

Exploring marginalisation and exclusion in renewable energy development in Africa

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Introduction

- Renewable energy offers development advantages to all nations including African nations.
- The distribution of renewable energy resources provide an equalizing or a balancing opportunity for energy access.
- There is a clear progress in renewable energy deployment globally. For example, global renewable energy capacity reached 657GW in 2014. This increase3d to 785GW in 2015 and to 921GW in 2016.
- However, events have shown that many developing countries, especially African countries have not cached up with the pace of global progress in renewable energy.
- These nations are at the margin of global renewable system:

Objectives

- The objectives are to:
 - Examine renewable energy capacities in Africa,
 - Determine global and regional marginalisation
 - Determine intra- African differences and emerging marginalization in renewable energy development,
 - Underscore the impact of marginalisation
 - Account for its presence in renewable energy development.

Methodology

- **Data type:**
- Data used are renewable energy capacities, with respect to all renewable energy technologies, transport application of renewable energy, investments in renewable energy and renewable energy policies in place by African countries.
- These were acquired from annual reports of major international renewable energy agencies. These are REN21, IRENA. GWEC, IEA, among others.
- **Analysis:**
- **Analysis is** based on descriptive, comparative analysis and classification of the countries according to performance. Other analytical methods are growth rate and trend analysis.

Concept of marginalisation

- The term is derived from the word marginal:
- This means peripheral, at the edge of an active system; for examples, economy, power.
- Marginalisation is a process of being at the edge of an active system.
- Being at the edge will bring exclusion that in itself demonstrates some form of deprivation.
- It is a situation where a community or territory is not able to compete with its pair and so remain backward in the parameters of progress. Hence, marginalisation will also mean backwardness in respect of any dimension of progress.
- Two forms of marginalization: (1) social; relating to the human dimension. Spatial, relating to physical location and distance from the centre
- Marginalisation in the renewable energy sense is a situation where territories that have the renewable resources at their disposal fail to key into the global drive of renewable energy deployment and therefore remains outside the drive of the renewable energy system.
- Renewable energy system: technology, harnessing, financing , marketing, employment benefits, networking.
- Features:**
 - It is both special and human dimensions; it is dynamic and so, could be temporal or otherwise; leads to vulnerability It varies across systems, space and society and therefore could be multidimensional.

Africa's Renewable Energy Capacity

- Solar energy capacity grew from 54MW in 2006 to 2491 MW in 2016. Significant increase started in 2014 when 1000MW was exceeded.
- Wind energy capacity increased from 386MW in 2006 to 3786MW in 2016. The 1000MW mark was reached in 2011 when the continent's wind energy generation capacity stood at 1037.
- CSP: Africa's recognizable production started in 2014 when 65MW capacity was achieved. The production rose to 425 MW in 2016.
- Hydropower increased from 23 623 MW in 2007 to 27 657MW in 2012. Its capacity stood at 33 524MW on 2016.
- Geothermal: Africa's geothermal output increased from 45MW in 1995 to 136MW in 2005 and to 601MW in 2015. The capacity increased to 676MW in 2016 (BP Statistical review of world energy, 2017)

Table 1: Renewable energy capacity growth rates in Africa

Renewable technology	Years covered	Growth rate (%)
Solar	2006-2016	46.7
Wind	2006-2016	25.6
CSP	2014-2016	155
Hydropower	2015-2016	5.5
Geothermal	1995-2015	13.8
Biofuel	2006-2016	16.0

Largely all the renewables are growing at relatively high rates. The highest growth rate is recorded in CSP with annual growth rate of 155% between 2014 and 2016. It is followed by solar energy (46.7% per annum) and wind energy (25.6% per annum).

Table 2: Relative contribution of renewable, 2016

Renewable technology	2016 Capacity (MW)	Percent contribution
Solar	2491	6.1
Wind	3786	9.3
CSP	425	1.0
Geothermal	676	1.7
Hydropower	33 524	81.9
Total	40 902	100

In terms of the relative contributions of the renewable technologies, hydropower is clearly the leading renewable energy provider in the continent.

