



**IREK**

Innovation and Renewable Electrification in Kenya

# Infrastructure projects and sustainable industrialisation: renewable electrification projects in Africa

African Centre for Technology Studies

**ACTS**

Knowledge for Better Livelihoods

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# What?

## **Impact of African Infrastructure Projects**

- Can African contractors benefit?
- What are the linkages with industrialisation?

Present findings from an existing project (IREK)

*And*

Thinking that going into a new project proposal

# Projects and sustainable industrialisation

- Increasing focus on large scale electrification infrastructure projects (increase energy access)
- Return to industrial policy and questions of sustainable industrialisation (SDG 9)
- Relevant academic theories:
  - Hirschman and mega projects as ‘trait making’ vs small projects as ‘trait taking’ and linkages work
  - Rosenstein-Rodan and ‘big push’ theory
  - Scale up – Geels, Kemp
  - Kaplinsky and inclusive innovation
  - ‘New industrial policy’ – Rodrik et al



Source: <http://renews.biz/105033/feet-up-for-vestas-in-kenya/>;

# Conceptual basis for IREK

## Projects literature

- New Public Management and making public sector more efficient through PPPs, PFIs and project management approaches (Brinkerhoff and Brinkerhoff, 2015)
- Brady and Hobday (2011) distinguish between five types of project management style
- Davis and Brady (2016) state that “dynamic capabilities at the strategic level of the firm decide how to create and mobilise project capabilities to support ambidexterity” at operational levels

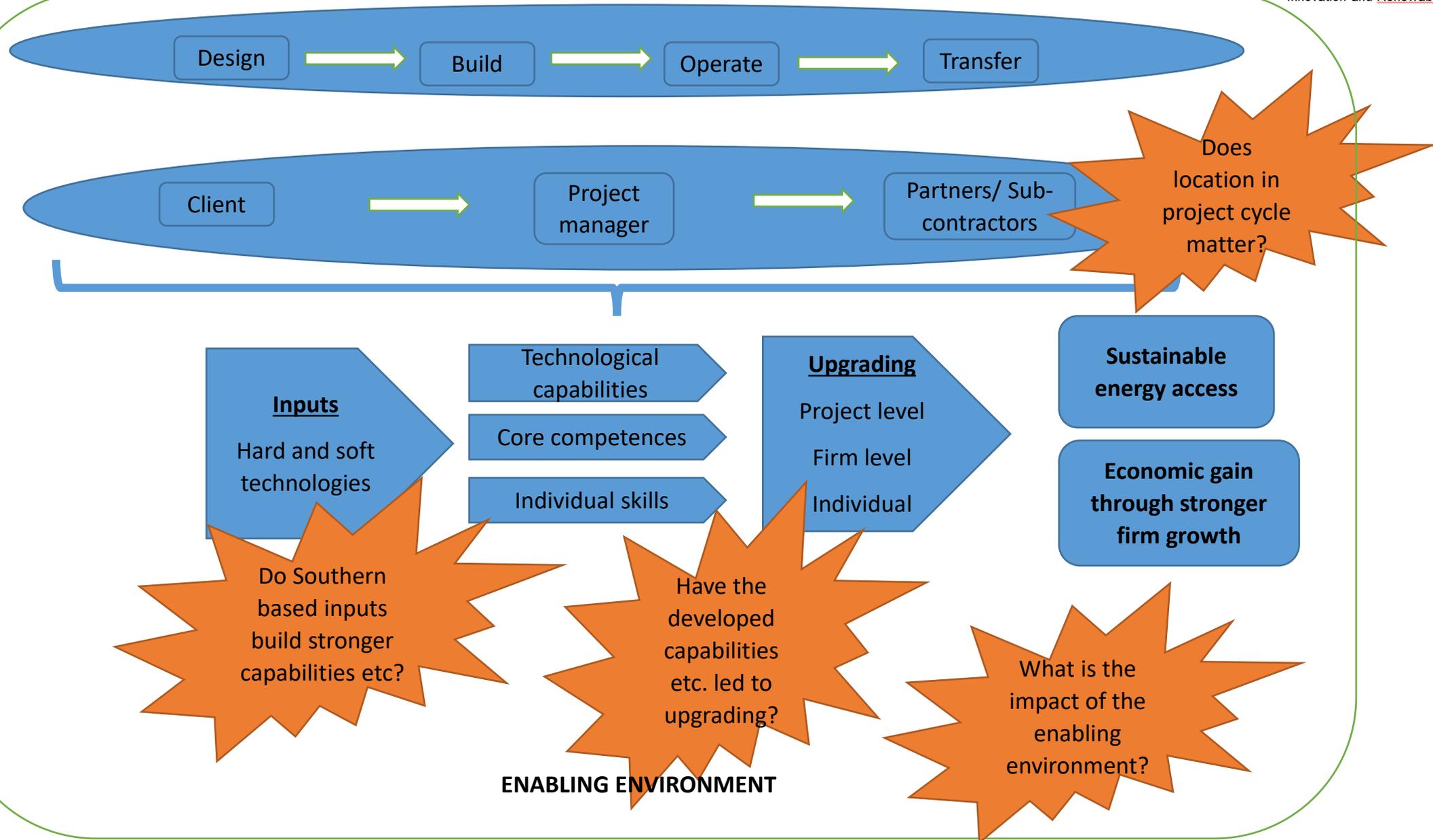
## Technological capabilities literature

