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Design of village scale solar power supply in Kenya as a creative learning process

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Solar cell technology well known in Kenya; - interest to develop new models for implementation and use

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Examples to study in India

The action research process through the Solar Transitions project (the case)

Village scale solar systems for development. Transfer of social and technological innovations between India and Kenya

SOLAR TRANSITIONS, 2009-2013

Part 1: Research on implementation and use of village scale solar systems

Part 2: Transfer and adaptation of knowledge through action research

Led by the Department of Sociology and Human Geography, University of Oslo.

9 other participants from different parts of the world – social scientists and technology practitioners (SUM, TERI, CAMCO, ACTS, IFZ, etc.)

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Main argument: A socio-technical design/innovation process can fruitfully be organized as an international, transdisciplinary action research effort with concrete and committing, but at the same time open goals, involving participants with strong engagement, complementary backgrounds and a humble attitude.

AND: Build on existing interests, competences, skills, visions and systems. AND: Facilitate learning from existing efforts, across geographical contexts.

BUT: Others have to find their own way.

Outline:

- The theoretical background
- The findings/experiences:
  - Emerging goals
  - Emerging phases
  - Emerging designs
  - Emerging insights
- Some reflections on the characteristics of our «experiment»/ systems innovation process

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Analytical framework – emergence of alternative socio-technical systems

- The understanding of technological change as a social process including the co-creation and integration of the social and the technological dimensions in the emergence of alternative socio-technical systems (Hoogma et al. 2002, Rohracher 2008, Raven 2008)
- Similarities with other strategies to explore and create socio-technical change, incl.transitions management, sustainability experiments, and action research activities (Loorbach 2007, Reason and Bradbury 2008, Berkhout et al. 2010)

- Socio-technical system-elements at different geographical scales and levels of analysis
- De-contextualisation and contextualisation of knowledge in transfer of s-t designs between places

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The research in India as a starting point

- Popular and beneficial electricity
- Problems of payment and over-use
- Expansion needed, but difficult
- Economic sustainability lacking
- Little room for maneuver for the local operators

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Emerging phases in the action research in Kenya:

Planning, negotiation and pondering about the pilot project!

- A place that suits the model or vise versa?
- Getting to know the Kenyan pilot village and its energy needs (survey, interviews, focus groups, meetings)
- A process of developing a suitable model of a solar power supply system, including selection of services to offer, economic design/business model, operational and institutional arrangements
- Funding constraints - extra challenges

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Ikisaya village, Kitui County, Kenya

- Dryland area, agro-pastoralists
- Poverty level high, serious droughts during the last 3-4 years, high level of economic stress
- Lighting expenditures: Kerosene and dry cell batteries, 350 Ksh per month. Mobile charging 115 Ksh
- Two primary schools, sub-chiefs office, 12-15 small shops/kiosks

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Messages from the community members and leaders

- CBO to operate as a business
- Use the surplus for expansion and general improvement
- Local people to be trained as technical experts to get jobs
- Lighting high priority
- Charging of mobile phones and portable batteries
- Photocopying, typing and printing will save time and money.
- Community TV. Children to be exposed to the outside world – see the president speak on television
- Additional wishes: Fridges, water pumping, juice making, micro grid……..

