



Mini grids in Senegal

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Presentation outline

1. Mini grids in Senegal in context
2. Institutional structures
3. Rural electrification: Top Down and Bottom Up
4. Further challenges

1. Mini grids in Senegal in context

Key talking points

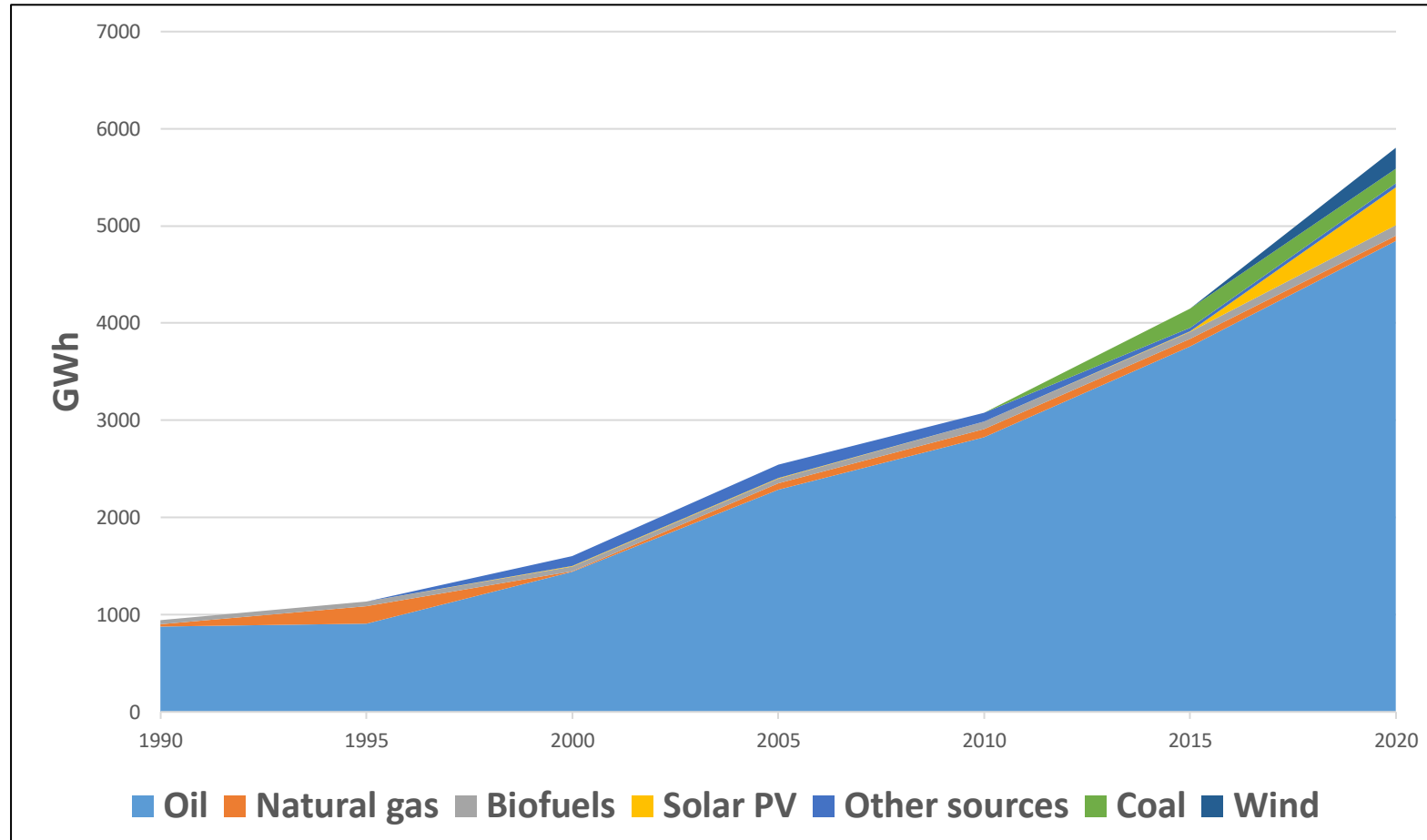
- Until recently Senegal seen as leader in the installation of mini grids in SSA.
- But mini grids play a small role in rural electrification in Senegal.
- DFIs have played a huge role in the sector (in procurement and project funding).
- Sector has attracted very little private investment.
- Lack of coordination between and within national institutions and DFIs.
- Rural electrification developed under various initiatives, not always well-aligned, often with competing priorities (Trompette et al 2022).
- Complex parallel and overlapping structures of governance in rural electrification.

