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Understanding the implications of the energy transition on African economies: Economy and Jobs

Status Briefing to KCI - 13

01- 02 October 2025

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1. Background to the Case Study

- In line with this mandate **KCI-11 in Accra 2024** approved the development of an African case study on understanding the implications of the energy transition on African economies: focussing on economy and jobs
- The study builds from existing work by **UNECA-ACF-4SightEngage** which analysed the implications of the energy transition on African economies, from a few perspectives including, trade, economy, jobs, emissions, jobs, and finance .
- The case is aligned with the function of: …. providing a platform allowing Parties to share, in an interactive manner, information, experience, **case studies**, best practices and views, and to facilitate assessment and analysis of the impacts of the implementation of response measures, including the **use and development of modelling tools and methodologies**, with a view to recommending specific actions;

Step 1

Inception Report

June 2025

Step 2

First Report

30 July 2025

Step 3

Second Report

15 Aug 2025

Step 4

Final Case Study

1 month after KCI13

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2. About the Modelling Platform

Modelling Outputs: Jobs, Earnings, Output, Value Added from investment in an energy technology

National Renewable Energy Laboratory (NREL) - Jobs and Economic Development Impact (JEDI) Model

Open-source Input-Output (I-O) Model; NREL, most suited for utility scale plant assessment

NREL

https://www.nrel.gov/analysis/jedi/

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2. About the Modelling Platform

General limitation of I-O Models

- Assume a **static** relationship between sectors, even though technological advancement and demand can change
- Assume **fixed** production technologies, e.g., doubling production doubles inputs; demand driven as such not fully responsive to constraints e.g., lack of skilled labour.
- Data limitations, **labour intensive** and expensive collection of data; data expressed in monetary terms can be influenced by price changes, hence poor comparisons over time and across economies
- Assume consumption is **not subject to budget constraints**, which is not always true

JEDI Model Specific Limitations

- Outputs show **gross impacts** and not net impacts of a renewable energy technology deployment, e.g. marginal changes from transitioning one technology
- The model does not reflect **other economic impacts**, e.g., where components are manufactured using AI or robotics
- Electricity **cost changes** are not considered in the analysis; multipliers are specific for a country/region

The model however remains a useful and simple screening and decision-making tool that can provide a basis for policy decisions in the energy transition

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2. About the Modelling Platform

Construction

Direct jobs	Direct **earnings**	Direct **economic output**	Direct **GDP**
Indirect jobs	Indirect **earnings**	Indirect economic output	Indirect GDP
Induced jobs	Induced **earnings**	Induced economic output	Induced GDP

Total – One-time

Operations

Direct jobs	Direct **earnings**	Direct **economic output**	Direct **GDP**
Indirect jobs	Indirect **earnings**	Indirect economic output	Indirect GDP
Induced jobs	Induced **earnings**	Induced economic output	Induced GDP

Annual – On-going

- The impact analysis is across three areas: Project Development and Onsite Labour Impacts; Local Revenue and Supply Chain Impacts; Induced Impacts
- Results are gross rather than net impacts; they are potential rather than realised based on different scenarios such Local Content Requirement
- Quantifying the employment impact of energy generation technologies, is normalised by calculating the ratio of jobs to installed capacity where,

$$\text{Index of Direct Jobs} = \Sigma \frac{Employment}{Installed\ capacity}$$

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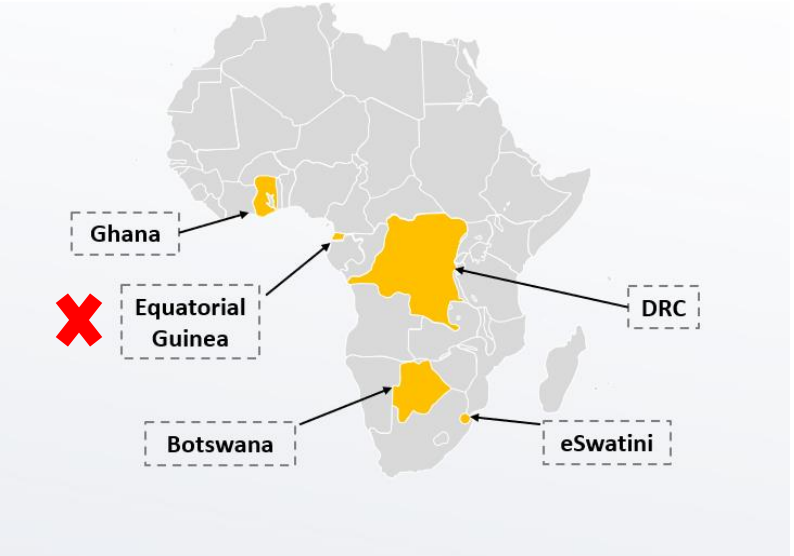
3. Countries in the Study



