



Federal Ministry
for Economic Affairs
and Energy



Solar Power Supply for Tourism and Hospitals in Africa

Facilitator

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Agenda

1. The Tourism and Hospital Sector in Africa
2. Case studies - Tourism and Hospitals in Tanzania
3. Case studies - Mozambican Tourism Sector
4. Conclusions



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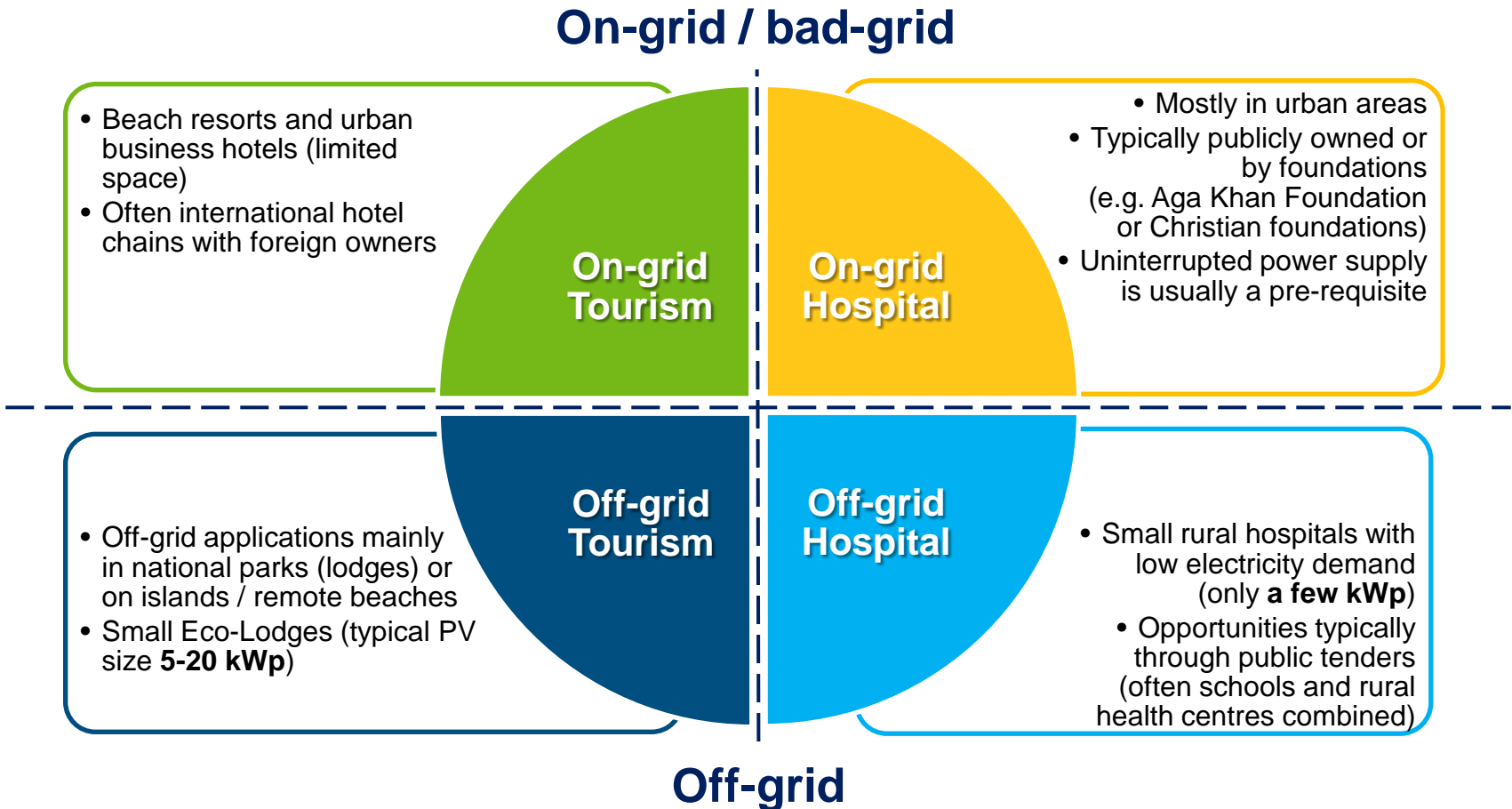
The Tourism and Hospital Sector in Africa

Solar business opportunities

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Key facts on Tourism and Hospitals in Africa



Challenges

Tourism:

- Typically seasonal business
- Hotel managers cannot take decisions → access to the owners needed
- Short-term planning vs long-term PPA's

Hospital:

- Hospitals not business driven → long decision processes
- Often weak business case since hospital receive subsidised power