Electricity in Senegal

- State-owned utility **Sénélec**: monopoly on transmission and distribution, just under half of generation. Partially liberalised electricity sector.
- Rest of generation from IPPs: sell exclusively to utility.
- Electricity access increased from 50% to 70% of population since 2006.
- Improvement in electricity security, affordability and access since 2012.
- Increase in installed generation from 647 MW (2014) to 1.5 GW (2023).
- Largely facilitated by procurement of utility-scale electricity from IPPs (thermal and renewable).
- 75% of electricity from (imported) heavy fuel oil/diesel.



Electricity generation by source, Senegal 1990-2020



Source: <https://www.iea.org/countries/senegal>

Senegal: electricity access in context

- Plan Sénégal Emergent (PSE) (approved 2014): obtain middle-income country status by 2035; target for renewables to meet 20% of power generation by 2017 (achieved end 2019); achieve universal access to electricity by 2025.
- Continued dependence on heavy fuel oil and diesel (volatile).
- Senegal has highest electricity tariffs in sub-Saharan Africa after Ghana.
- Heavily dependent on public subsidies.
- Considerable disparity between *urban* electrification rate of 94 per cent and a *rural* electrification rate of 44.5 per cent.
- Universal access target unlikely to be met.

Senegal: electricity access in context

- Approx 50% of population lives in urban centres/ larger rural habitations and connected to S n lec’s grid. 60% of electricity demand from Dakar region (20% of population) .
- Southern regions have lowest rates of electrification (except for Ziguinchor).
- Energy needs of highly dispersed rural population largely overlooked by S n lec (Diouf and Miezani 2021).
- Many poor communities either live a long way from the distribution grid or ‘under it’.
- ESMAP (2022): Approx 30% of population (17 million) could be served by mini grids. Based on existing data, Senegal had largest number of installed mini grids on the continent, 677 (ESMAP 2022:32).
- A further 1200 are planned, most third generation.
- But significant portion of installed projects presumed to be no longer be operational (data is lacking).
- Mini grids set to play a small role: National operational plan for universal electricity access by 2025 proposes that 7% of households without access will be electrified by PV mini-grids as compared to 32% by solar home systems.

2. Institutional structures

Electricity governance: institutions and processes

- Power sector liberalisation began 1998. Start of breakup of Sénélec monopoly.
 - i) creation of regulator (CSRE) responsible for establishing and verifying tariffs;
 - ii) creation of L'Agence Sénégalaise d'électrification rurale (ASER), an autonomous agency for rural electrification.
- Removal of Sénélec's right to distribute electricity in non-electrified areas and the transfer of responsibility to private sector operators under the coordination of ASER.
- Renewable Energy Law 2010. Objectives: increase RE generation to 20% of total installed capacity by 2017; reduce cost of electricity generation and tariff; increase energy security.
- **Sénélec, ASER and CSRE** are under the supervision of the **Ministry of Petrol and Energy**, which has overall responsibility for strategy and policy.

New Code de l'Électricité, July 2021

- End to Senelec's remaining monopoly.
- Introduces major institutional and legal changes, including:
- Unbundling of Senelec into a holding company and three autonomous subsidiaries for generation, transmission and distribution.
- Introduction of a new model of rural electrification (L'électrification rurale décentralisée, ERD) to replace ERIL. Aim to generate more private sector interest and economies of scale.
- Further reform in Feb 2023: sets conditions on self-generation of electricity for domestic, industrial, commercial or industrial use of below 1 MW in the case of solar PV, and 2 MW for other generation sources, as well as the sale of surplus electricity and its integration into the main grid (CRSE 2023).
- Potential game changer.