- Technologies in various countries, source of input, and their typical lifespan, which influence O&M jobs

- Equatorial Guinea dropped in the study due to data limitations and scale

	Botswana	DRC	eSwatini	Ghana
Utility Scale Solar PV	X	X	X	X
Distributed Solar PV				X
Wind	X	X		X
Hydropower		X	X	X
Natural Gas	X			
Bioenergy			X	X
Coal	X			
Geothermal		X		
Policy	IRP of 2021	NDC by 2030	NDC by 2030	NDC by 2030

Technology	Typical Lifespan	Notes
Hydropower	65-100 years	Longest-lived technology: civil infrastructure can last indefinitely with maintenance
Coal	50 years (historical)	May be reduced to 20-35 years under climate constraints
Natural Gas	30-40+ years	Well-maintained plants can exceed 40 years
Solar PV	30 years	Standard warranty/design life
Wind	25 years	Turbine design life
Bioenergy	20-30 years	Varies by technology and feedstock

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4. Key Findings: Construction vs O&M

Economic Impact Estimates

30% local content

Construction Period
Total Impacts

	On-Site	Supply Chain	Worker Expenses	Total
Jobs	**3 277**	**3 796**	**3 724**	**10 797**
Earnings	USD 23 558 541 297	USD 28 742 744 746	USD 31 499 826 185	USD 83 801 112 227
Output	USD 134 332 944 324	USD 130 809 278 904	USD 205 836 564 832	USD 470 978 788 060
Value-added	USD 36 254 822 235	USD 61 560 338 733	USD 59 289 857 035	USD 157 105 018 004

Operations and Maintenance
Annual Impacts

	On-Site	Supply Chain	Worker Expenses	Total
Jobs	**273**	**290**	**317**	**879**
Earnings	USD 1 492 169 328	USD 1 643 379 517	USD 1 888 466 826	USD 279 111 982
Output	USD 8 723 400 357	USD 7 386 999 173	USD 12 340 243 465	USD 1 580 591 277
Value-added	USD 2 519 994 945	USD 3 687 111 951	USD 3 554 525 268	USD 542 312 898

Economic Impact Estimates

60% local content

Construction Period
Total Impacts

	On-Site	Supply Chain	Worker Expenses	Total
Jobs	**4 698**	**5 216**	**5 289**	**15 203**
Earnings	USD 31 096 403 489	USD 36 677 470 140	USD 40 818 599 325	USD 108 592 472 954
Output	USD 173 364 308 292	USD 166 362 085 499	USD 266 730 369 149	USD 606 456 762 940
Value-added	USD 46 242 131 022	USD 78 899 931 326	USD 76 829 913 415	USD 201 971 975 763

Ghana - Wind Example

- There are significant differences across most technologies where **O&M jobs about 10%** of the construction phase.
- The **exception is Natural Gas** where the O&M Phase generates more jobs, e.g. in the case of Botswana the analysis shows 30% more jobs
- In terms of value added, there are significant differences which are just above 30% for all LCR scenarios

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4. Key Findings: Local Content Requirements

Economic Impact Estimates				
30% local content				
Construction Period				
Total Impacts				
	On-Site	Supply Chain	Worker Expenses	Total
Jobs	**2 868**	**2 742**	**3 055**	**8 665**
Earnings	USD 14 846 922 048	USD 15 364 807 561	USD 18 195 809 385	USD 48 407 538 995
Output	USD 84 211 880 714	USD 70 721 973 033	USD 118 901 065 557	USD 273 834 919 304
Value-added	USD 30 429 579 068	USD 33 402 597 345	USD 34 248 663 176	USD 98 080 839 589
Operations and Maintenance				
Annual Impacts				
	On-Site	Supply Chain	Worker Expenses	Total
Jobs	**57,6**	**78,8**	**298,5**	**434,92**
Earnings	USD 245 246 194	USD 424 645 171	USD 403 459 707	USD 1 073 351 072
Output	USD 1 826 266 288	USD 1 987 453 096	USD 2 636 419 632	USD 6 450 139 016
Value-added	USD 543 771 977	USD 880 044 652	USD 759 403 186	USD 2 183 219 815

