Africa's industrial climate competitiveness

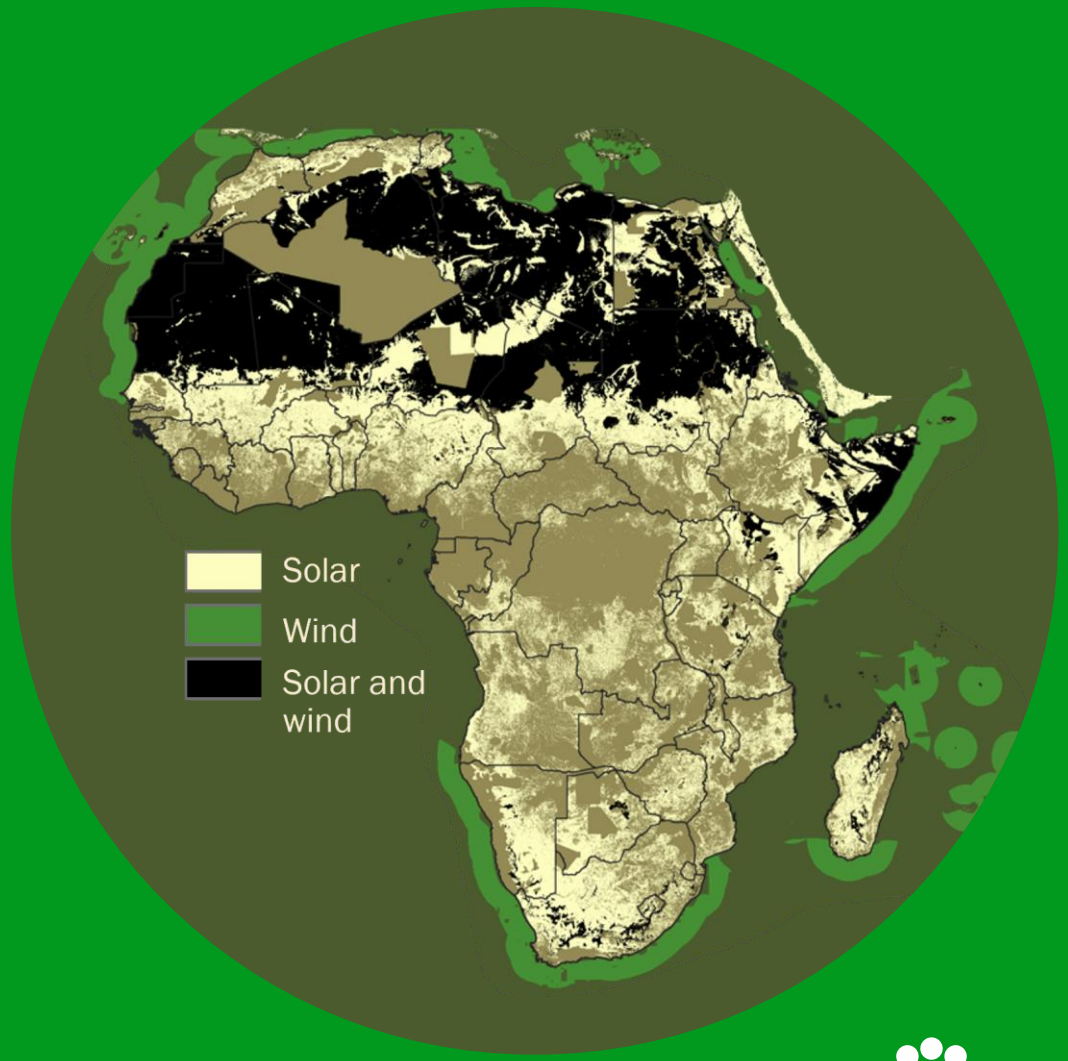
September 2023

Climate Action Platform Africa

Africa's renewable energy potential can drive green industrialisation

Africa's renewable energy potential is **50 times the world's** estimated electricity demand by 2040

Africa can provide energy access for all Africans by 2030. A renewable-focused path to this, can be **30% cheaper**, reducing emissions by ~80% from generation and **reducing emissions per MWh by more than 90%**. Yet it does need anchor demand to create a bankable investment case for the 40% higher upfront investment required.