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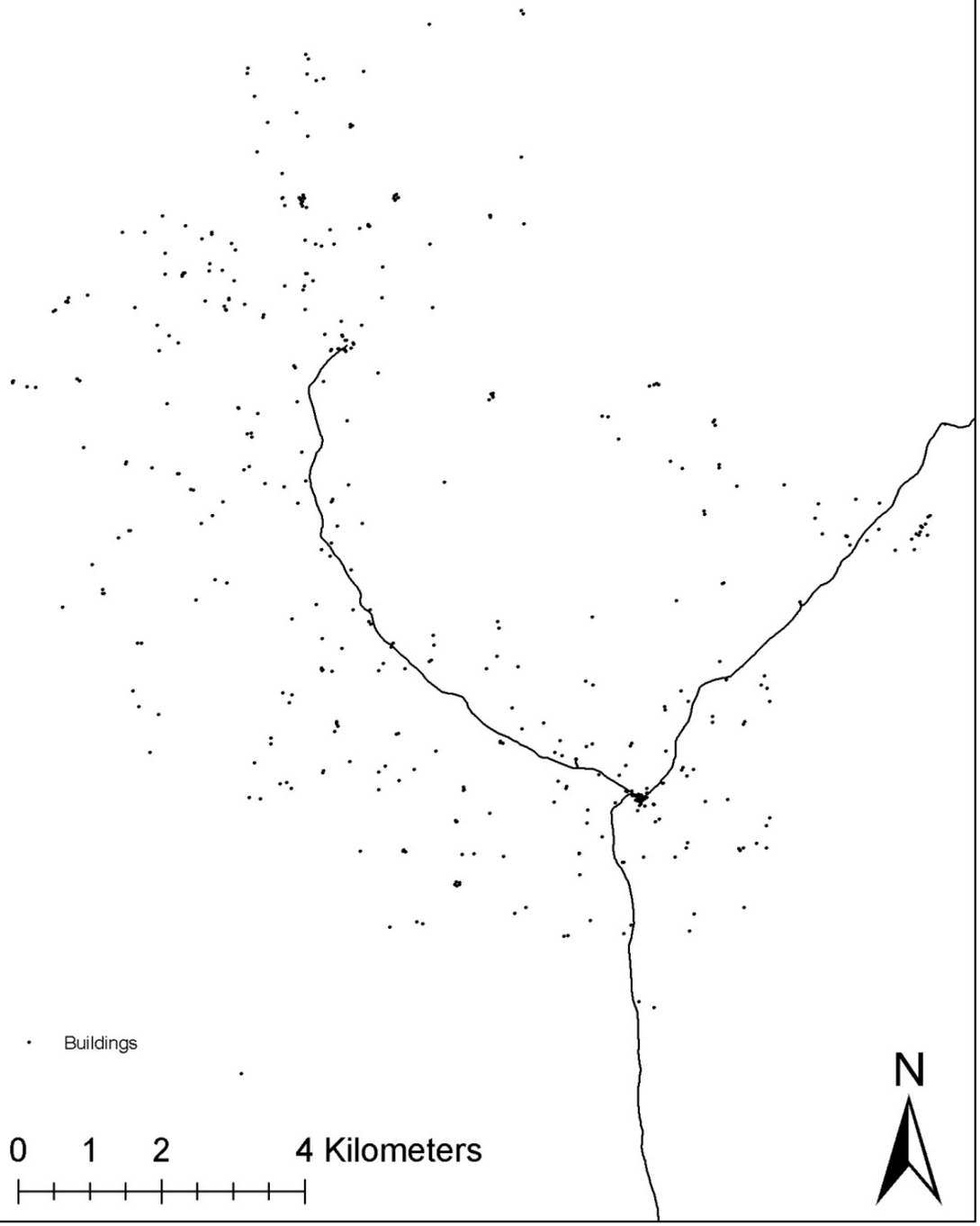
Emerging goals for the design (aspects that we try to address)

- How can local, village scale, off-grid solar power supply be socially organized and otherwise designed in ways that give
  - Broad access (low entry costs), flexibility in use
  - Economic sustainability/viability through services that people want to prioritize and can pay for, saving for battery replacement
  - Well functioning operations and maintenance, good book-keeping system
  - Gender and context sensitive implementation and operation
  - Modest investment level
  - Replicable system

Ikisaya market and surroundings



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Emerging socio-technical designs: From the vision of a solar mini-grid to the Ikisaya Energy Centre

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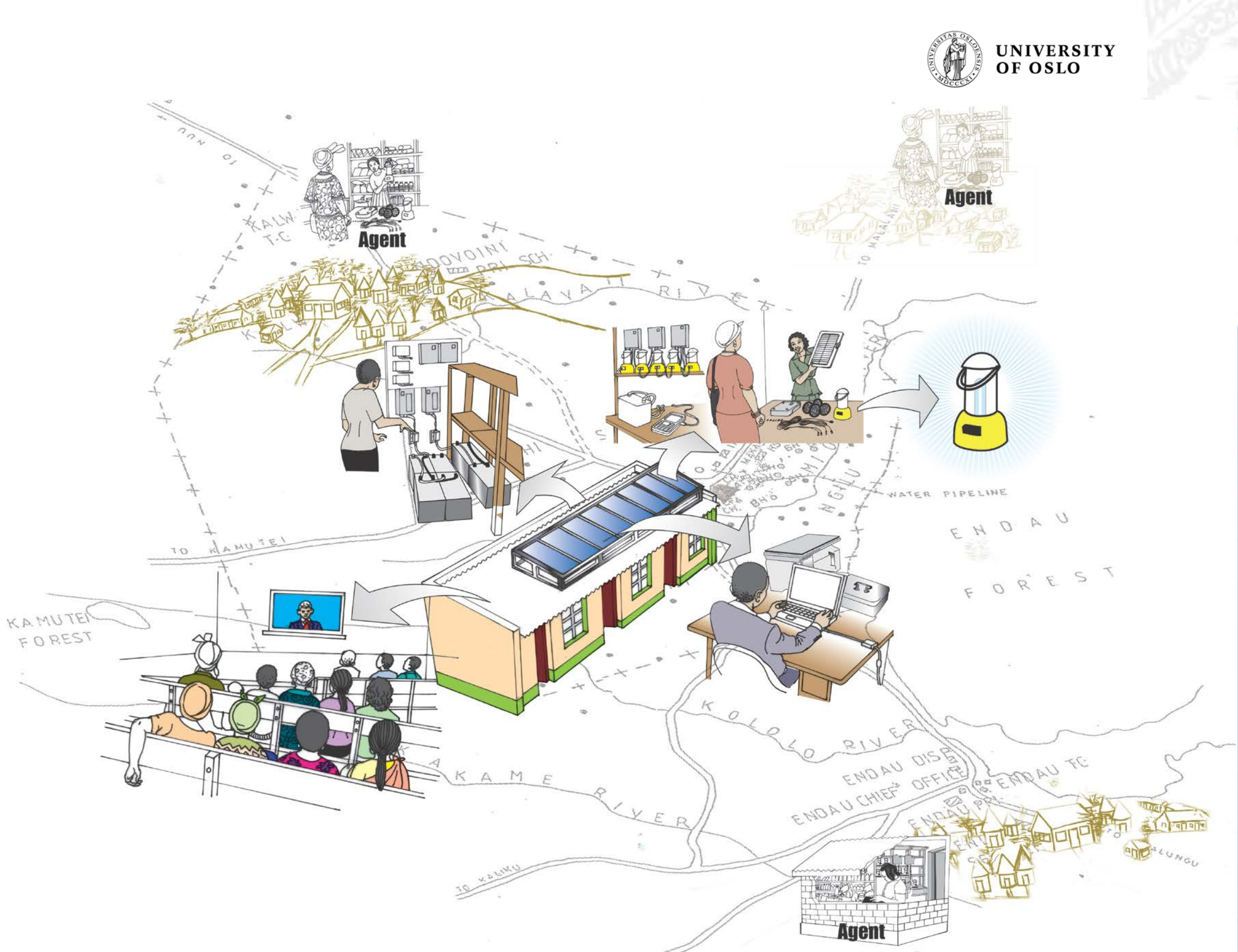

