

Course CME 310

Solar Power for Africa



- Overview on Rwandan history.
- The role of NGOs and foreign aids in the development of Rwanda after the 94 genocide against Tutsi
- Situation of Electricity in Rwanda

By

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RWANDA



Capital (and largest city)

Official languages

Demonym

Government

President

Prime Minister

Independence (from Belgium)

Area

Water (%)

Population

Density

GDP (ppp)

Currency

Kigali

Kinyarwanda, English, French

Rwandan, Rwandese

Unitary parliamentary democracy and presidential republic

Paul Kagame

Pierre Damien Habumuremyi

1 July 1962

26,338 km² or 10,169 sq mi (138th/236)

5.3

2011 estimate: 11,370,425 (81rd/225)

2001 census: 8,162,715

419.8/ km² or 1,087.2/ sq mi (31st/241)

2011 estimate: total \$13.109 billion

per capita: \$1,284

Rwandan franc (RWF)



SABYINYO

Mountain Gorillas

Agaseke



Traditional dance

Traditional dance (Intore)

RWANDA SEASONS

- DECEMBER – FEBRUARY: SHORT DRY SEASON
- MARCH – MAY: LONG RAINY SEASON (HEAVY AND PERSISTENT)
- JUNE TO MID SEPTEMBER: LONG DRY SEASON
- OCTOBER – NOVEMBER: SHORT RAINY SEASON

Outline of the presentation

- History of Rwanda: pre-colonial, colonial and post-colonial
- Post genocide period: role of NGOs and Foreign aid in development of Rwanda
- Electricity situation in Rwanda: main problems and how they can be addressed

1.1. Rwanda as united nation with a common identity: pre-colonial period.

- In Ancient Rwanda, some issues proved unity in a society characterised by some diversities. Different authors come back on the pillars of this unit cohesion: proverbs; common activities; language; religion.

Ctd

A-Cultural issues

- Culture is defined here as the totality of socially transmitted behavior patterns, arts, beliefs, institutions, and all other products of human work and thought
- It is agreed that during many centuries Rwandan were sharing national feast like *umuganura* (*First- fruits festival*); *morning feast* (*umunsi wa gicurasi*)
- Traditional religion: belief in one God “Rurema” who does not need any gift because of his kindness. Other cults like *kubandwa* were not only a way of worshiping but also a sign of friendship and an occasion for local feast with neighbours. People who did *kubandwa* were considered as one united community.
- The language Kinyarwanda was another important unifying component with its proverbs; songs; legends; etc.

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- Values such as kindness, love, tolerance were encouraged in ancient Rwanda.
- Cowardice; jealousy; avarice; to kill were discouraged. To kill was fought by *guhora* (to revenge) and a bride of unity could be offered between two families.

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B-Social issues

- Lineages
- Clans were shared by different social classes and people were happy to host members of the same clan as they share a same totem.
- Socialization process (*amatorero, imbohero*)
- Conflict resolution (*gacaca*). The aim of justice was not to punish people but to reconcile them.
- Blood pact (*kunywana*); intermarriages between different social classes

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C-Political issues

- The process of integrating chiefdoms clan based started many centuries ago – from Rwanda rwa Gasabo. Different institutions helped to shape a national identity:
- Eg: the king was called Sebantu, Father of all lineages. The consensus agreed that he came from one clan.
- The defense of the national territory was done by all Rwandans. Abatwa were known as competent fighters.

Ctd

D-Economic aspects

- In ancient Rwanda, some activities were done together, and symbolized unity of Rwandans: *ubudehe*; *umubyizi*; *umuganda*
- Barter exchange favoured also unity not only between Rwandans themselves but also with neighbouring countries:



Courtesy of ORINFOR

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“The big profit that one could have from his first journey in Rwanda was to create himself friends who could host him. These friends earned from barter trade guided the tradesmen in the market. Thereafter, this friendship was materialized by the pact of blood between the two parts exercising a moral constraint.”