3. Rural electrification

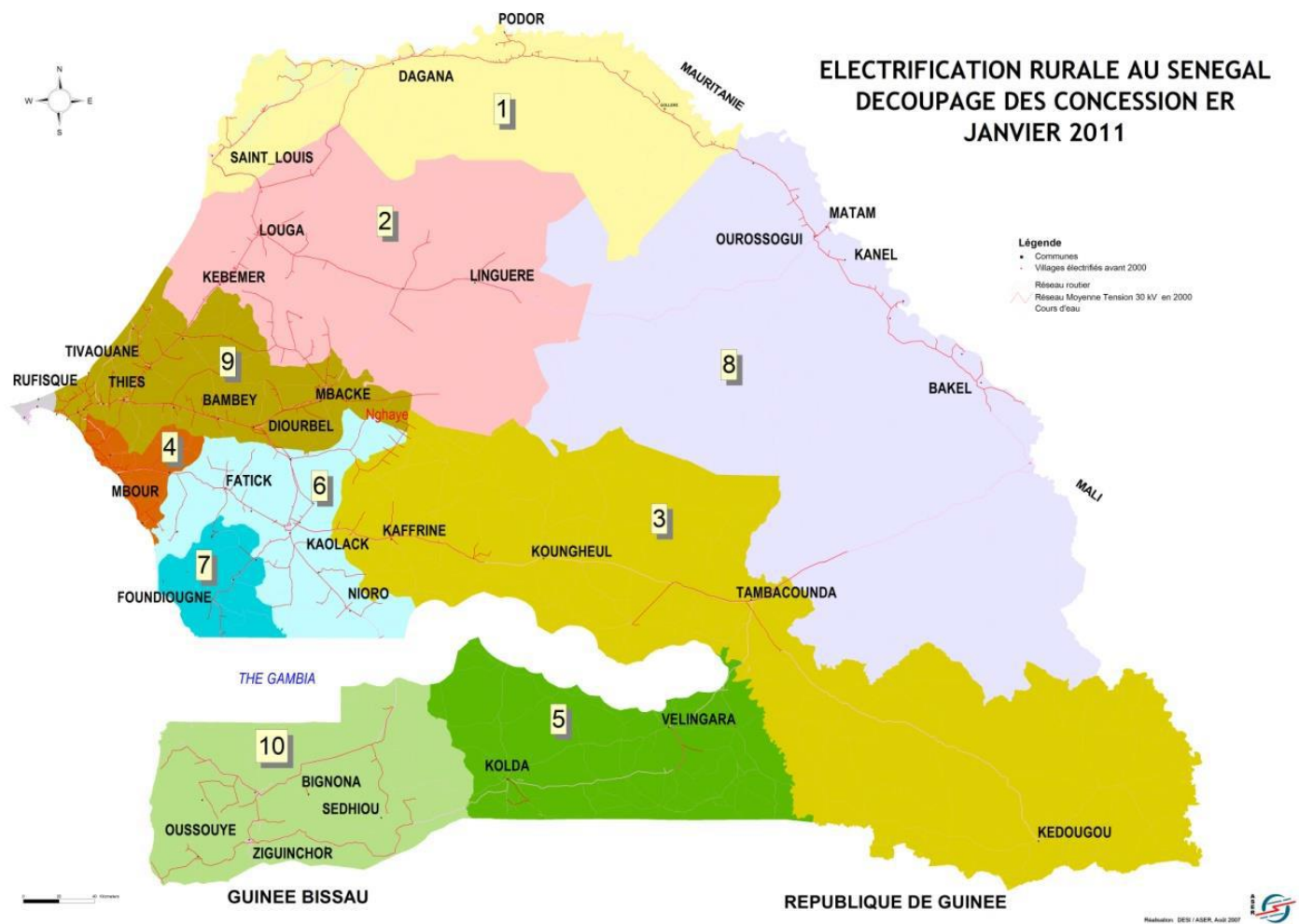
Rural electrification strategy: Top down and bottom up

- Senegal one of the first countries to pursue rural electrification on a significant scale through an area-based concession approach
- The rural electrification action plan (PASER) (2002) established two major concession programmes with aim of increasing rural electrification from 8% in 2000 to 62% by 2022 by encouraging private sector participation in off-grid and on-grid systems.
 1. Programme Prioritaire d'Electrification Rurale (PPER) and 2. L'Electrification Rurale d'Initiative Locale (ERIL).
- Both programmes are technology neutral.
- Both managed by ASER.
- Both heavily subsidised by government and/or multi-lateral or bi-lateral donors.
- The anticipated private sector investment these programmes were meant to encourage has not materialised.
- Neither have performed well for meeting rural electrification targets or resulted in significant deployment of mini grids (more mini grids installed under the ERIL programme than the PPER).