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Case studies

Tourism and Hospitals in Tanzania

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Hospital:

Existing power generation setup

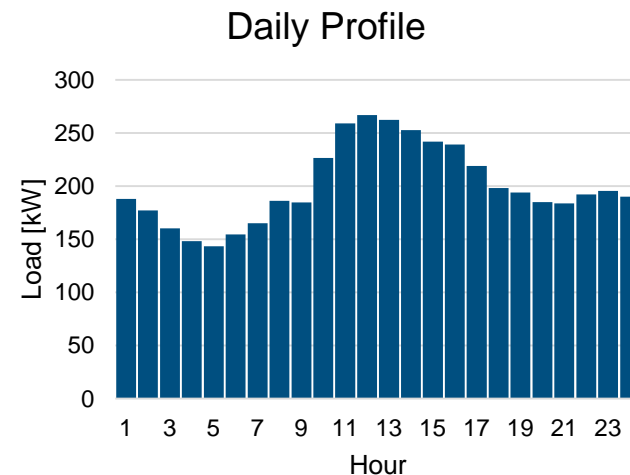
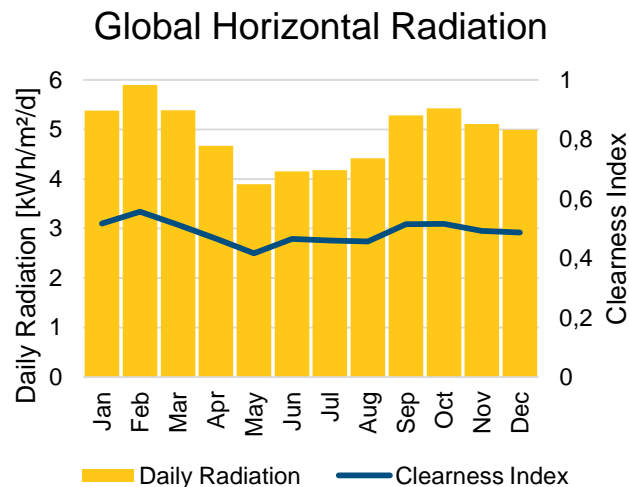
- Grid-connected facility with frequent power outages (no reliable grid)
- Undesirable as this leads to the non-functionality of critical medical appliances
- Back-up diesel generator to supply electricity when the grid is down
- The simulated PV system acts as a captive power system



Hospital:

Measured load data

- High constant base load of at least 150 kW
- High power consuming equipments (medical appliances, air conditioning, office appliances, cleaning and washing activities)
- Typically high solar radiation, maximum in February



Hospital: Proposed PV-System

- A 250 kWp PV system combined with a grid-connection possibility is the cost optimum solution
- PV penetration rate of approx. 18,9 %
- Payback period of approximately 8 years and savings of \$ 60,000 per year

	Base case	Case 1
Grid connection	yes	yes
Solar PV Size [kW]	-	250
PV Array [kWh/yr]	0	332.911
Grid Purchases [kWh/yr]	1.757.472	1.426.544
Total Capital Cost [\$]	-	500.000
Operating Cost [\$ /yr]	316.345	256.776
LCOE [\$/kWh]	0.18	0.17
Payback Time [yr]	-	8.4
Savings [\$/yr]	-	59.923

Tourism (lodge): Existing power generation setup

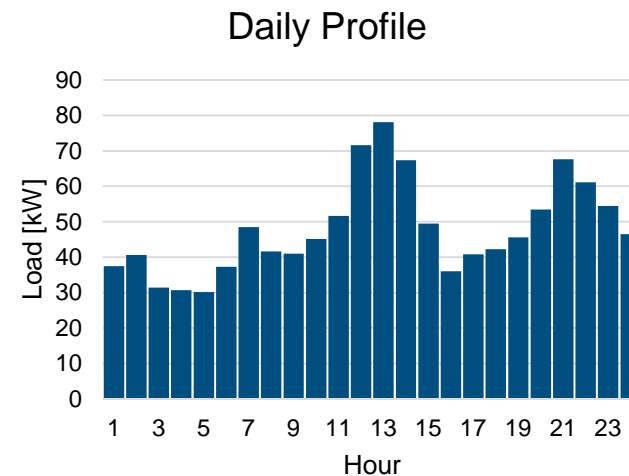
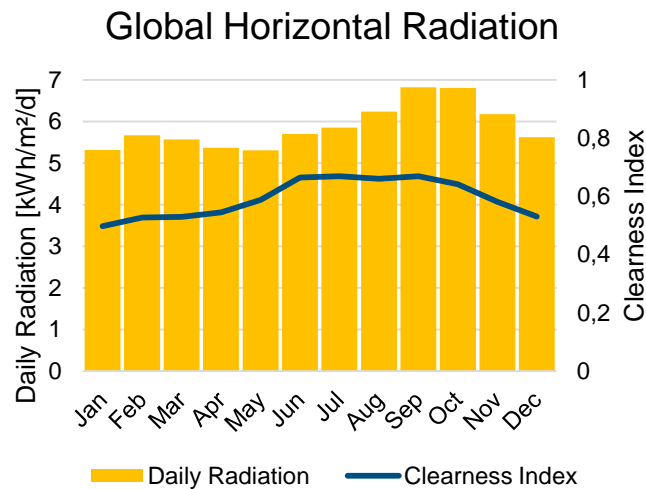
- Highly dependent on diesel-based generators to meet energy demands
- Generator 2 operates between 11 am – 3 pm (peak load)
- Generator 1 operates rest of the day
- Controlling the operation strategy by manually switching on/off