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CASH BOOK (CENTRE MANAGER)
ACCOUNTANT'S ROLE
BANKING RECONCILIATION
IT, TV/VIDEO SHOWS & ROOM HIRE
ENERGY CENTRE
OPERATING HOURS
WEEKENDS (SATURDAY)
TV/VIDEO SHOWS
CASH HANDOVER SHEET
LANTERN STOCK BOOK
STOCK CARDS
RETAIL SHOP STOCK CARD
TV/VIDEO SHOW REGISTER BOOK
ROOM HIRE REGISTER
CASH HANDOVER SHEET RETAIL SHOP

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IKISAYA ENERGY CENTRE, KENYA

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A local «socio-technical system» in Ikisaya village

Some of the physical/technical elements:

- 2,5 kWp capacity solar PV system
- Equipment for the services offered in the centre Building, furniture, fence

Some of the non-technical/social elements:

- A diversity of services offered, four trained staff members, the book-keeping system, the operational rules and routines, the institutional arrangement, different groups of customers

Some of the external elements:

- The international solar PV market, importation rules, suppliers practices, national policies, the ways in which solar PV is diffusing in Kenya

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Changes in knowledge and ideas locally

- Technical concepts
  - Installed capacity, battery replacement
  - Charging regulator, inverter
  - Deep discharging
- Organisational concepts:
  - Annual general meeting
  - Board, election
  - By-laws
- Business concepts
  - Customer management
  - Revenue, banking routines, saving
  - Maintenance and expansion
  - Equipment suppliers

- Motivation
- Gender roles
- Experience, creativity
- Leadership, trust
- Economic insentives
- Control mechanisms

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Learning through practice

- The design process has continued after implementation, led by the local staff
  - The agent system
  - Price adjustments
  - Ways of explaining to the customers
  - Another woman trained by the staff on IT, charging and book-keeping
- Adapting the system to the practices that people develop, but also implementing necessary rules
- Working hard towards economically viable operation

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Emerging insights

- The importance of the trained individuals
- Anticipation of people's priorities is difficult, even if planning with them, doing interviews, etc.
- Understanding of the local context is nevertheless crucial for such an action research/innovation process
- Significant changes should be allowed to happen after the practical implementation of a project

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Characteristics of the socio-technical innovation and learning process

- Learning by doing research together and solving a practical task together, learning by trying and failing, by having fun together, and by disagreeing...
- Social science research feeding directly into social change, but difficult to separate out its specific impact (good sign of “co-creation”)
- The practitioners’ contributions crucial
- Contrast between the big visions and the necessity of struggling with the details
- Complex choices, uncertainty, concerns, personal journeys

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A fruitful way of creating «sustainability experiments»?

- A few glimpses have been given into a comprehensive process
- An example of how a process of planned system innovation/socio-technical systems design can unfold
- Dynamic process of mutual learning, transfer and adaptation between countries and participants – a “creative learning process”
- Not only a learning process, but application of strong and complementary background knowledge, including the knowledge and experiences of the local community members
- Embedding in local and national contexts central
- Encouraging to see extended effects in Kenya