(Bishikwabo Chubaka, in A. Nyagahene, 1979:164)

1.2. Deconstruction of National Identity

- 1.2.1. Colonial period
- By using hamitic myth, colonisers deconstructed sociological aspects of Rwandan society by presenting social groups as completely different, one superior to the others (L de Lacger, 1959; R.Heremans, 1973; JJ Maquet, etc)
- The superior group was depicted as born to rule and others to be dominated (L.de Lacger, 1959:

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- In this regard and due to racist ideology, some missionaries and explorers' writings linked Tutsi to Europeans because they thought no Black people was able to create organized kingdoms as they found them in Central Africa.

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- This was concluded by an official exclusion done during the Mortejan Reforms during the 1920s. The power was given mainly to Tutsi chiefs (IRDP:2005)
- Bishop Leon Class pushed Belgian authorities to be caught in this trap.

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- “The greatest mistake this government could make would be to suppress the Mututsi caste. Such a revolution would lead the country directly to anarchy and to hateful anti-European communism. (...) We will have no better, more active and more intelligent chiefs than the Batutsi. They are the ones the population likes best. The government must work mainly with them”. L de Lager, 1959:523; G Prunier: 26.

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- This Mortehan Reform put an end to a trilogy of chiefs from all three social groups. Thus the social cohesion was endangered.
- The hard measures (whips) taken during imposed works were considered by the population as a punishment from local chiefs.

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- A change was done after World War II when the Rwandan elites started claiming independence or more participation in decision making bodies.
- Belgian administration chose to collaborate by the social group (Hutu) which was excluded from power. Many examples show this new shift.
- The 1950s was characterized by the creation of political parties and different Councils to allow Rwandans to participate more actively in decision making organs.

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- Most of parties which were created had an “ethnic” or regional background. The society was somehow polarized as the colonial administration in collaboration with the Catholic Church decided to back Hutu who were somehow not integrated in high decision making organs.
- The polarization was followed by violence of 1959 and onwards and which pushed most of Tutsi to exile.

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- Independence of Rwanda was gained in 1962 in a divided atmosphere.

1.3. Post colonial era: end or continuity of lack of social cohesion?

- Both two republics (1962-1994) did not manage to recover social cohesion disrupted during colonial period. Regionalism and social divisionism were main hindrances.

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- Another hindrance of social cohesion from the 1950s was the refugee problem.
- Both republics did not manage to have a clear policy to integrate them in daily life.
- The policy based on regional and “ethnic group” quota in job and education was exploited by southern *prefectures* under the first republic and north-western prefectures under the second republic to exclude tutsi and other regions.

- Eg: From 1981 to 1988, only three prefectures got the majority of scholarship to study abroad:

Prefecture	Nr of Students
Gisenyi (NW)	297
Ruhengeri (N)	205
Kigali	138
Gitarama (Centre)	130
Byumba	123
Butare (South)	109
Gikongoro (South)	84
Cyangugu	72
Kibungo	62
Kibuye	62

Ctd

- Job seekers and people recruited in 1989

Job seekers	Nr	%	Ethnic group	Nr	%
Hutu	4,240	80.3	Hutu	1,985	85.4
Tutsi	1,022	19.3	Tutsi	332	14.3
Twa	13	0.3	Twa	6	0.2
Natural	4	0.1	Natural	2	0.1
Total	5,279		Total	2,325	

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- From 1978 to 1990, three *prefectures* out of 10 (Gisenyi, Kigali, Ruhengeri) received 51% of the national budget against less than 25% for Gikongoro, Kibuye, Cyangugu and Kibungo. (IRDP, 2005: 122).

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- Rwandans in exile did not accept to remain out of their home country. They had tried to come back by force in vain. There was always a retaliation on Tutsi in Rwanda.
- They launched an attack in 1990, when Rwanda was facing economic problems due to the shortcut of exported commodities prices on the international market. The UN effort to sort out this refugee problem were also vain. In addition, some intellectuals inside Rwanda were claiming democratic regime.

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- When the Presidential plane was grounded in Kigali from peace talks in Dar-es-salam (Tanzania), the genocide to exterminate Tutsi and moderate Hutu was executed. Most of 1 million people died.