1. Top down: concession areas

- Ten large concession areas for rural electrification eventually set up by 2012.
- Bidding programme supported by DFIs and bi-lateral donors.
- International developers in JVs with Senegalese companies bid for concessions to construct mix of grid extension & off-grid electrification, to supply local populations using variety of technologies.
- Successful bidders based on greatest number of households they propose to supply.
- 25-year contract with CRSE, a 'predefined output-based subsidy' and further subsidy for the installation of renewable energy technologies.
- However, significant delays in awarding the concessions.
- Six concessionary areas allocated to private companies.
- Remaining four areas managed by S en elec due to lack of interest from private sector.
- Within its four concessionary areas, S en elec's strategy has been more about extending the grid than installing mini grids.

Concession areas



1.	Dagana-Podor-Saint-Louis
2.	Louga-Kebemer-Linguere
3.	Kaffrine-Tamba-Kedoudou
4.	Mbour
5.	Kolda-Vélingara
6.	Kaolack-Nioro- Fatick Gossas
7.	Foundiougne
8.	Matam-Bakel-KanelRanerou
9.	Rufisque-Thies-Tivaouane Bambe- DiourbelMbacke
10.	Ziguinchor -OussouyeBignona- Sédhiou;

Concession allocations

	Concessionary area	Company	Entry into force
1.	Dagana-Podor-Saint-Louis	Compagnie Maroco Sénégalaise d'Electricité (COMASEL)	2011
2.	Louga-Kebemer-Linguere	Compagnie Maroco Sénégalaise d'Electricité (COMASEL)	2012
3	Kaffrine-Tamba-Kedoudou	Energie Rurale Africaine (ERA). A JV between EDF (France) and Matforce (Senegal).	2014
4	Mbour	Groupement Sénégalais Coselec et les Câbleries (SCL) Energie Solutions : Steg International Services Mbour SCL	2015
5	Kolda-Vélingara	Groupement ENCO – ISOFOTON Maroc (Isufoton Spanish) (Enco-Senegalese subsidiary of a Senegalese company).	2015
6	Kaolack-Nioro- Fatick Gossas	Groupement ENCO – ISOFOTON Maroc (Isufoton Spanish) (Enco-Senegalese subsidiary of a Senegalese company)	2014
7	Foundiougne	Senelec	2018
8	Matam-Bakel-KanelRanerou	Senelec	2018
9	Rufisque-Thies-Tivaouane Bambey-Diourbel Mbacke	Sénélec	2018
10.	Ziguinchor -OussouyeBignona-Sédhiou;	Senelec	2018

Concession areas

- Concession areas differ widely in terms of size, geophysical characteristics, socio-economic development, infrastructure coverage and access to electricity.
- Largest concession, Kaffrine- Tambacounda- Kédougou, covers approximately 25 per cent of Senegal's landmass but includes some of the least densely populated areas of the country (ERA Senegal, n.d).
- Regardless of income, the regions with the lowest population densities have the lowest electrification rates, while the electricity concessions with higher population densities have attracted higher levels of private investment (Diouf and Miezán 2021:630).
- Overall collective target of 106,601 households for the six concessionaires, individual targets range from 11,800 to 19,000 households per area, none of which have been met thus far (RVO 2022:22).
- By December 2020, the six private concessionaires had only connected 46 per cent of the overall target of 106,601 households (IDA 2022:1).

Tariffs and grid arrival

- Concessionaires were able to charge cost reflective tariffs.
- This changed with tariff harmonisation process introduced in 2018.
- Tariff harmonisation within concessions led to a significant restructuring of the contracts.
- Concessionaires can apply for compensation from the Ministry of Finance via CRSE.
- But such a process can take a long time, far from straightforward and much harder for smaller companies who do not have the capital to wait (le Quotidien 2023).
- Legal requirement that mini-grid operators withdraw following the arrival of the main grid.
- Compensation for developers often provided, and/or the relocation of the project elsewhere.
- However, existing model acts as deterrent to many potential mini grid operators.