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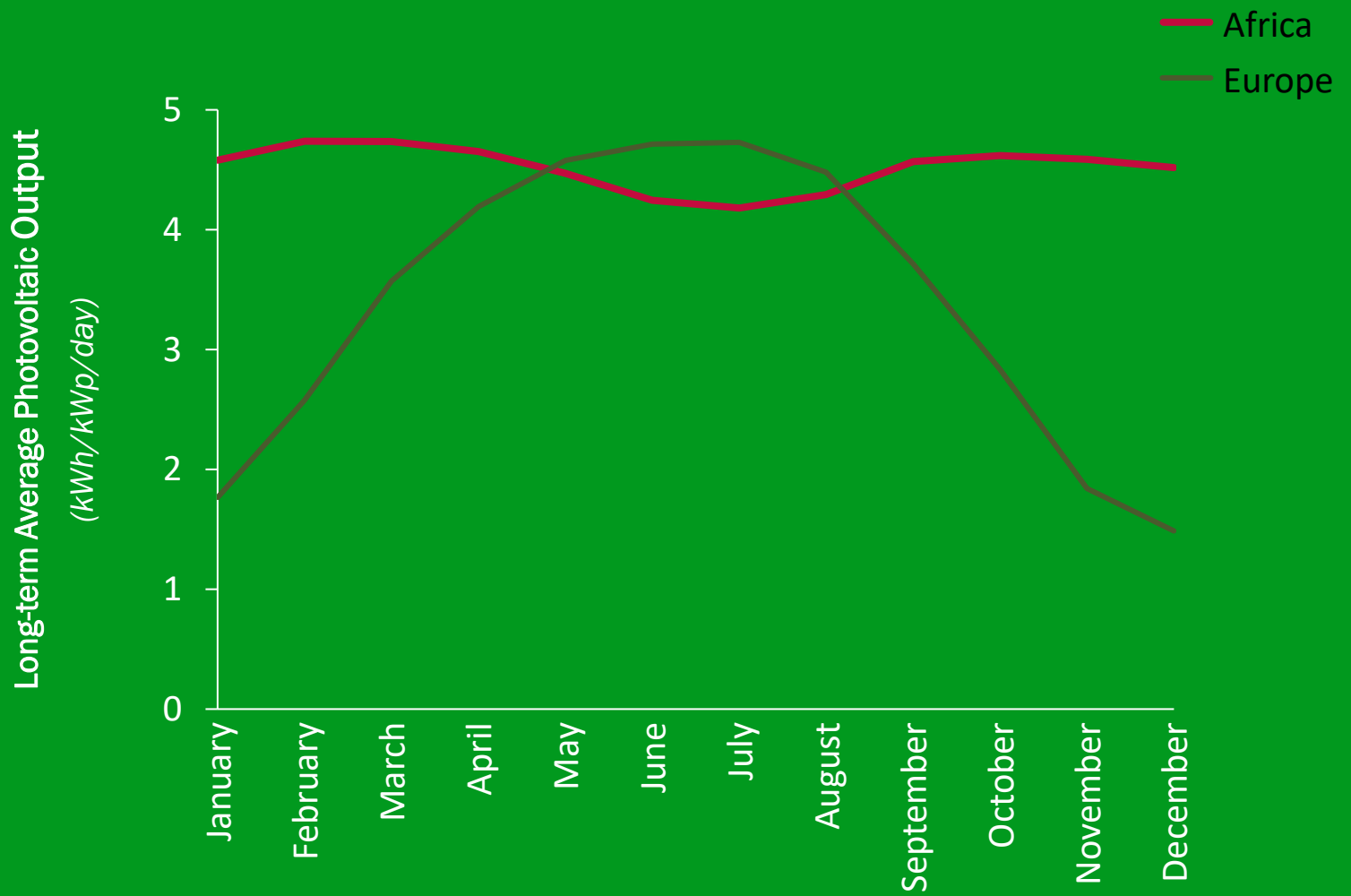
Africa's low seasonal variation can create renewable baseload



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Solar PV in Kenya vastly outperforms Europe's industry centre – and even Europe's top PV spot