Generator	Rated power	Operation strategy
Generator 1	120 kW	3 pm – 11am
Generator 2	140 kW	11 am – 3 pm



Tourism (lodge): Measured load data

- Constant base load of 30 kW
- Peak loads during mid day and then during night hours
- High solar radiation data



Tourism (Lodge): Proposed PV-System

- 50 kWp PV system combined with the two diesel generators represent the most cost-effective option
- Annual savings of about 20.610 \$
- Payback time of approx. 5 years

	Base Case	Case 1
Solar PV Size [kW]	-	50
Size Generator 1 [kW]	120	120
Size Generator 2 [kW]	140	140
Generators [kWh/yr]	419.749	393.385
PV Array [kWh/yr]	-	26.364
Total Capital Cost [\$]	-	102.500
Operating Cost [\$/yr]	258.079	237.469
LCOE [\$/kWh]	0,62	0,59
Payback Time [yr]	-	4,96
Savings [\$/yr]	-	20.610



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Case studies

Tourism Sector in Mozambique

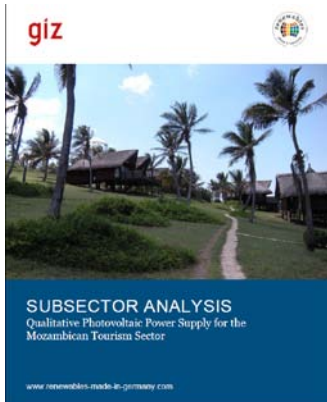
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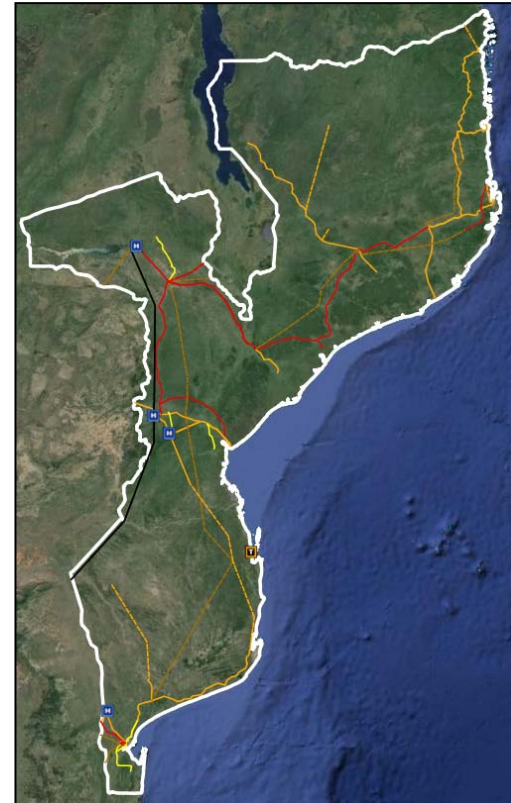
Tourism Sector in Mozambique Overview

Overall Market Potential

- 80% of population without electricity access
- Tourism sector is the second largest revenue source for forex market directly after extractive industry (coal, gas, etc.)
- Hotel owners often from South Africa



Download our Analysis of PV business opportunities in the Mozambican Tourism industry:
<http://www.giz.de/fachexpertise/downloads/giz2014-en-pep-ssa-mz-sub-sector-analysis-pv-tourism.pdf>



Source: [FUNAE](#)

Tourism Sector in Mozambique

Travessia Beach Lodge

Buildings: & Infrastructure:

8 cottages existing, further in construction

Electrical: equipment:

