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Too big to succeed? Africa's clean energy mega-projects

When it comes to deploying renewables for Africa's urgent need for a high-energy future, big is indeed beautiful -- and necessary. But history suggests that proposing massive coordinated infrastructure projects as quick fix/catch-all solutions to a country or region's energy challenges is far less straightforward than the alternative: fostering a market for utility-scale renewables. Supersizing project ambitions beyond the capacity limits of governments, utilities, and grids may not ultimately be the fastest or most cost-effective path to achieving infrastructure goals.

Clean energy mega-projects have a mixed track record

Egypt's 1650 MW Benban Solar Park and Morocco's Noor project sites -- as large as 580 MW and 2,000 MW cumulatively -- have successfully brought coordinated mega-projects online. However, previous efforts like Desertec, the Grand Inga Dam, and the African Renewable Energy Initiative (AREI) have been infamously stalled or cancelled for years. But this string of failures hasn't tempered ambitions, with a new wave of mega-project announcements such as the AfDB's Desert to Power program and a potential 5 GW PV project in Botswana and Namibia.

Mega-projects face inherent risks to progress and completion

Generally, large-scale infrastructure projects face inherent execution risks.

- ***Cost and timeline overruns.*** The sheer scale of mega-projects naturally results in divided power over meeting project milestones, leading to ballooning budgets and long delays in completion. This isn't exclusive to energy projects in Africa, one study[1] suggests that nine out of ten megaprojects (generally defined as projects costing $1 billion+) go over budget, eroding investor interest and confidence in their feasibility.

9 out of 10
share of mega-projects that are completed over budget and behind schedule[1]

- ***Changing market conditions.*** Design and construction timelines for big infrastructure projects typically span at least a decade, and can run thirty to forty years in some cases, during which macro-market conditions, leadership at stakeholder organizations, and political economy balances can change dramatically.[2]
- ***Multiple actors.*** Most mega-projects depend on pooled resources, and shared interests from a network of both public and private entities, often representing governments, land and resource owners, contractors, international investors, and local communities. When projects cross borders, which many mega-projects do, this further raises the complexity. Consensus building, aligning strategic interests, and stakeholder management can be highly challenging.[3,4]

- ***Perverse incentives.*** Because competition typically occurs at the sub-contractor level rather than at the contractor level, mega-project funding structures often systematically incentivize stakeholders to underestimate costs and timelines and overstate the benefits of a project to gain a competitive advantage when competing for work.[5,6]

A more favorable alternative. Because Africa's need for cheap and abundant industrial-scale energy is urgent, massive mega-projects that will likely take 10 years or more to reach fruition -- and be over-budget and behind schedule -- may not be the optimal path to bringing on the most additional generation capacity in the shortest amount of time.

Instead, developing a well-designed procurement market for cost-competitive utility-scale renewables, with competitive tendering, reasonable design, permitting, and construction timelines, regularly cadenced rounds of procurement, and a stable policy regime will likely bring more large-capacity projects online more rapidly and at lower cost than simply trying to concentrate ambitions, capital, and logistics into a single mega-project.

Fortunately, utility-scale renewables are modular by nature, so where it does make sense to concentrate or co-locate generation capacity, such as at Benban or Noor, a phased tendering approach to scale-up may be more effective than one single procurement for the whole amount. Other limiting factors, such as the capacity of the transmission and distribution network, may also favor a phased approach to scale-up in parallel, especially when phases of different projects can be sited strategically at nodes on the grid to avoid congestion.

Bottom Line: In most markets, the barriers to the timely success of mega-projects will likely overwhelm the benefits of large-scale coordination. A stable, well-designed procurement market for cost-competitive renewables will likely scale affordable, reliable industrial energy supply in Africa faster and at lower cost than mega-project plans that rely on insufficient institutional, financial, and technical capacity.

Endnotes

1. Bent Flyvbjerg, "What you should know about megaprojects and why: An overview," Project Management Journal, 2014, Volume 45, Number 2, pp. 6–19.
2. Keith Schneider (2017). Massive infrastructure projects are failing at unprecedented rates.
3. Puranam, Lundrigan, and Gil (2015). Why Mega-projects seem to fail.
4. Söderlund, Sankaran, and Biesenthal (2017). The Past and Present of Mega-projects.
5. Flyvbjerg, Bruzelius, and Rothengatter (2003). Mega-projects and risk: An anatomy of ambition.
6. Garemo, Matzinger, Palter (2015). Megaprojects: the good, the bad, and the better

TABLE 1: Sample of clean energy Mega-Projects in Africa

PROJECT	COUNTRY/ REGION	TECHNOLOGY	PLANNED CAPACITY (MW)	ESTIMATED COST (BILLION USD)	PROGRESS NOTES
Grand Inga Dam	D.R. Congo	Hydro	40,000	$80	1,775 MW completed, tendering for further capacity stalled since 2014
Desertec 1.0 and 2.0	Sahara Region	Solar PV, CSP	100,000	$400	Abandoned in 2013, 3.0 Initiative focused on building enabling environment for decarbonised power
African Renewable Energy Initiative (AREI)	African continent	Solar PV, Wind, Biomass	10,000	--	Some capacity building and coordination, but no direct project support
Desert to Power	Sahel Region	Solar PV	10,000	--	208 MW Yeleen project in Burkina Faso financed, increased pipeline
5GW Solar Project	Botswana and Namibia	Solar PV	5,000	--	Early discussion stages
Benban	Egypt	Solar PV	1,650	$2.1	Complete
Noor Solar Program	Morocco	Solar PV, CSP	2,000	~$7.5	582 MW Noor Ourzazate complex complete, tender and projects under development at Layounne, Boujdour, Tarfaya, and Ain Beni Mathar