Economic Impact Estimates				
60% local content				
Construction Period				
Total Impacts				
	On-Site	Supply Chain	Worker Expenses	Total
Jobs	**3 846**	**3 642**	**4 079**	**11 568**
Earnings	USD 19 892 679 197	USD 20 449 113 672	USD 24 296 906 625	USD 64 638 699 494
Output	USD 112 342 689 197	USD 93 121 940 677	USD 158 768 869 595	USD 364 233 499 469
Value-added	USD 37 396 822 557	USD 44 414 744 076	USD 45 732 319 656	USD 127 543 886 289

Botswana - Utility Scale PV Example

- A higher LCR always translate to a much higher figure for jobs around 30%;
- Standalone PV and Wind have the **highest benefits from localisation of value chain** at between 40 and 50%
- Output figures always demonstrate a **marginally higher multiplier** figure between 30% and 60% LCR figures;

Reflective of model limitation of fixed relationship between input: output for a technology in a specific locality

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4. Key Findings: Upfront Investment

Economic Impact Estimates				
30% local content				
Construction Period Total Impacts				
	On-Site	Supply Chain	Worker Expenses	Total
Jobs	**22 143**	**24 080**	**25 243**	**71 467**
Earnings	USD 9 798 580 492,45	USD 12 726 617 340,31	USD 13 566 393 299,18	USD 36 091 591 131,94
Output	USD 58 288 428 352,18	USD 58 260 839 332,17	USD 88 650 006 431,82	USD 205 199 274 116,18
Value-added	USD 16 065 757 461,07	USD 27 046 327 914,28	USD 25 535 046 272,12	USD 68 647 131 647,47
Operations and Maintenance Annual Impacts				
	On-Site	Supply Chain	Worker Expenses	Total
Jobs	**USD 166,73**	**USD 177,21**	**USD 193,93**	**USD 537,86**
Earnings	USD 912 641 791,02	USD 1 005 125 087,13	USD 1 155 025 581,50	USD 170 710 692,20
Output	USD 5 335 413 062,15	USD 4 518 042 307,56	USD 7 547 549 519,65	USD 966 722 493,85
Value-added	USD 1 541 281 311,71	USD 2 255 114 343,12	USD 2 174 021 570,70	USD 331 689 845,86

Economic Impact Estimates				
60% local content				
Construction Period Total Impacts				
	On-Site	Supply Chain	Worker Expenses	Total
Jobs	**28 025**	**30 312**	**31 804**	**90 141**
Earnings	USD 9 798 580 492,45	USD 12 726 617 340,31	USD 13 566 393 299,18	USD 36 091 591 131,94
Output	USD 58 288 428 352,18	USD 58 260 839 332,17	USD 88 650 006 431,82	USD 205 199 274 116,18
Value-added	USD 16 065 757 461,07	USD 27 046 327 914,28	USD 25 535 046 272,12	USD 68 647 131 647,47

Botswana - Coal Example

- The model results can also be used to estimate imported capital equipment from a specific technology, which can inform policy decisions,
  - About 33% of initial investment is captured in the local market
  - The required initial investment for 1,500MW for coal is around $200 million

The country's GDP is $19.4 billion as of 2024

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4. Key Findings: Scale Matters

Economic Impact Estimates

30% local content

Construction Period
Total Impacts

	On-Site	Supply Chain	Worker Expenses	Total
Jobs	**97 205**	**92 959**	**103 562**	**293 726**
Earnings	USD 503 285 493 150	USD 520 840 934 287	USD 616 807 097 805	USD 1 640 933 525 242
Output	USD 2 854 640 024 220	USD 2 397 355 018 063	USD 4 030 544 595 142	USD 9 282 539 637 425
Value-added	USD 1 031 511 154 851	USD 1 132 291 435 433	USD 1 160 971 633 070	USD 3 324 774 223 355

Operations and Maintenance
Annual Impacts

	On-Site	Supply Chain	Worker Expenses	Total
Jobs	**1 952,3**	**2 671,4**	**298,5**	**4 922,19**
Earnings	USD 8 313 430 306,16	USD 14 394 751 547,50	USD 13 676 600 242,24	USD 36 384 782 095,90
Output	USD 61 907 331 809,83	USD 67 371 291 377,97	USD 89 370 157 027,17	USD 218 648 780 214,97
Value-added	USD 18 432 948 376,43	USD 29 832 022 107,61	USD 25 742 480 873,83	USD 74 007 451 357,86

