CIREG

Climate Information for Integrated Renewable Electricity Generation

WP 5: Local case studies & Demonstrator

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ERA4CS European Research Area for Climate Services

JPI Climate

Review of earlier studies 1

Africa's Major Energy Trends at a glance:

- Africa is home to the largest unelectrified population in the world (mostly rural), with about 600 million people lacking access, expected to reach 700 million by 2030 (UNEP, 2015).
- Electricity demand vs. supply imbalance (population growth)
- Spatial and socio-economic inequalities in access, reliability & affordability (rural vs urban; affluent vs impoverished)
- Growing consensus that delivering these services requires a combination of decentralised and centralised approaches (complementarity of off-grid solutions, including mini-grids and stand-alone solutions + centralised grid-extension efforts)
- For West Africa, mini-hydro options could provide up to 70% of rural electricity (IRENA, 2015)

CIREG's target basins

Volta River basin (CS3, CS4)

Niger River basin (CS2)

Mono River basin
Hybrid REG (CS1)

Review of earlier studies 2

- New electricity business models are taking root but are faced with challenges:
  - In some WA countries (e.g., Ghana and Nigeria), rural electrification agencies and funds were set up, but the funds still depend on budgetary support and developmental aid (in addition to revenues)
  - Handing out concessions to professional electricity companies, but could not attract investors (e.g. Senegal)
- Most electricity in suburban and rural Africa is set up and managed either under schemes of development cooperation by public utilities or in (individual-driven) Public Private Partnerships, making it difficult to negotiate establishing solar, wind or micro-hydro systems by small private or communal initiatives, with public utilities
- Investment & management challenges (connections, electric metering, user practices of local population/illegality)

Knowledge gap

"*all lifestyle change that electricity brings, accompanying cultural, moral, symbolic, and political shifts need to be understood more completely*" (Strauss et al., 2013: 26).

- Infrastructures are key managing populations and their welfare (Gupta 2015).
- Field of **energy humanities**: studies on access to energy, energy use patterns, cultural, political & social changes caused by new energy systems
- Mostly neglected/marginalised in technical assessments

➢ That implies electricity's **dialectical relationship** to social infrastructure and political institutions

ZEF's tasks

- **Review of current energy supply (ZEF, DTU)**
  - ✓ Review of legal and public utility documents, academic studies and media reports
  - ✓ Transect walks with photo documentation
  - ✓ Participant observation and mapping of real access to energy
  - ✓ Expert interviews
- Objective : social stratification/ spatial analysis of access

- **Review of Business models (ZEF)**
  - ✓ Survey among small and medium entrepreneurs with semi-structured interviews

- **Accompanying the establishment of the REG demonstrator** (with commercial partner, PIK, VUB, SEI)
  - ✓ Ethnographic case studies in four locations (rural/urban)

- **Investigation and evaluation of local socio-economic effects** (with commercial partner)
  - ✓ Semi-structured interviews with customers of public utilities and other energy users
  - ✓ Analysis of the real cost of energy and affordability
  - ✓ Evaluation of social-economic effects of REG

Table 1 Guiding selection criteria for the final selection of the four case studies (two rural and two sub-urban locations)

Selection criteria	**Rural community**	**Sub-urban area** (Quarter of a middle-size town of up to 200.000 inhabitants)
No electrification	**Case study/ Site 1** Ethnography & Survey Evaluation of REG demonstrator	**Case study/ Site 2** Ethnography & Survey
On-going electrification	Review of project reports	**Case study/ Site 3** Ethnography & Survey
Electricity available	Review of project reports and studies	**Case study/ Site 4** Ethnography & Survey

Tentative roadmap

2018

- Oct: Early contacts with RE entrepreneurs and authorities' representatives (mainly in Niger and Togo) (RC); discussion of locations for Case studies 2, 3 and 4 with CIREG partners
- Nov-Dec: Focused studies on areas of interest for the Case studies

2019

- First four months: Ethnography and Surveys for Case studies 1 (REG demo location, Togo), 3 (Burkina or Niger), 4 (Ghana)
- Late spring-summer: Analysis of collected data and presentation of first results to conferences; WP5 mid-term report
- Autumn: Ethnography and Surveys for Case study 2 (Niger or Burkina) (RC) and return to REG demo (Case study 1) for study of ongoing electrification

2020 (to to revised)

- First half: Data analysis, article writing and submission, presentation of results at conferences
- Autumn: short return to Togo to evaluate implementation of REG demo (RC)
- Winter: Final CIREG report writing

Quantitative parameters to collect

Contextual factor	Variable	Proxy
population density	population density	number of inhabitants per km2 built-up area
population growth	population growth	total population growth up to the year 2025 [%]
property rate	property rate	property rate [%]
economic structure	forestry and agriculture	earners in forestry and agriculture [%]
	industry	earners in industry [%]
	commerce and services	earners in commerce and services [%]
economic strength	tax income	municipal tax income from households [$]
unemployment	unemployment	unemployment rate [%]
access to electricity	access to electricity	access to electricity [%]
		hours of electricity per day [h/d]
		households connected to electricity grid [%]
use of energy	energy mix	energy sources used [% of each]
energy subsidies	energy subsidies	energy subsidies for each source [$ of each]
National and Rural Electrification Plan		Short-term and long-term energy access target (in %)
		Document title of national and rural electrification plan
Role of DRE in National Electrification Plan		Document title of national DRE plan
		Responsible institution
		Short-term and long-term DRE generation target (in %)
		Investment plan (in million USD)
		DRE technologies (qualitative parameter)
		Policy instrument (qualitative parameter)
Consumer affordability of electricity	Affordabilty gap	Purchasing power

Consortium partners

Potsdam Institute for Climate Impact Research

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Center for Development Research
University of Bonn

National funding organizations

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