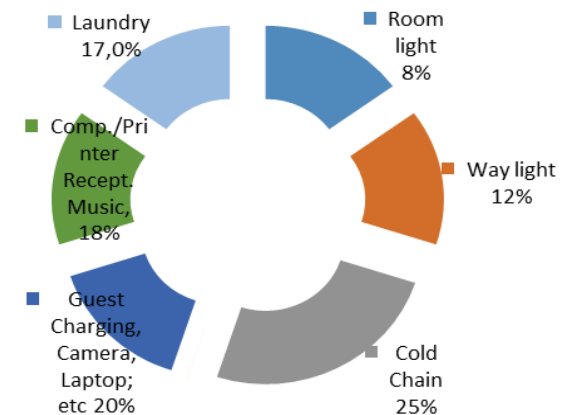
Lamps, fan, refrigerators, deep freezers for bar and kitchen, no air conditioning, water heating with solar water heaters

Consumption estimation:

- optimized for low energy consumption
- electrical consumption 20 – 24k Wh per day

Power Supply:

- **7 kWp PV-system with 43.6 kWh battery installed by Asantys as main power supply**
- Diesel generator as backup system



Tourism Sector in Mozambique

Massinga Beach Lodge

Buildings & Infrastructure:

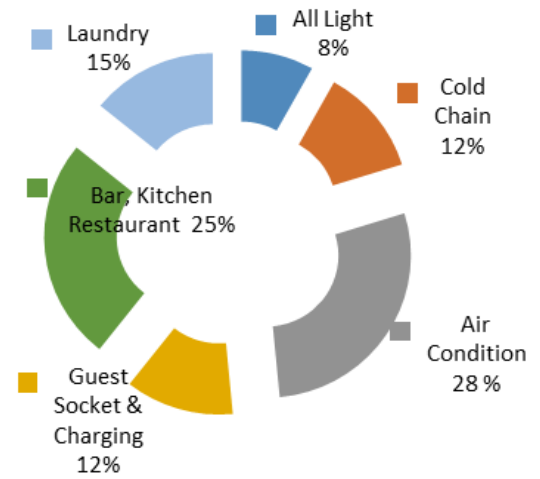
- 32 villas with air conditioning & fridge, pools without pool pump, warm water supply by gas separated for each villa, energy saving lamps for lighting the villas and walkways

Consumption estimation:

- peak power demand ~70kW
- electrical consumption 400 kWh per day

Power Supply:

- Mini-grid driven by diesel genset with 72 kW power
- operating time 10 – 12 hours per day (until 10pm)
- diesel generator is used as main power supply
- second one is installed as backup system
- for the future a connection to the grid is planned



Tourism Sector in Mozambique

Azura at Gabriels, Benguerra Island

Buildings & Infrastructure:

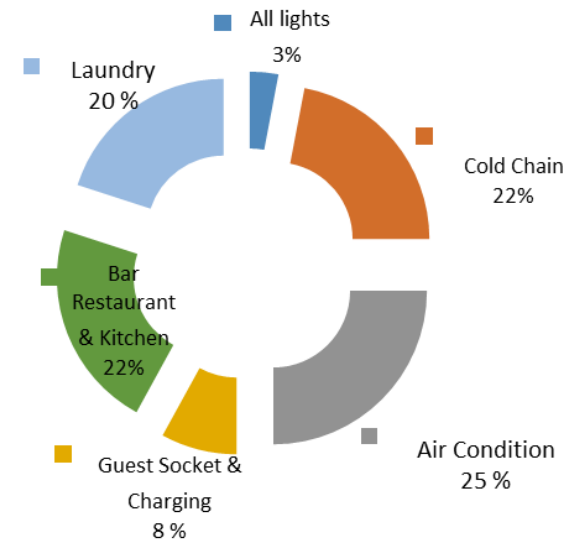
- 16 Villas, all with air conditioning, swimming pool & fridge, cold room and refrigerating room for the restaurant

Consumption estimation:

- peak power demand ~150 kW
- electrical consumption 2,100 kWh per day

Power Supply:

- Mini-grid driven by 200 kVA natural gas generator for 24/7 use; operated with natural gas via gas pipeline from main land
- power supply contracted to ELGAS Maputo, ELGAS is owner of the equipment and performs the O&M
- payment based on consumed kWh (~34 USct/kWh)
- diesel backup in case of limited natural gas supply





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Conclusions

Conclusions

Tourism:

- Growing market in most African and Southeast Asian countries
- Off-grid tourism typically a good business for local solar companies
- Solar integration in new constructions much easier to convince than existing ones
- Reach out to tourism associations

Hospital:

- Difficult market
- Do not try to sell solar but uninterrupted power supply
- Look for grants/public tenders to implement solar projects
- Reach out to foundations (e.g. Aga Khan Foundation or Christian foundations)



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Thank you for your attention!

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Project Development Programme (PDP)
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initiative

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