

F433695-GYP052-CWK2

CW2 Baseline Model Report

Country: Nigeria

OSeMOSYS Cloud Email [REDACTED]

OSeMOSYS Cloud Run Number: 68617

Run Status: Successful

Model Completion Level: Complete

Data-in-Brief

Energy:

Table 1.1: Nigeria's specified annual energy demand. Figures calculated by totalling their INDELIC, RESELIC and COMELIC. Data from (*CCG Starter Data Kit: Nigeria, 2023*).

Energy	2020	2030	2040	2050
Specified Annual Demand (PJ)	254.65	515.99	1099.88	2006

Table 1.2: Capital Costs for the 6 powerplant technologies available for the model to consider. Data from (*CCG Starter Data Kit: Nigeria, 2023*).

Technology	Capital Cost (\$10 ⁶ /MW)			
	2020	2030	2040	2050
Gas Power Plant (CCGT)	1,200	1,200	1,200	1,200
Geothermal PowerPlant	4,000	4,000	4,000	4,000
Solar PV (Utility)	1,378	886	723	723
Biomass Power Plant	2,500	2,500	2,500	2,500
Onshore Wind	1,489	1,087	933	933
Off-grid Hydropower	3,000	3,000	3,000	3,000
Transmissions	365	365	365	365

Table 1.3: Operational Life for the 6 powerplant technologies available for the model to consider. Data from (*CCG Starter Data Kit: Nigeria, 2023*).

Technology	Operational Life (Years)			
	N/A	N/A	N/A	N/A
Gas Power Plant (CCGT)	30	30	30	30
Geothermal PowerPlant	25	25	25	25
Solar PV (Utility)	24	24	24	24
Biomass Power Plant	30	30	30	30
Onshore Wind	25	25	25	25
Off-grid Hydropower	50	50	50	50
Transmission	50	50	50	50

Table 1.4: Fixed Costs for the 6 powerplant technologies available for the model to consider. Data from (*CCG Starter Data Kit: Nigeria, 2023*).

Technology	Fixed Costs (\$10 ⁶ /MW)			
	2020	2030	2040	2050
Gas Power Plant (CCGT)	35	35	35	35
Geothermal PowerPlant	120	120	120	120
Solar PV (Utility)	17.914	11.518	9.399	9.399
Biomass Power Plant	75	75	75	75
Onshore Wind	59.56	43.48	37.32	37.32
Off-grid Hydropower	90	90	90	90
Transmission	N/A	N/A	N/A	N/A

Land:

Table 2.1: A table recording the area harvested, production quantity, output activity ration, capital cost and operational life of three selected crops and all other crops in Nigeria. Data from (FAOSTAT, 2024).

Nigeria	Crop Name	Crop Naming Convention	Area Harvested 10 ³ km ²	Production Quantity (mTon)	Output Activity Ratio	Capital Costrs Millions Per 10 ³ km ²	Operational Life (Years)
Crop1 Rainfed	Cassava, Fresh	CRPCASHR	96.14	55	0.567273653	10	15
Crop 1 Irrigated	Cassava, Fresh	CRPCASHI	96.14	55	1.208292881	80	15
Crop 2 Rainfed	Yams	CRPYAMHR	71.28	56	0.779	10	15
Crop 2 Irrigated	Yams	CRPYAMHI	71.28	56	1.658	80	15
Crop 3 Biofuel Rainfed	Maize (corn)	CRPMAIHR	60.486	12	0.196	10	15
Crop 3 Biofuel Irrigated	Maize (corn)	CRPMAIHI	60.486	12	0.418	80	15
Crop 4	Other	CRPOTHHR	392.29	84	0.214	10	15

Table 2.2: Accumulated Annual Demand (Mton) for the top three crops and other crops in Nigeria. Demand was calculated by adding production and import values and then deducting exports. Data is from (FAOSTAT, 2024) and (FAOSTAT2, *Food Balances*, 2024).