The same battery-supported PV system in Kenya will enable a baseload that is **~10 times as big** as Germany

Similarly, the same PV system can support a baseload that is **2.3 times as big** in Kenya as in Spain

Performance data of the same PV system at a baseload that would have a 98% reliability in Kenya

PV system specifications

Peak Capacity: *10MWp* *Reliability:* *98%*

Battery capacity: *50MWh*

PV system specifications

Peak Capacity: *10MWp* *Baseload:* *1.9MW*

Battery capacity: *50MWh*

Analysis conducted using hourly energy output from specified PV system specifications

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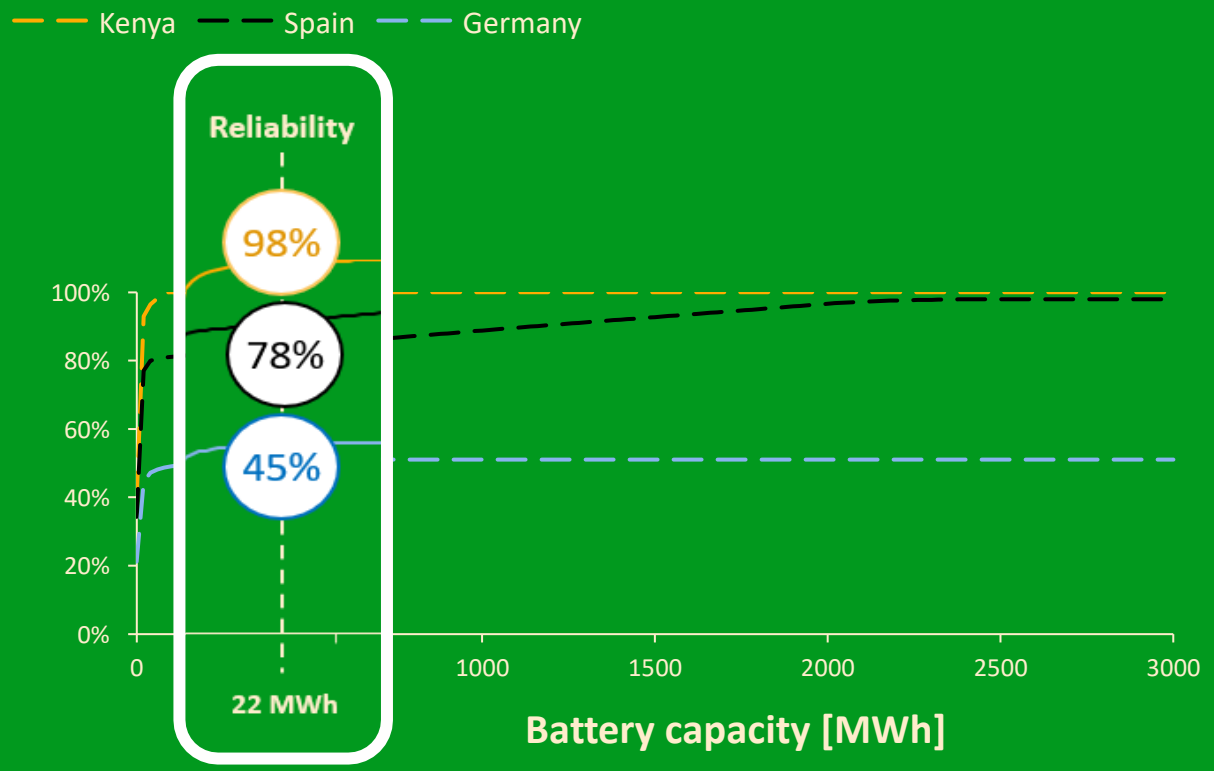
When maximising PV system performance, the difference is even starker

To reach 98% reliability, the same PV system in Spain will require a battery capacity **nearly 100 times as big** as required in Kenya to deliver the same baseload reliably

The same PV system set-up that allows Kenya to deliver that same baseload with **98%** reliability, yields only **78%** reliability in Spain, and a mere **45%** in Germany

Performance the for same installed capacity and baseload in 3 locations (baseload set by max theoretical potential in Spain)