Efforts to reunite after 94 genocide

- National unity and reconciliation commission
- Different commissions and programmes aimed at promoting social justice in Rwanda as embedded in the constitution (Office of Ombudsman, SFAR, National Examination Council, National Commission for Human Rights, etc)
- Promotion of gender
- Reintegration of former/recent refugees in daily life and reintegration of FDLR fighters
- Revision of history programmes.
- Gacaca/community justice

Diplomacy and International Relations

Understanding Rwandan Foreign Policy

Background

- **From independence to 1994:** though with the indep. The country regained its right to elaborate and implement its own policies (economy, social welfare, international relations, cooperation, etc.), a close analysis of the post-independence history of Rwanda shows that until 1994, the former leaders of the country had not adopted a stable policy.

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- The political orientation in the field was characterized by:
 - A foreign policy aligned with those of some countries, notably the former colonial power (Belgium) and France.
 - Attempts to export the sectarian and discriminatory policies in the region through the support to organizations aimed at sowing divisions such as MAGRIVI (Mutuelle des Agriculteurs des Virunga
 - Keeping in exile hundreds of thousands of refugees and their continuous destabilization

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- **The post-genocide period:**during this period, RPF adopted a foreign policy advocated in its political programme. Rwanda sought to rebuild relations with other countries based on the safeguard of national integrity and sovereignty, respect and promotion of mutual interests as well as the principles of sovereign equality and complementarity among nations.

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- The country's foreign policy hinges on two major pillars which are building peace and security and creating wealth through development cooperation, attracting foreign investments, promotion of tourism and access to foreign markets.
- In the absence of a sector policy document, Rwandan has some achievements.

1. Some achievements of Rwandan foreign policy

- Rwanda has played a positive role in all recent peace process in the region, particularly in Burundi, DRC and within the International Conference on the Great Lakes Region.
- Rwanda is also the biggest contributor of troops to the AU mission in Darfur.
- Rwanda was the member of the Peace and Security Council for 2006-2008 of the AU and the NEPAD Heads of State and Government Implementation Committee and was together with Ghana the first country to subjected to the African Peer Review Mechanism (APRM).

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- Due to Rwanda's commitment to build a strong African Union and its new image throughout the world, Rwandans are given high responsibilities in international organizations.
- There is also the satisfactory level of mobilization of bilateral and multilateral development assistance that has been achieved despite the active opposition to it by some Rwandan political refugees, international NGOs and even some countries.

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- In addition to traditional partners, new partnerships have been established and countries like the United Kingdom and Sweden are amongst those that give to Rwanda high quality development assistance. Other countries like South Korea, Singapore and India are also in the process of joining.

2. Constraints and Opportunities

- **Constraints and opportunities with respect to building peace and security:**
 - The continuing presence in DRC of the forces which perpetrated genocide in Rwanda
 - The war launched by Rwanda for removal of the security threat due to the presence of ex-FAR/Interahamwe in the East of th DRC destabilized the enormous and powerful interests of several companies or governmental or non governmental international organizations which in turn launched a massive smear campaign against Rwanda with harmful consequences.

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- That war brought about a feeling of humiliation among Congolese citizens which some politicians from DRC exploit by launching a hatred campaign against Rwanda
- The fighting between Uganda and Rwandan armies in Kisangani harmed the excellent relations between the two countries and this has been often a source of tensions between the two countries

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- The conditions and circumstances that led to the 1994 change of regime in Rwanda, as well as the behavior of the international community during those events have destabilized relations between Rwanda and some neighboring or distant countries
- The instability in the region has left behind major challenges (illicit arms race, many combatants to be disarmed, etc).

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- **Constraints and opportunities with respect to creating wealth:**
- Some countries have not yet decided to resume their relations of cooperation with Rwanda to the level of prior 1994 genocide.
- The weak relationship with Scandinavian countries, South-East Asia countries (Singapore, Malaysia, Thailand, Vietnam, etc.), which could potentially contribute to Rwanda's economic development.