The hydropower capacity of 33 524MW in 2016, is about nine times the continent's capacity in wind energy and about 13 times the capacity in solar energy. It contributes nearly 82% of the continent's renewable energy power.

Geothermal, CSP and biofuel occupy low position in renewable energy development in the continent. Solar contributes about 6% and wind about 9%.

Marginalisation and Exclusion: Global Comparison

Table 3: Africa's RE capacity in relation to global capacity

Renewable technology	Capacity in GW		Africa as percent of world
	World	Africa	
Solar PV	303	2.491	0.82
Wind	487	3.786	0.78
CSP	4.8	0.425	8.85
Geothermal	13.5	0.676	5.00
Hydropower	1096	33.524	3.05
Total RE with hydro	2017	40.902	2.03
Total Re without hydro	921	7.378	0.80

- Africa's contribution to global capacity in all the five renewable technologies is less than 10 percent.
- It is very poor in the case of solar PV and wind where Africa's capacity is less than one percent of global capacity each.
- The marginal position is also seen in hydropower generation in which the continent is potentially strong. Here Africa contributes about 3% of global capacity.
- Although Africa contributes about 16% of global population, its contribution to global renewable capacity with hydropower is 2% while without hydropower, it is less than 4%.w

Table 4: Africa's capacity and the world capacity in bioenergy, biogas and geothermal in 2010-2016

Year	Bioenergy		Biogas		Geothermal	
	Capacity (MW) ¹	Proportion of world capacity	Capacity (MW) ¹	Proportion of world capacity	Capacity (MW) ¹	Proportion of world capacity
2010	715	1.0	14	0.2	202	2.0
2011	808	1.1	16	0.2	202	2.0
2012	915	1.1	19	0.2	217	2.1
2013	946	1.1	20	0.2	253	2.3
2014	982	1.0	20	0.1	600	5.2
2015	1018	1.0	36	0.2	607	5.1
2016	1018	1.0	36	0.2	1091	8.6

Source: ¹ IRENA, 2017

For these three renewable energy technologies the weak position for Africa in comparison to global capacity is clear.

Between 2010 and 2016 Africa contributed only one percent of global bioenergy capacity' well below one percent of biogas capacity.

However, the continent has a fair share of the global geothermal capacity. Its contribution rose from 2.0% in 2010 to 8.6% in 2016.

Marginalization and Exclusion: Regional comparison

- Wind Energy:
- While Latin America has pushed ahead to exceed 10GW by 2015 (12.2GW) and reaching 15GW in 2016; Africa's wind energy capacity remains below well below 5GW.
- The Pacific is doing well above Africa. it maintained a lead over Africa in wind energy capacity between 2010 and 2016
- it is not surprising therefore that no African country is seen in the top 10 countries in the renewable energy technologies. In wind energy, while Latin America has pushed ahead to exceed 10GW by 2015 (12.2GW) and reaching 15GW in 2016; Africa's wind energy capacity remains below well below 5GW.
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- it is not surprising therefore that no African country is seen in the global 10 leading countries in the renewable energy technologies

Table 5 : Regional capacity in hydropower,2016

Region	2016 Capacity MW	
	Capacity MW	Percent of world
Africa	33 524	2.7
East Asia and Pacific	457 473	36.7
Europe	223 008	18.0
North and Central America	200 922	16.1
South America	164 071	13.2
South and Central Asia	166 402	13.3
Total	1 245 500	100

- In hydropower generation in 2016, Africa contributed only 2.7% of global hydropower capacity as opposed to 16.1% from North and Central America, 13.2% from South America and 18% from Europe. All these regions have less population than Africa.

Source: International Hydropower Association, 2017.

Intra-continental marginality

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Table 6: Summary of top renewable energy generating countries, 2016

Renewable technology	Top countries				
	1	2	3	4	5
Wind energy	South Africa	Egypt	Morocco	Ethiopia	Tunisia
Hydropower	Ethiopia	South Africa	Egypt	Democratic Republic of Congo	Zambia
Solar	South Africa	Algeria	Morocco	Egypt	Ethiopia
CSP	South Africa	Morocco	Algeria	Egypt	
Bioenergy	Sudan	South Africa	Swaziland	Zimbabwe	Mauritius
Biogas	South Africa	Reunion	Mauritius	Kenya	Morocco

Out of about 50 countries in Africa, it is only 13 that account for significantly large proportion of Africa renewable energy capacity.