PV system specifications

Peak Capacity: *10MWp* *Baseload:* *1.54MW*

Analysis conducted using hourly energy output from specified PV system specifications

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Africa has great potential for cost-competitive **green hydrogen production** with particular future-proof potential **using seawater**

- Green hydrogen is a **highly versatile industrial product suitable** for direct export, energy storage, input to sustainable fuel synthesis (for aviation, shipping, and road transport), precursor for green production – green fertiliser, green steel, green chemical, and green plastics production
- Sub-Sahara Africa can produce 5000 to 13500 Mt/year of green hydrogen for < $ 2/ kg H_2 in 2050 - or up to 25 times anticipated global demand
- Coastal countries can use seawater to produce green hydrogen, eliminating concern about water stress for 0.5 - 5% additional energy[2]

1 All production locations have sufficient land area for industrial footprint (not using built-up environment and protected areas), sufficient untapped renewable energy potential, and suitable water availability
2 Range is driven by distance assumptions: desalination alone takes ~0.5% of total energy to produce green hydrogen – transport of water over 20 km ~0.2% and transport up to 100 meters altitude for a higher inland production location a little over 4%

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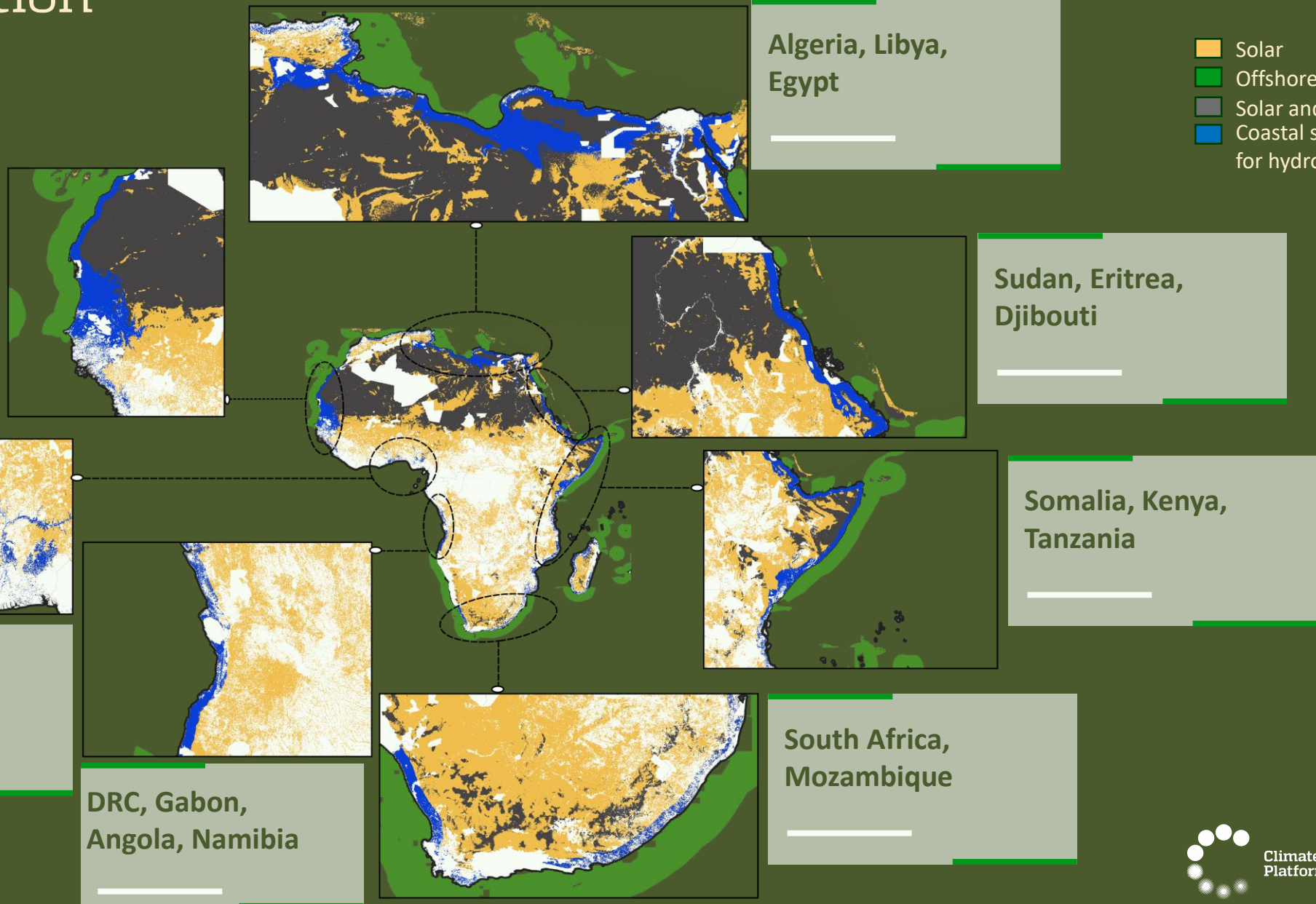
Over 20 countries have potential for green hydrogen production