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- The country's image is still marked by the genocide and its consequences. The image of a small country with no substantial natural resources, still unstable and located in a region infested with conflicts still hinders the expansion of tourism and investment from abroad
- The tariff and non tariff barriers lead to an unjust world trade that penalizes developing countries.
- MINAFFET recognizes that the Rwandan Diaspora can play an important role. However, there is still in this Diaspora several groups bent on destabilizing Rwanda

NGOs

- NGOs: Non-governmental organization (NGO) widely accepted for referring to a legally constituted, non-business organization created by natural or legal persons with no participation or representation of any government.
- In the cases in which NGOs are funded totally or partially by governments, the NGO maintains its non-governmental status insofar as it excludes government representatives from membership in the organization
- Civil society organizations (CSOs)
- 128 NGOs registered in Rwanda and operating in different districts

Role of NGOs in aftermath of Rwanda genocide

- In the aftermath of the genocide, civil society organizations (CSOs) emerged to help in addressing social needs, including assistance to widows and orphans, child-headed households, and traumatized survivors.
- Today, CSOs continue to provide essential social assistance to the Rwandan people. Approximately 80 percent of CSOs in Rwanda carry out health and education-related activities, while 20 percent provide other social services.

Role of NGOs in aftermath of Rwanda genocide

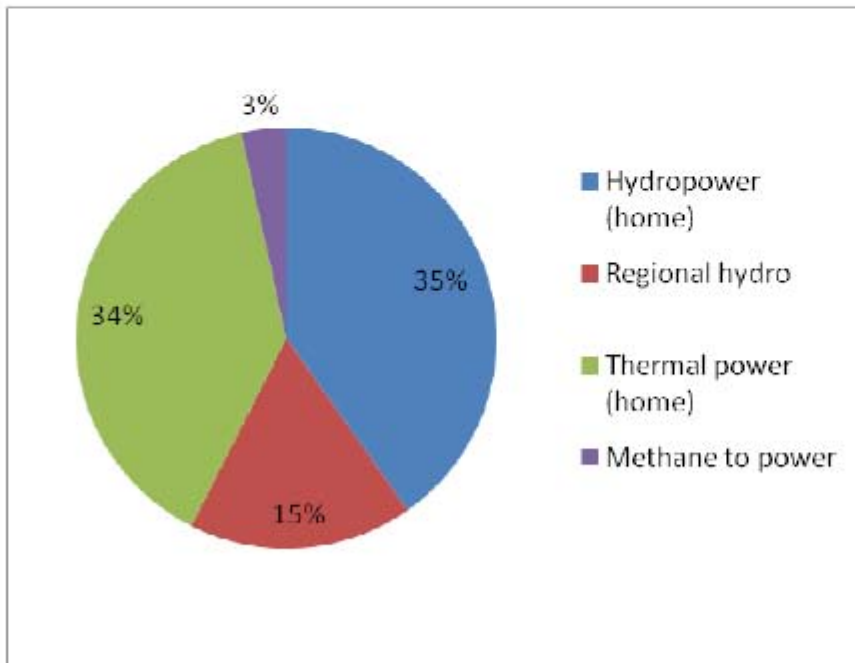
- Aid effectiveness: transparent in the management of resources, minimize the operational cost, development activities with impact on the ground.
- Should not get engaged in subversive political activities or present the government programmes as their owns to get more funds.
- The 4 social conditions that give rise to the persistence of poverty and hunger in Africa: marginalization of women food farmers, poor leadership, too little investments in building people's capacity in rural areas and AIDs and gender inequality

SITUATION OF ELECTRICITY IN RWANDA

Electricity Generation

The available electricity generation capacity in Rwanda by July 2009 is at 69 MW and is produced from:

- Hydro power (home): 35%
- Regional Hydro power: 15%
- Thermal power (home): 34%
- Thermal power (rental): 13%
- Methane to power: 3%



Electricity Generation Capacity (MW) – Rwanda July 2009 (grid- connected)