Economic Impact Estimates

60% local content

Construction Period
Total Impacts

	On-Site	Supply Chain	Worker Expenses	Total
Jobs	**130 389**	**123 470**	**138 287**	**392 146**
Earnings	USD 674 328 108 368	USD 693 190 293 971	USD 823 623 953 394	USD 2 191 142 355 733
Output	USD 3 808 226 752 445	USD 3 156 675 955 152	USD 5 381 995 579 487	USD 12 346 898 287 085
Value-added	USD 1 267 688 900 232	USD 1 505 584 544 935	USD 1 550 248 123 944	USD 4 323 521 569 111

Economic Impact Estimates

30% local content

Construction Period
Total Impacts

	On-Site	Supply Chain	Worker Expenses	Total
Jobs	**543**	**519**	**578**	**1 640**
Earnings	USD 2 810 849 479	USD 2 908 896 618	USD 3 444 867 641	USD 9 164 613 738
Output	USD 15 943 164 535	USD 13 389 227 776	USD 22 510 591 564	USD 51 842 983 875
Value-added	USD 5 760 989 800	USD 6 323 847 667	USD 6 484 026 571	USD 18 568 864 037

Operations and Maintenance
Annual Impacts

	On-Site	Supply Chain	Worker Expenses	Total
Jobs	**11**	**15**	**299**	**324**
Earnings	USD 46 430 508,26	USD 80 394 687,39	USD 76 383 812,35	USD 203 209 008,01
Output	USD 345 752 448,16	USD 376 268 662,35	USD 499 132 327,00	USD 1 221 153 437,50
Value-added	USD 102 948 016,68	USD 166 611 843,47	USD 143 771 755,68	USD 413 331 615,83

Economic Impact Estimates

60% local content

Construction Period
Total Impacts

	On-Site	Supply Chain	Worker Expenses	Total
Jobs	**728**	**690**	**772**	**2 190**
Earnings	USD 3 766 122 485	USD 3 871 467 792	USD 4 599 939 780	USD 12 237 530 057
Output	USD 21 268 946 412	USD 17 630 035 210	USD 30 058 445 311	USD 68 957 426 933
Value-added	USD 7 080 042 508	USD 8 408 689 683	USD 8 658 135 772	USD 24 146 867 963

DRC vs eSwatini – Utility Scale PV

- eSwatini has 56MW planned whereas DRC has 10,000MW; whereas jobs and value added per MW are comparable; the investment can contribute **3 times GDP of $5billion for eSwatini**, whereas it would contribute **47 times GDP of $70billion for the DRC**

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4. Key Findings: Comparative Analysis

FTE per MW at 30% LCR

- **Utility Scale Solar PV delivers 1-6 FTE per MW**;
- Distributed Solar PV delivers ~2 FTE per MW;
- Wind delivers ~3 FTE per MW;
- **Bioenergy: ~4 FTE per MW**;
- Hydropower at ~1 FTE per MW;
- **Natural Gas at ~13 FTE per MW**.

Earnings per MW at 30% LCR

- Utility Scale Solar PV delivers ~$11,000 per MW;
- Distributed Solar PV is at ~$33,000 per MW;
- **Wind delivers ~$47,000 per MW**;
- **Bioenergy delivers ~$80,000 per MW**;
- **Natural Gas with a potential of ~$158,000 per MW**;
- Coal delivering ~$6,300 per MW (lowest quality)

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4. Key Findings: Comparative Analysis

GDP contribution Construction per MW at 30% LCR

- **Bioenergy: $7.63 million per MW (Ghana, eSwatini)**;
- **Natural Gas: $14.8 million per MW (Botswana)**;
- Distributed Solar: $3.91 million per MW (Ghana);
- **Wind: $3.17 million per MW (Average)**;
- Utility Solar: $2.86 million per MW (Average);
- Coal: $422,000 per MW (Botswana)
- Hydropower: $189,000 per MW (Average).