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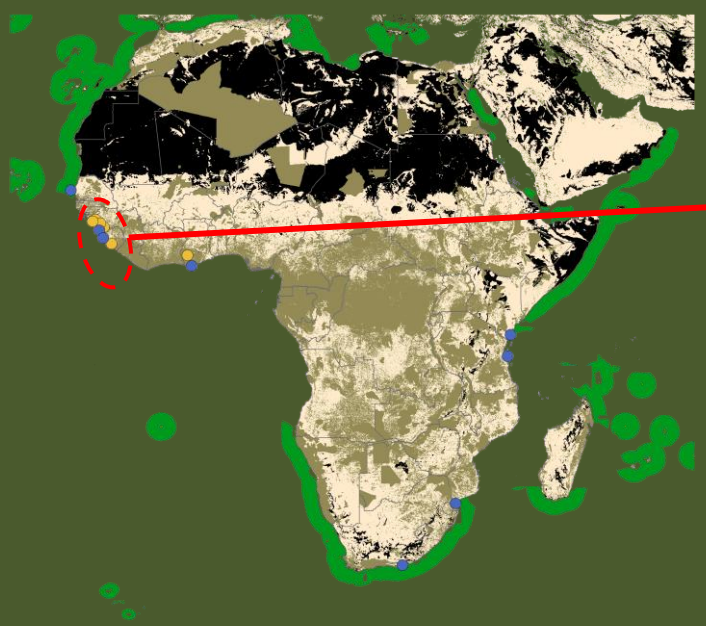
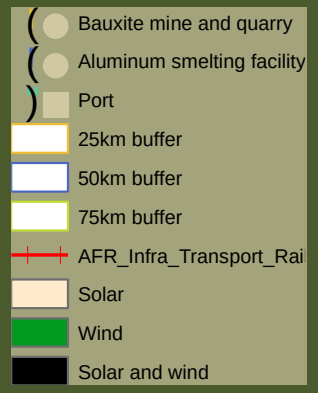
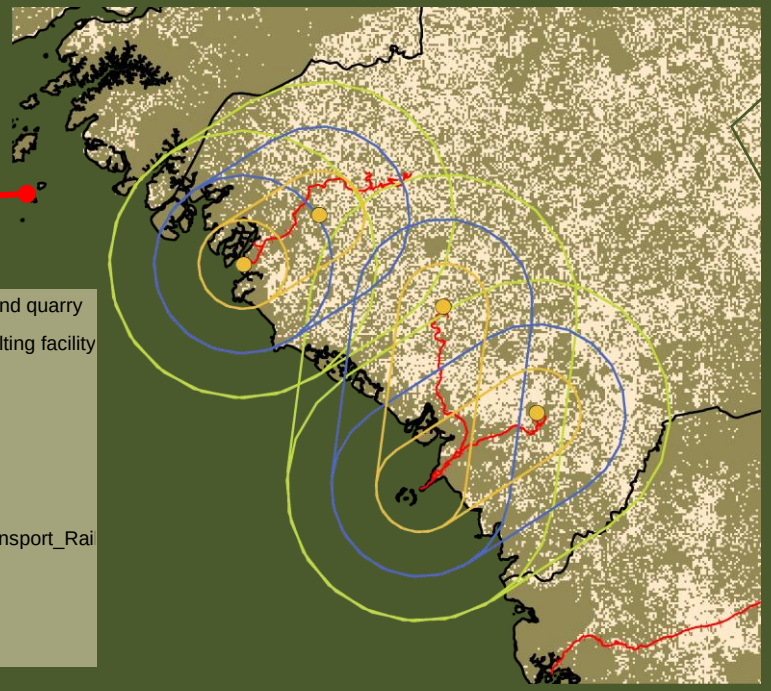
Smelting African bauxite locally can drive 280,000 jobs and avoid 1% of global emissions