Category	Name	Installed Capacity (MW)	Available Capacity (MW)
Hydropower	Ntaruka	11.5	7.25
	Mukungwa	12	12
	Gihira	1.8	0.7
	Gisenyi	1.2	0
Regional Hydropower	Rusizi I	3.5	3.5
	Rusizi II	12	8
Thermal Power	Jabana HFO	20.5	20.5
	Jabana Diesel	6.24	4.8
Rented Thermal Power	Gikondo Diesel	10	10
Solar Power	Kigali Solar	0.25	0.25
Methane Gas	KP1	4.2	1.8
Total		85.3	69.10

Figure 5 Transmission grid and location of generation

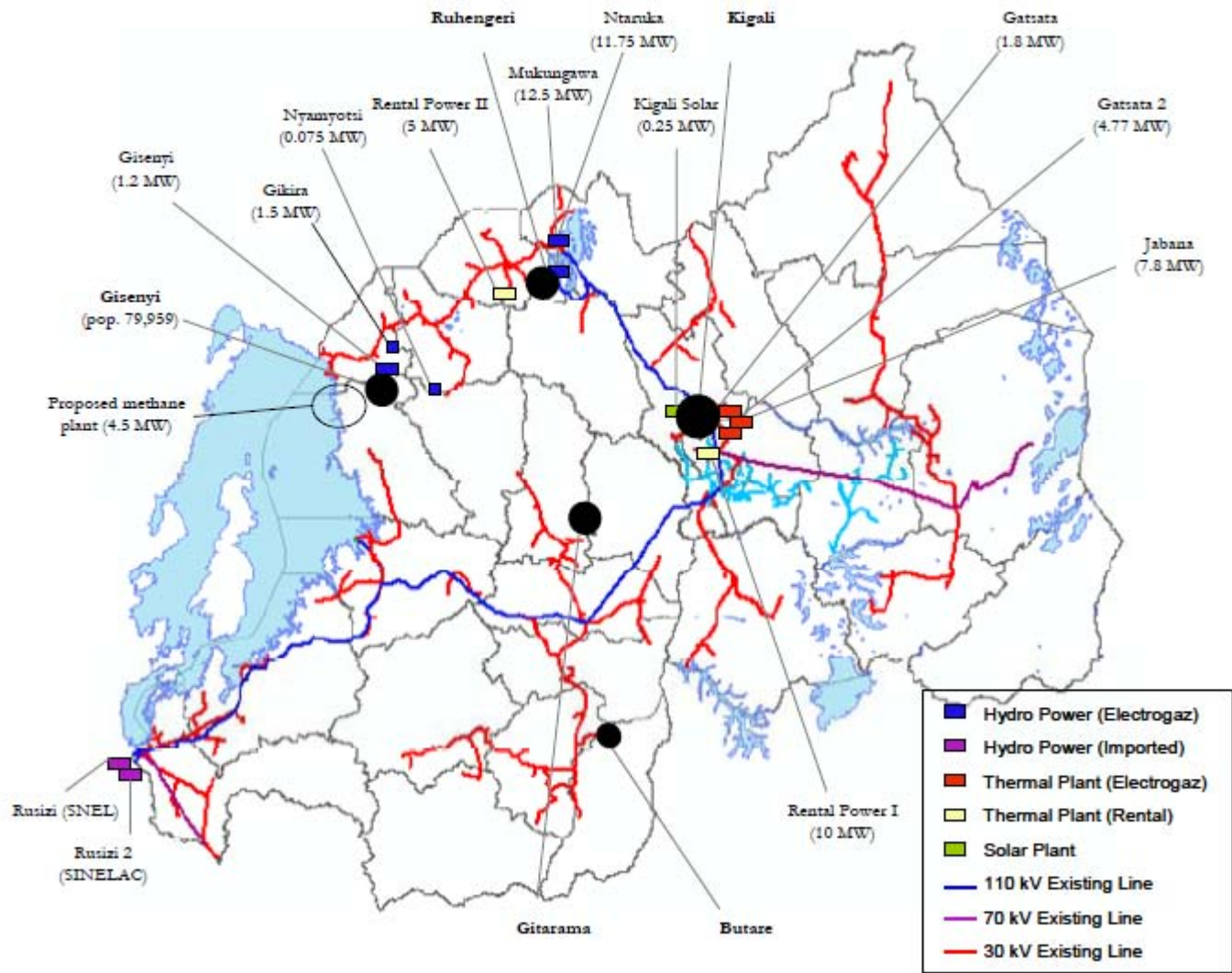