The balance of about 37 are not only marginal players or even non-players, they also excluded from the gains from renewable energy development.

South Africa is a major player in all renewable energy technologies.

Table 7: Combined capacity of top five countries relative to Africa capacity and population

Renewable technology	Combined capacity of top five countries (MW) ¹	Proportion of Africa capacity	Combined population (2016) ¹	Proportion of African population	Proportion of African population excluded from major players	Proportion contributed by South Africa
Wind energy	3637	96	296408034	24	76	38
Hydropower	15 318	46	271674073	23	77	11
Solar	2288	78	325388765	27	78	60
CSP	429	100	223565500	18	82	47
Bioenergy	656	64	114702780	9	91	14
Biogas	34	94	139193094	11	89	61

¹ population data is from <http://www.worldometers.info> (accessed 16/12/2016 and 05/09/2017)

The dominance of the five countries is above 90% of the African capacity in the case of wind, CSP and biogas.

The top five also control 78% in the case of CSP and 64% in the case of bioenergy. It is only in hydropower that the combined capacity is less than 50%.

In each of the renewables, it is also seen that the combined population of the top five countries is less than a third of the African population.

The five countries that generate 96% of African wind capacity contains only 24% of the continent's total population while in the case of solar energy, the top five countries that generate 78% of the solar energy capacity contains 27% of the population of Africa.

In wind energy, solar energy, CSP and biogas, the contribution of South Africa is above a third of the total capacity of Africa. it is as high as 60% in the case of solar energy, 47% in CSP and 61% in biogas. However, South Africa contains only about 5% of the population of Africa.

ACCOUNTING FOR MARGINALISATION

- **Investment factor:** Only few countries are captured on global renewable investment. This will partly explain the localization of renewable energy development and the emerging exclusion arising therefrom.
- Between 2012 and 2016, annual investment on renewable energy varied between 7.7 billion USD for Africa and Middle East with an average of 9.4 billion USD per annum. Brazil with a population of around 200 million has an average annual renewable investment of about 7 billion USD per annum.
- Again, marginality is observed even in investment. The leading investors are South Africa, Morocco, Kenya, Uganda, Ethiopia and Egypt.
- **Commitment to policy implementation:** : although, most African countries have policies and targets for renewable energy; most have fallen aback in implementing the policies and are grossly incapable of meeting the renewable targets.
- Setting unrealistic targets in the face of weak capacity including institutional weakness.
- The problem of balancing fossil fuel security with renewable energy drive.

Impacts of marginalisation

- One obvious impact of very low level of renewable energy development in Africa is large margin between its potentials and the realization of these. For example, Africa's hydropower generation is only 8% of its technically feasible potential.
- Africa's very poor showing in liquid biofuel means that when the global market is matured, Africa may not be there to share in the market.
- There is the case very low progress in electricity access. The proportion of people with access to electricity have remained virtually stagnant; changing only by 2% for the continent in 2014.
- Power outage has remained a regular feature of power supply in Africa. it is as high 2500 hours in Central Africa Republic.
- Employment impact: Employment in renewable energy in Africa is limited by the low level renewable development. The renewable employment in 2016 was 61 000 for Africa (IRENA, 2017). Out of this, 30 000 is from South Africa, 16 000 in North Africa and 15 000 from other parts of Africa. Africa's renewable employment is only 0.75% of world's 8 052 000.
- Limited application of Renewable energy. It is applied in limited and micro cases; street lighting and stand-alone building application of largely solar energy.

Reducing marginality

- Policy appraisal and realistic targets.
 - Pursue policy implementation with vigour
- Getting right renewable energy institutions.
- Finance: people-based and state-based.
- Mobilizing local development banks.
- State-supported private sector initiative that can lead to renewable energy system's revolution.
- Intra-continental collaboration: bilateral and multilateral.
- African Development Bank to get more involved in renewable energy development.
- The mobilization of all friendly green financing mechanism in the world.
 - Africa should key into the real technology of renewable energy through appropriate capacity building.