Africa's bauxite production is nearly **25% of global production**





Nearly all Africa's bauxite is exported unprocessed



Producing African green aluminium drives 4 benefits

- 335 million tonnes CO_2e saved/ year
- 280,000 new jobs (60,000 direct)
- $ 37 billion revenue
- 44 GW anchor demand for renewable energy investment

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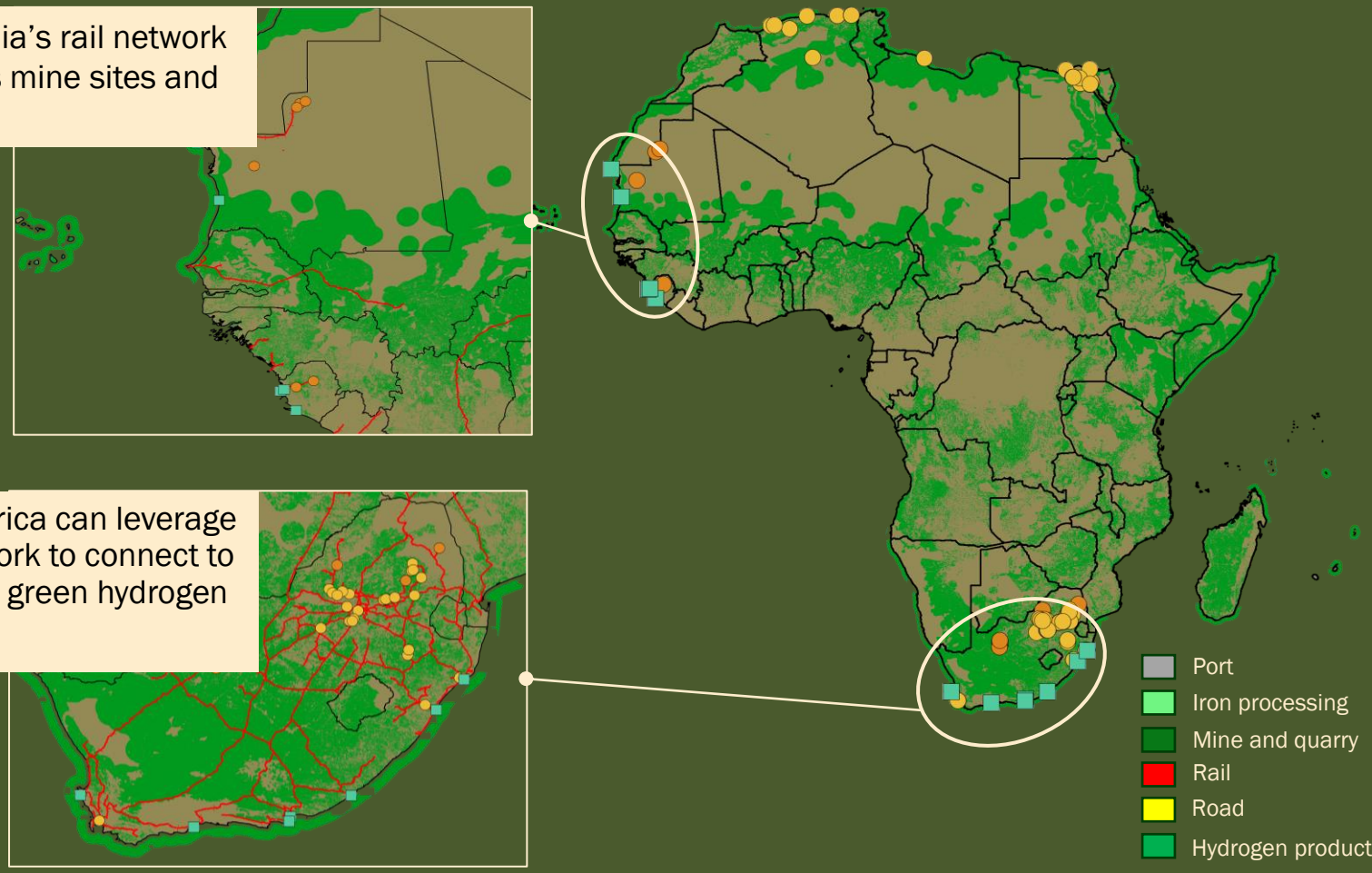
Producing green steel from African iron ore (using green hydrogen) can drive 215,000 jobs

