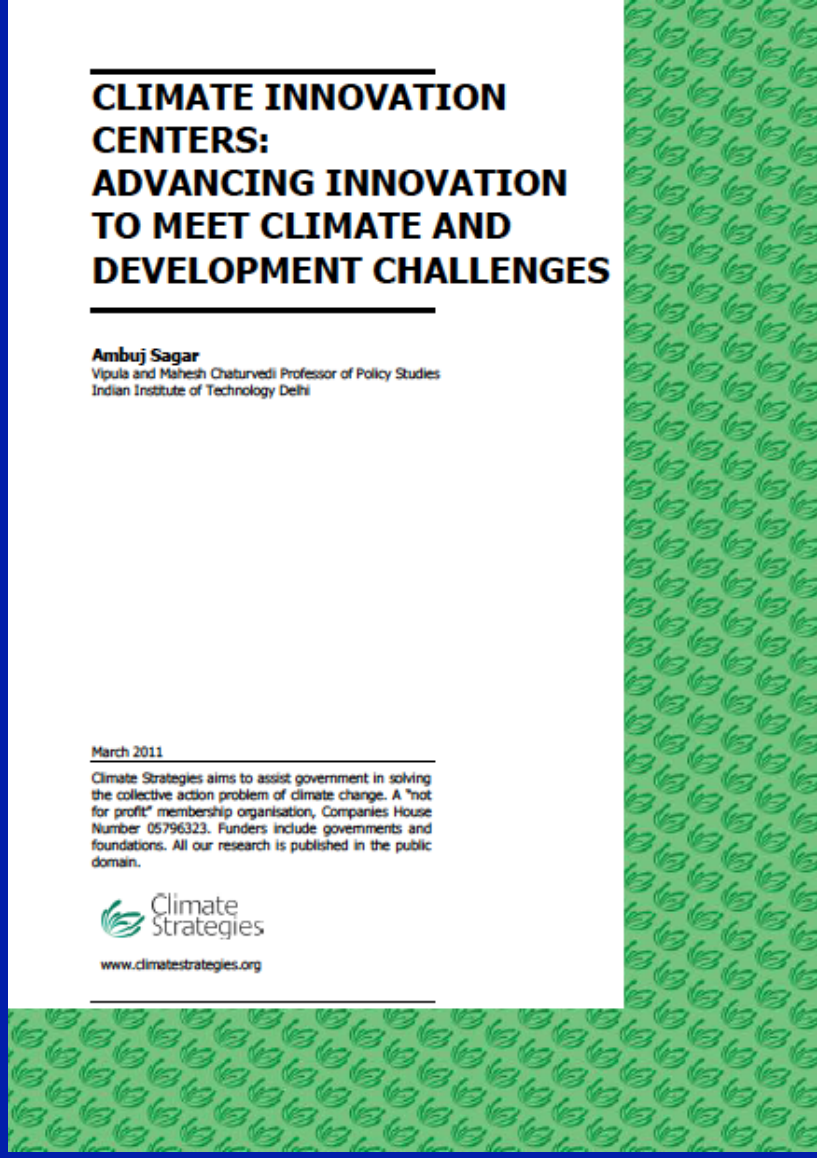
Bureau of Energy Efficiency (India) as "system operator"

- Bachat Lamp Yojana (CFLs dissemination)
  - ✓ Technology: CFL use monitor (Competitive RFP)
  - ✓ Production and delivery chains (partner with existing CFL suppliers)
  - ✓ Finance (CDM)
  - ✓ Policy evolution (driven by BEE)
- Appliance standards and labelling
  - ✓ Technology: Selected appliance categories
  - ✓ Policy evolution (driven by BEE) – voluntary participation -> mandatory participation -> performance standards
  - ✓ Stakeholder participation (industry, regulatory bodies, consumers…)
  - ✓ Phased approach: developing markets (labelling and consumer awareness), technology forcing (performance standards), technology development (super-energy-efficient appliance program)

Chaudhary et al., 2012

In summary:

- Technology offers great potential in simultaneously meeting climate and development challenges faced by energy sector
- Different collaborative R&D models may be most approprite for different technologies
- But realizing potential of technology requires attention to full innovation cycle
- Limited innovation capabilities in developing countries – need technical, analytical, and institutional capacity building to overcome limitations
- If done right, short-term and long-term gains on climate mitigation and adaptation; meeting human needs; sustainable development; and job creation.



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Comments/suggestions:

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