- Bell (2009) *innovation capabilities* or the ability to recognize the need for different forms of technology that are not currently in use in the firm Vs. *production capabilities* – routine skills and technology embedded in firms
- Prahalad and Hamel (1990): firm’s ‘core competences’ or the skills needed to ‘coordinate diverse production skills and integrate multiple streams of technologies’

## Upgrading literature

- Kaplinsky and Morris (2001) Product, Process functional and chain upgrading
- Measuring upgrading at micro/ firm level
  - Is upgrading evident? (what type)
  - How is upgrading happening? (value added at each part of the chain e.g. Barbie doll/ iphone production elements plus mapping of the chain or business function analysis – Sturgeon et al, 2012)

# Conceptual framework



# What are we measuring?

<b>Micro level inputs</b>	Individual skills	<ul style="list-style-type: none"> <li>• Government minimum standards</li> <li>• Additional ‘on the job’ skills identified</li> <li>• Training opportunities</li> </ul>
<b>Meso level inputs</b>	Technological capabilities	<ul style="list-style-type: none"> <li>• New physical technologies (e.g. new piece of testing equipment) introduced into the firm that results in new business opportunities at any stage in the project cycle</li> <li>• New knowledge introduced into the firm that results in new business opportunity at any stage in the project cycle (e.g. recruitment of a staff member with EPC experience or training of existing staff in how to install a specific new inverter design)</li> </ul>
	Core competences	<ul style="list-style-type: none"> <li>• Function as an EPC contractor</li> <li>• Evidence of ability to leverage new partnerships on the back of previous work</li> </ul>
<b>Outcomes</b>	Upgrading	<ul style="list-style-type: none"> <li>• Process upgrading (e.g. increased efficiency of installation process – speed/ manpower requirement)</li> <li>• Product upgrading (e.g. from using Chinese to German inverters)</li> <li>• Functional upgrading (e.g. move from being a contractor to doing full EPC)</li> <li>• Chain upgrading (e.g. move from installing solar heaters to installing mini-grid systems)</li> </ul>