Mauritania's rail network connects mine sites and ports

South Africa can leverage rail network to connect to potential green hydrogen sites



Local green steel production can:

- Reduce emissions by ~110 million tonnes CO_2e/year
- Generate 24,000 direct jobs and support a total of 215,000 jobs
- Contribute up to $20 billion in additional revenue for Africa
- Create 20 GW anchor demand for renewable energy development

Local construction boom will drive demand as will global demand for green steel: 40% of new city dwellers globally between now and 2050 will live in African cities – but Africa produces only 1% of global steel production

USGS, Compilation of Geospatial Data (GIS) for the Mineral Industries and Related Infrastructure of Africa, 2021

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Annex – PV performance in Tanzania compared to Germany and Spain

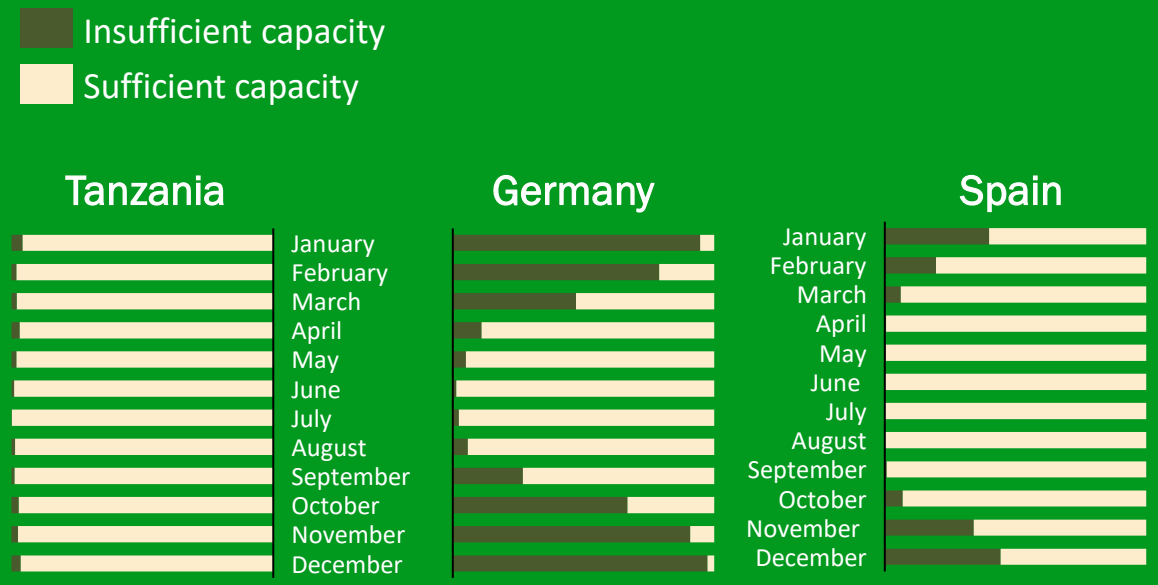
Note that findings are location-specific. Site selection is driven by mapping of where PV plant of this size is possible given land use, overlayed with high-output existing plant locations within that. Performance analysis based on hourly data for 16 years.
Detailed information available upon request.