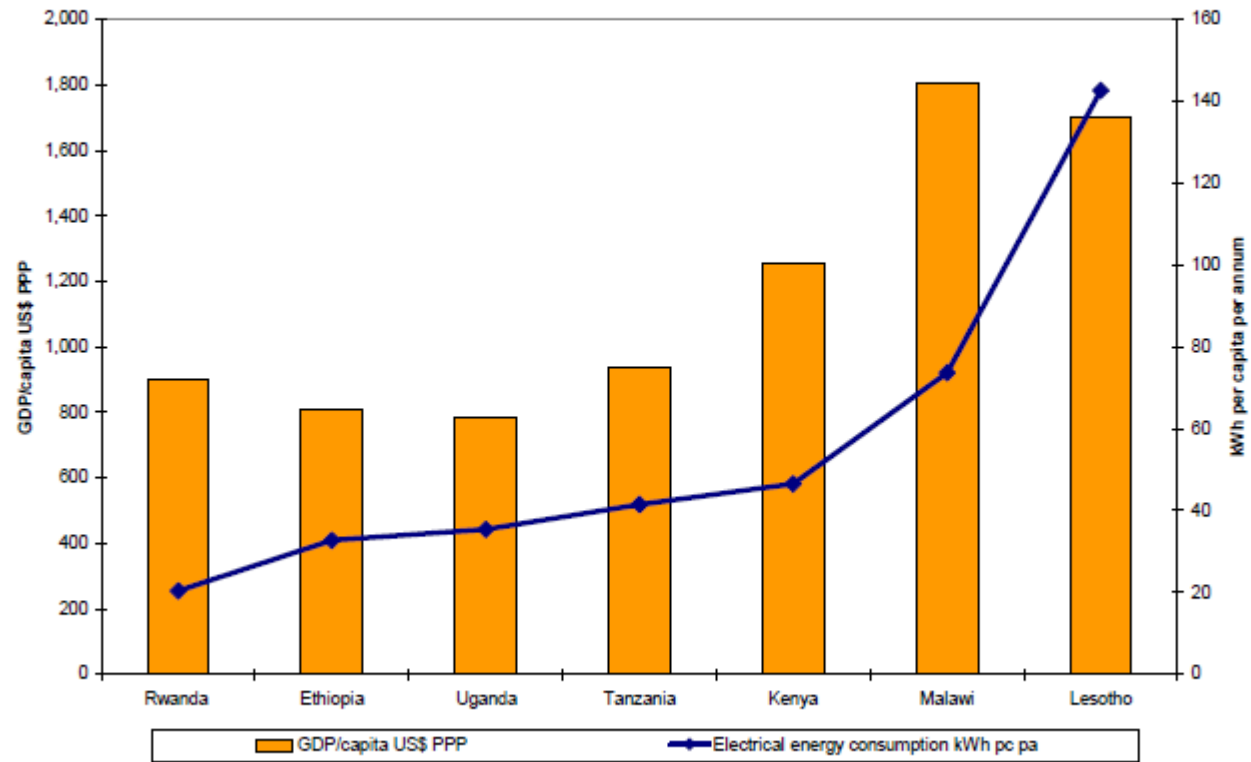


Figure 2 Comparative data on electricity consumption



Sources: IMF for economic data, national utilities for electricity data. PPP = purchasing power parity.

SOLAR OVERVIEW

- Sun very basis of the existence of life on our planet and is the
- Driving force behind other sources of energy such as wind, biomass and hydro.
- Sunlight can be transformed into electrical energy through solar photocell systems.