Crops	2020	2030	2040	2050
Cassava, Fresh	59.045	72.684	89.474	110.145
Yams	50.052	61.614	75.847	93.367
Maize (corn)	12.749	15.694	19.319	23.782
Other Crops	84.000	103.404	127.290	156.694

Water:**Table 3.1:** Accumulated annual demand for water for Nigeria. Data from (AQUASTAT Dissemination System, 2021).

	Accumulated Annual Demand 10 ⁹ m ³			
	2020	2030	2040	2050
Water Demand	6.970	9.510	12.990	17.720

Table 3.2: Water system inputs for precipitation and water for irrigation in Nigeria. Data from (AQUASTAT Dissemination System, 2021).

	Water System Inputs 10 ⁹ m ³			
	2020	2030	2040	2050
Precipitation	1.150	1.150	1.150	1.150
Water for Irrigation	1.910	1.910	1.910	1.910

Table 3.3, 3.4 and 3.5: A breakdown of the output water commodities for Nigeria and their water use percentages. With 3.3 representing evapotranspiration, 3.4 representing groundwater recharge and 3.5 representing surface runoff. Data from (AQUASTAT Dissemination System, 2021).**3.3 Evapotranspiration (WTREVT)**

Nigeria	%	Ratio
Cassava (rainfed)	42%	0.483
Cassava (irrigated)	42%	1.2852
Yams (rainfed)	42%	0.483
Yams (irrigated)	42%	1.2852
Maize (rainfed)	42%	0.483
Maize (irrigated)	42%	1.2852
Other crops (rainfed)	42%	0.483
Forests	71%	0.8165
Built up Land	63%	0.7245
Water Bodies	33%	0.3795
Other Land	71%	0.8165

Table 3.4: Groundwater Recharge (WTRGWT)

Nigeria	%	Ratio
Cassava (rainfed)	6%	0.069
Cassava (irrigated)	6%	0.1836
Yams (rainfed)	6%	0.069
Yams (irrigated)	6%	0.1836
Maize (rainfed)	6%	0.069
Maize (irrigated)	6%	0.1836
Other crops (rainfed)	6%	0.069
Forests	2.5%	0.02875
Built up Land	3%	0.0345
Water Bodies	7%	0.0805
Other Land	2%	0.023

Table 3.5: Surface Run Off (WTRSUR)

Nigeria	%	Ratio
Cassava (rainfed)	52%	0.598
Cassava (irrigated)	52%	1.5912
Yams (rainfed)	52%	0.598
Yams (irrigated)	52%	1.5912
Maize (rainfed)	52%	0.598
Maize (irrigated)	52%	1.5912
Other crops (rainfed)	52%	0.598
Forests	26.5%	0.30475
Built up Land	34%	0.391
Water Bodies	60%	0.69
Other Land	27%	0.3105

Table 3.6: Water data for Nigeria for 2021. Data is from (AQUASTAT Dissemination System, 2021).

Variables	Unit	Value
Long-term average annual precipitation in volume	10 ⁹ m ³ /year	1,062.34
Area equipped for full control irrigation: total	1000 ha	238.15
Irrigation water requirement	10 ⁹ m ³ /year	1.7
Irrigation water withdrawal	10 ⁹ m ³ /year	4.55
Municipal water withdrawal	10 ⁹ m ³ /year	5
% of irrigation potential equipped for irrigation	%	14.21
Total renewable groundwater	10 ⁹ m ³ /year	87
Total renewable surface water	10 ⁹ m ³ /year	279.2
Total water withdrawal	10 ⁹ m ³ /year	12.47
Industrial Water Withdrawal	10 ⁹ m ³ /year	1.97

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AQUASTAT Dissemination System. (2021). AQUASTAT.

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FAOSTAT. (2024). <https://www.fao.org/faostat/en/#data/QCL>

FAOSTAT2, Food Balances . (2024). <https://doi.org/10.4060/CD1656EN>