2. Bottom up: ERIL

- L'Electrification Rurale d'Initiative Locale (ERIL) introduced 2000 to address slow progress of rural electrification under the concessionaire system.
- Focusses on households in areas not covered by either the electricity distribution concessions or S n elec's network for next three years and where there are no plans for grid electrification.
- Allows small and medium-enterprises, NGOs, community, private or public sector actors to supply electricity to local communities through operation & maintenance of mini grids and SHSs.
- Until recently each ERIL could not exceed 200 households. This lifted with new 2021 electricity code/ ERD.
- ERIL projects also heavily subsidised. Can receive up to 80 per cent of subsidy by the Senegalese state or international donors (RECP, no date).
- Though designed to attract private sector investment, most ERIL projects to date have been entirely funded by bi-lateral or multi-lateral development institutions e.g ERSEN and ASER 300 (Etienne 2022).
- ERIL programme has made slow progress, though there is also lack of data (RVO 202).

Challenges to ERIL

- Weak mobilisation of private sector financing; absence of reliable data; poorly implemented management and M&E; malfunctioning of invertors and batteries due to extreme heat and dust; lack of technical oversight; lack of trained technical personnel; poor security; lack of education of users.
- As yet, no regulatory framework between local authorities and the institutional players involved in ERIL.
- Most projects installed under ERIL have therefore been operating without licences or tariff reviews since their inception.
- Multiple tariffs and billing systems between different ERIL operators, as well as from one project site to another, even if run by the same operator.
- Unlike in the concessions, ERIL project operators have no recourse to compensation for charging affordable tariffs to customers.
- Many customers have been unable, and/or reluctant to pay.

Further challenges

Demand and supply

- Some electricity consumers supplied by ERILs live in neighbouring villages to consumers supplied by concessionaires.
- Those supplied through ERILs often paying higher tariffs for less reliable and less continuous supply of electricity than those connected to grid by concessionaries. Reluctance to pay.
- Mismatch between mini grid project capacity and project demand, e.g ERIL's 200-household limit made it hard to generate sufficient customers for private sector to consider mini grids profitable.
- On the other hand, electricity demand from mini grid projects sometimes higher than project capacity, in which case, concessionaires/ERILs have to increase the capacity themselves and cover the cost of doing so.
- Lack of continuous reliable supply from projects, (approx 6 hours per day); much of the electricity consumption from ERIL mini grids has been directed to domestic needs rather than productive use. Reduced supply has led to mistrust of systems by users.

Rural livelihoods v. private sector logics

- Senegal has little intensive rural agriculture; rural population largely dependent on irregular seasonal income, e.g agricultural production, fishing and/or livestock (Trompette et al 2022).
- Income can be seriously affected by external events such as drought or fuel price hikes.
- Rural communities are not necessarily static; individuals may work in urban areas for months at a time or may go away during fishing seasons (Interview 8).
- During periods of low or no monetary income generation, people may depend on deferred payments for goods and services, payment in kind e.g local produce, and loans and transfers from family or community members, particularly those working in urban areas or abroad (interview 4).
- During periods of high-income e.g harvest, households may wish to clear all their debts at once and pay for services in advance.
- Irregular monetary income in rural areas means that a regular economic subscription to an energy service is therefore a “recurring expense that many households cannot cover” (Cholez and Trompette (2019:348)).

Governance issues

- Lack of transparent electricity planning, e.g mini grid operators can lack information on arrival of main grid.
- Lack of institutional oversight to direct and lead rural electrification; lack of donor coordination; no capitalising on lessons learned.
- Lack of coordination between key players e.g ANER, ASER, Sénélec.
- Conflict of interest between national institutions of electricity governance e.g Sénélec, ASER.
- Lack of data.

Conclusions

- Mini grids: a small part of rural electrification.
- Greater focus on the electricity grid and SHSs.
- Ambiguity of position of some parts of government towards mini-grid development.
- Significant financial, technical and other influence of DFIs. Questions of accountability?
- Inherent contradictions between private investors, and low-income often dispersed electricity consumers who will not meet expectations of profitability without large amounts of public subsidy.
- Future of mini grids: ERD?