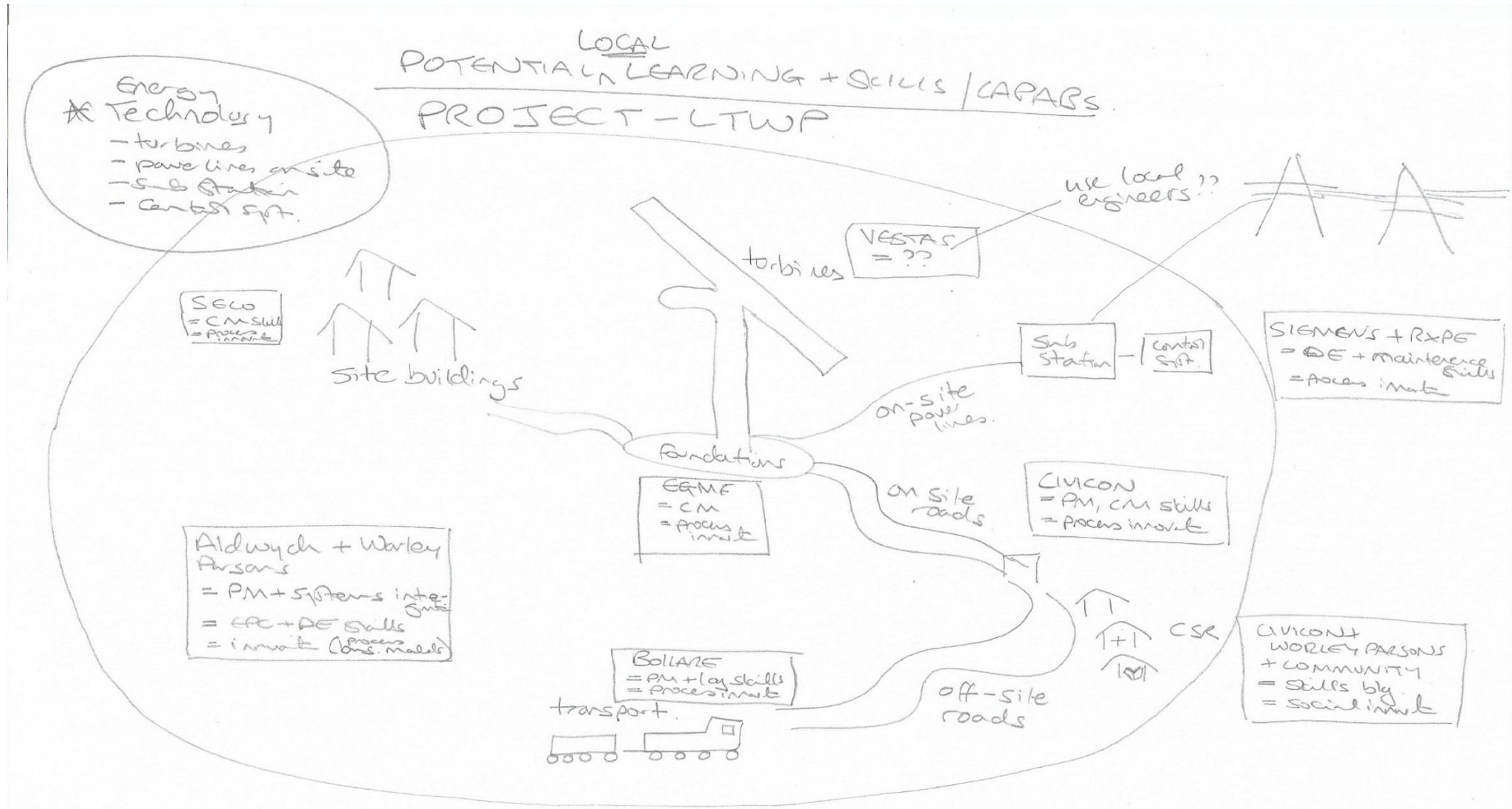
# Case study approach

	Large scale (>100KWp)	Small scale (<100KWp)
Solar on grid	Garissa (50mwp, Chinese technology)	SOS children's village Mombasa (60kwp; German technology)
Solar off grid		Kitonyoni solar project by E4D at Uni of Southampton (13.5kwp; EU technology)
Wind on grid	Turkana (300mwp; Dutch technology)	

Ideally we would have like to have included a large scale solar off-grid and a small scale wind on-grid project to be studied as well, unfortunately, we have found it difficult to identify a suitable project candidate in each of these two categories.

	Garissa
<b>Dates</b>	Agreement with China signed 2013; Construction started Jan. 2017; Commissioned Oct. 2018
<b>Size/ Type</b>	55 megawatt, solar
<b>Employment numbers</b>	At peak construction: 350 workers (100 unskilled general construction work; 250 skilled installing panels). Of 250 skilled 100 from Garissa environs. In addition, 80-90 of the 250 were Chinese nationals. O&M: 5 Kenyan nationals (although appear to only be 2 onsite at any one time) and 4 Chinese. Local Kenyan workers will be employed to clean panels every 3 months.
<b>Project owner</b>	Rural Electrification and Renewable Energy Corporation (REREC), formerly known as Rural Electrification Agency (REA) Have 25 year power purchase agreement with Kenya Power at 5KShs/KWh
<b>Financing</b>	EXIM Bank of China totalling Kshs. 13.5 billion
<b>Design and engineering</b>	IT Electronics Eleventh Design & Research Institute Scientific & Technological Engineering Corp Ltd (China)
<b>Construction</b>	China Jiangxi Corporation for International Economic and Technical Cooperation Company Maknes Consulting (Kenya) was site agent
<b>Operation</b>	Kengen (on behalf of REREC) with Chinese technical support for 2 years
<b>Maintenance</b>	Kengen/ REA with Chinese technical support for 2 years
<b>Other</b>	Primary school and dispensary amongst other things built as part of CSR activities. Kenyan (Garissa based) contractor to build borehole for community. Kenyan transport firm (Landmark) transported tech from Mombasa port to site.

# Potential learning at LTWP



# Major findings

- 1. Local companies benefited in all projects but only business 'unusual' in small scale projects**
  - Kenya develops mini-grid EPC firms in 3 years
  - PM activity in all firms at large scale was 'normal' practice – but huge investment in kit relatively
- 2. Job creation opportunities but (a) short term and (b) path dependency towards certain technologies reduces opportunities**
  - Solar PV dominance creates a specific skill set available
  - No need to only employ foreign engineers
  - Construction vs. O&M job opportunities
- 3. Projects do present opportunities for trait making and scale up but not at large scale**
  - Functional upgrading has taken place
  - New partnerships and alliances
  - Lock in of local firms involved in large scale projects – little innovation



# Directive policy instruments

- Kenya has local content rules now (new Energy Act) but do they go far enough?
- Project format makes a difference
  - EPC vs EPCM for more local contractor involvement
- Local ownership makes a difference



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# Projects and sustainable industrialisation

Jury still out... need more research

Asante sana!

Tak!

Thanks!

Comments, questions, ideas pls...