A Tanzanian location vastly outperforms Europe's industry centre – and even its top spot

The same battery-supported PV system in Kenya will enable a daily baseload that is **~6.5 times** as big as Germany

Similarly, the same PV system can support a daily baseload that is **50% greater** in Tanzania than in Spain

Performance data of the same PV system at a baseload that would have a 98% reliability in Tanzania



PV system specifications

Peak Capacity: *10MWp* *Reliability:* *98%*

Battery capacity: *50MWh*

PV system specifications

Peak Capacity: *10MWp* *Baseload:* *1.26MW*

Battery capacity: *50MWh*

Analysis conducted using hourly energy output from specified PV system specifications

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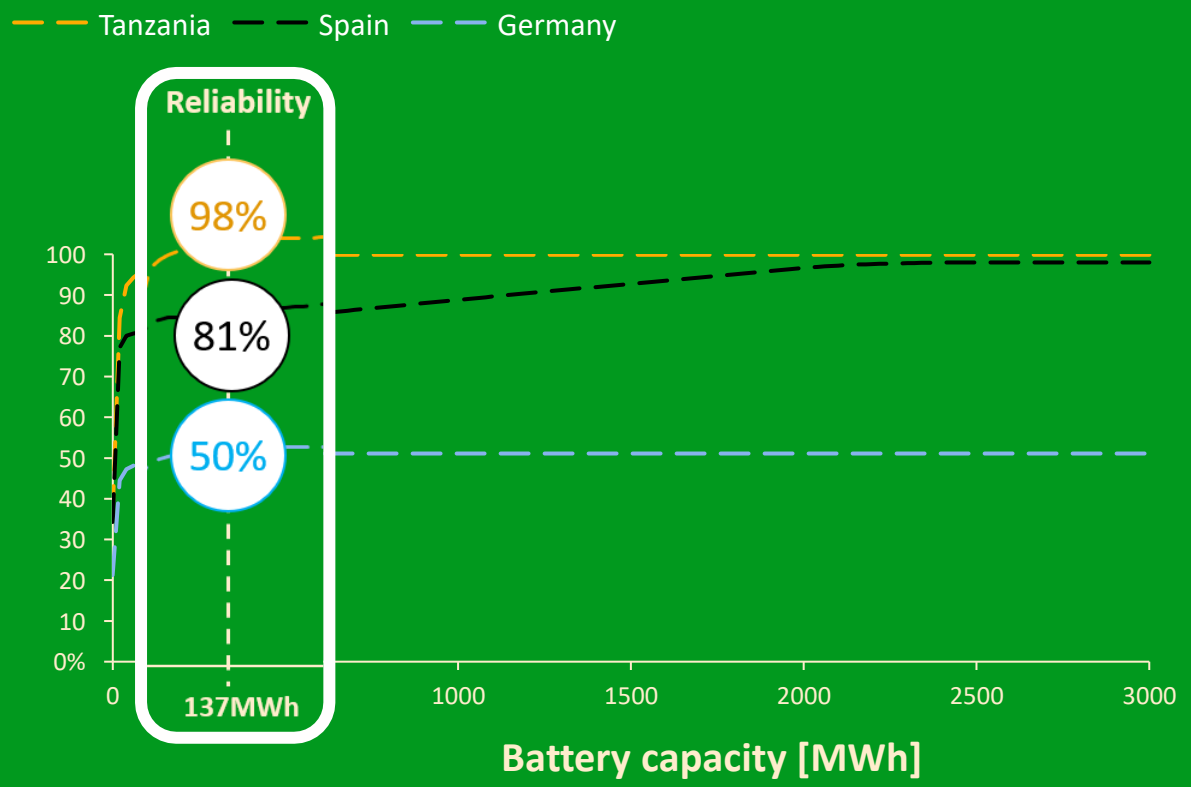
When maximising PV system performance, the difference is even starker

To reach 98% reliability, the same PV system in Spain will require a battery capacity **~16 times larger** than Tanzania

The same PV system set-up that gives Kenya **98%** reliability, yields only **81%** in Spain, and a mere **50%** in Germany

Performance the for same installed capacity and baseload in 3 locations (baseload set by max theoretical potential in Spain)



PV system specifications

Peak Capacity: *10MWp* *Baseload:* *1.54MW*

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