In Rwanda, solar energy has been exploited in recent decades by

- ❖ local and international organizations for the electrification of churches, schools and households in rural areas
- ❖ The potential for solar energy in Rwanda is **4.5-5.5 kWh/ m²/ day** at an average of 8 hours of sunshine a day.
- ❖ However, the relatively high cost of solar systems has been a barrier to widespread dissemination until now.

Currently, solar energy is mainly used for two purposes in Rwanda:

1. Electric power production through solar photovoltaic systems
2. Direct heating, for example solar water heaters

Average Solar insolation figures (Measured in kWh/m²/day onto a horizontal surface)

1. Rwanda/Kigali

☀️	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	4.86	5.15	4.9	4.77	4.65	4.77	5.08	5.03	5	4.62	4.48	4.5

2. Germany/Muenchen

☀️	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1.12	1.94	2.94	4.1	5.09	5.29	5.29	4.65	3.2	1.9	1.15	0.86

3. USA/Los Angeles

☀️	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	2.93	3.62	5.12	6.6	7.49	7.83	7.54	6.87	5.7	4.45	3.34	2.73

4. Australia/Brisbanne

☀️	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	6.19	5.39	4.95	3.98	3.23	3.02	3.22	4.04	5.12	5.52	6.07	6.35

5. South Africa/Johannesburg

☀️	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	6.59	6.02	5.48	4.84	4.3	3.96	4.27	5.05	5.88	5.96	6.45	6.67

There are 6 players active in the Rwandan solar energy sector

1. SECAM
2. MODERN TECHNICAL SERVICES (MTS)
3. DAVIS & SHIRTIFF
4. GREAT LAKES ENERGY
5. EPS RENEWABLE
6. SOLAR ELECTRIC LIGHT FUND (SELF)

They are the primary repositories of solar skills as well as a number of independent contractors.

Table 1: A Summary of Current Solar PV Market Activities in Rwanda

Solar PV technology	Size of opportunity	Estimated kWp installed/year (2008)	Notes
Government administrative centres	>0.4 MWp	±15 kW	Good government contacts required
Government clinics and schools	>1 MWp	±40 kW	World Bank, EU, Belgium
NGO & NGO health sector	>0.3 MWp	<±5 kWp	PEPFAR
Solar Home System	>4 MWp	N/A	Low rural spending power
TOTAL	>6 MWp	>50kWp	

Table 4: The SHS Market in Rwanda

Type of solar home systems	Size of system (Wp)	Estimated % of households buying	Total number	Size of market (kWp)
No System	0	55.0%	944,690	-
Micro Systems	2	35.0%	601,168	1,202
One Light & Radio	10	7.3%	124,527	1,245
Two light and radio system	20	2.0%	34,352	687
Four light system or higher	50	0.5%	8,588	429
Larger systems (inverter or hybrid)	150	0.3%	4,294	644
TOTAL		100.0%	1,717,618	4,208 kWp

Rubaya Health Center



Synergy Rwanda



- K-Light Solar Lantern
- Solar power system installation in East Africa



Kirambo Health Center



Solar Electric Light Fund (SELF)



Installation of solar power to PIH clinics in Eastern Rwanda.

- ✓ Supply of solar energy for refrigeration
- ✓ Computer recordkeeping
- ✓ In labs, powers microscopes, blood analysis machines, centrifuges, sterilization devices



Photovoltaic park on a hill near Kigali: Kigali Solar (peak output of 250 kW). Installation by **Mainz's utility Company (Rhineland-Palatinate/Germany)**



Solar Light for Africa (SLA): Non-profit Christian organization whose mission is to transform lives and empower the people of Africa by providing light and energy using the natural power of the sun.



Izuba (sun) energy solutions (local company): goal is to indulge in the renewable energy developments



Ministry of infrastructure(MININFRA) Project: Idea of Solar Kiosks, which will consist of a central solar battery charging station, where rural communities can rent charged batteries for a small fee to power their lighting and equipment at home.

Solar Power for Africa in collaboration with **Solar Light for Africa**