Construction local Value Addition MW at 30% LCR

- **Natural Gas: $4.94 million per MW (Botswana)**;
- **Bioenergy: $3.27 million per MW (Average)**;
- **Distributed Solar: $1.39 million per MW (Ghana)**;
- Wind: $1.06 million per MW (Average);
- Utility Solar: $1.02 million per MW (Average);
- Coal: $140,000 per MW (Botswana)
- Hydropower: $115,000 per MW (Average).

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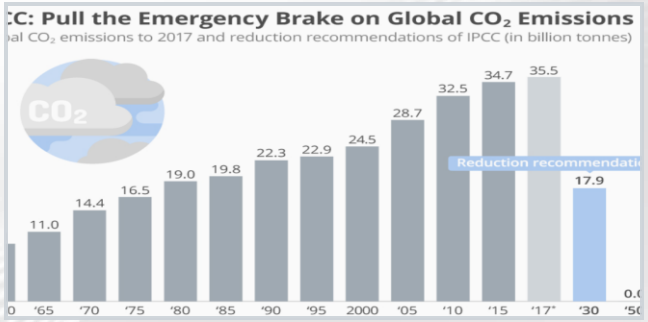
5. Conclusion: Dynamics and Considerations

Baseline resource are finite and not environmentally friendly

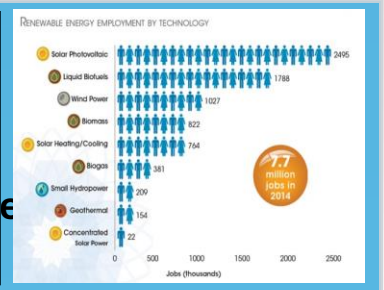
- Coal
- Gas
- Oil
- Direct wood burning pollution

CO2e impact needs to be reduced



Energy transition resources are renewable and can drive job creation

- Solar
- Wind
- Bioenergy
- Hydropowe



1 **Upward price pressure**

2 **Regulatory/policy pressure**

3 **Downward price pressure**

Vision net zero by 2050

Reliable and efficient energy service dependent on available minerals and resources that support economic growth through job creation

Environmental sustainability through efforts to reduce pollution and mitigate the effects of climate change should not compromise employment and growth opportunities

Social Equity and ensuring an energy transition process that would stimulate economic growth and expanded access to energy at affordable prices and through targeted low carbon technology adoption

Sources: WEC; BCG; CSIR , National Development Plan, Statista

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5. Conclusion: Policy Issues

Africa is behind in the renewable **technology innovation curve**, with an impact on trade balance, foreign exchange reserves, FX denominated borrowing, currency impacts, cost of capital, sovereign debt profile; African countries lack the technical ecosystems required to absorb, adapt, and domestically produce sophisticated energy technologies, creating dependence on **imported expertise and components** even under ambitious LCR scenarios.

In respect of **local content requirements**, industrial capacity gaps pose a significant risk in local value capture from misalignment between LCR policy ambitions and existing industrial capacity, even though some of these economies are rich in critical minerals for the energy transition; these may operate at **insufficient scales to justify sustained local manufacturing** investments if seen from individual country programmes

African countries can impose technology transfer requirements as a condition for investment and/or import taxes on renewable energy technologies, **power asymmetries in global trade** limits their agency where new generation trade agreements tend towards zero tariffs are imposed on green technologies, which benefits incumbent manufacturing countries; Some **international trade rules** acting as barriers, such as ‘services purchased should be for governmental purposes and not with a view to commercial resale (Article XIII.1 of the General Agreement on Trade in Services);

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5. Conclusion: Policy Issues

The **financing of the transition** remains a major barrier for African countries, significant capital requirements that exceed domestic financing capacity; option is debt-creating instruments from international financing; risk perception premiums; high capital costs, reduces project viability, and limits the scale of deployments that could generate the employment and economic benefits.

***

Local content requirement policies to increase economic multipliers have potential for a positive impact on jobs and economic value added; African economies need to integrate to **technology value chains** to mitigate import-costs/burden, which negatively impact foreign exchange reserves, and currency variability; accelerate the implementation of the African Continental Free Trade Area (AfCFTA) with a view of developing **critical mass for technology market**, and driving industrialisation incl. through tax incentives

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The energy **transition in Africa has the potential** to drive sustainable economic growth and job creation, address energy access challenges and contribute to global mitigation efforts; should be enabled by addressing structural deficiencies in global trade and finance.

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Recommendation

Finalize the case study and consider any recommendations from the case study as part of the annual report discussion