

**Project for Establishment of Rural Electrification Model
Using Renewable Energy in the Republic of Kenya
(JICA Assistance Project)**

**Project Description
for the Pilot Project
(Lot 1: Solar PV System)**

October 2012

Rural Electrification Authority (REA)

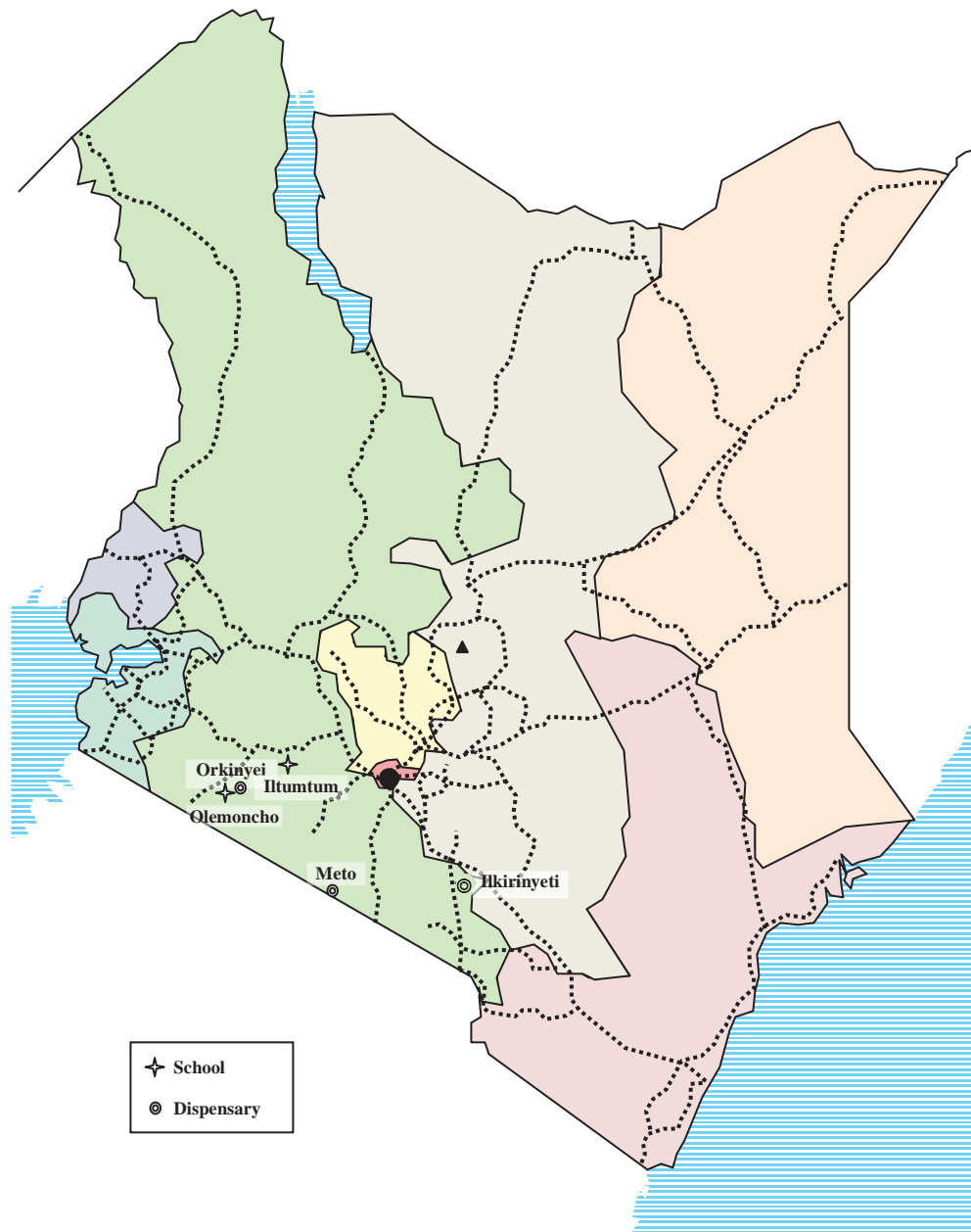


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List of Electrical Terminology

A (Ampere)	Unit of current
V (Volt)	Unit of voltage
kV (kilovolt)	1,000 volts
W (Watt)	Unit of active power
kW (kilowatt)	1,000 watts



Pilot Project Location Map (Lot1: Solar PV System)

Approximate Distance to the Sites

Nairobi – Ilkirinyetti	180 km
Nairobi – Meto	190 km
Nairobi – Itutmtutm	150 km
Nairobi – Olkinyei	200 km
Nairobi – Olemoncho	230 km

1. Project Outline

“Project for Establishment of Rural Electrification Model using Renewable Energy” is being implemented by the Government of Kenya in Cooperation with the Japan International Cooperation Agency (JICA).

REA and MoEn are responsible organizations in the Project.

1.1 Project Objectives

The project aims to establish practical models for rural electrification using renewable energy in public facilities (schools and health centers).

1.2 Overall Goal

Rural electrification models using renewable energy are disseminated to improve the quality of life of Rural Communities in Kenya.

1.3 Project Purpose

Rural electrification models using renewable energy are established.

1.4 Project Outputs

- (1) A practical model for electrification of health service institutions in non-electrified areas using solar PV is developed through pilot projects.
- (2) A practical model for electrification of schools in non-electrified areas using Solar PV (Photovoltaic) is developed through pilot projects.
- (3) Necessary policy and institutional frameworks for spreading the models for rural electrification using renewable energy are recommended.

2. Lot 1 Projects (Electrification of Public Facilities: Health Center and Schools)

2.1 Background and Current Situation

Kenya has sufficient experience in introducing PV systems into rural areas since the 1990's. As a result, many PV companies and shops were established and are an expanding business in Kenya. There are many PV shops, not only in Nairobi but also in many rural towns. It is not difficult to find houses with PV systems in most rural communities. According to a World Bank (WB) report, around 300,000 Solar Home Systems (SHS) have been installed in Kenya so far. A Dutch company, Ubbink has a panel assembly factory in Naivasha, whose maximum production capacity is around 10MW per year. The retail price of

the company's panels is around 180-200KShs/W (larger panels are cheaper). The price level is very competitive in comparison to Chinese companies' panels.

REA was established in 2007. Its mission is to promote rural electrification using Rural Electrification Programme Fund (REPF), which is sourced through a 5% surcharge on electricity sales. REPF is mainly used for grid electrification, though some part of it can be used for off-grid rural electrification using renewable energy. REA has installed 64 PV systems in rural boarding schools and dispensaries using REPF.

Based on its experiences, REA has developed a design method for PV systems, composed of systems for schools, dispensaries and their staff quarters. The method is very reasonably formulated. For example, PV systems at dispensaries have a larger battery capacity to ensure longer autonomy days. Installation of PV systems is also well achieved. Taking these into consideration, Kenya has sufficient PV technologies in terms of design and installation. On the other hand, the PV systems which were installed more than 4 years ago have problems with battery replacement. Most of these batteries come to the end of their life span and are not replaced because of financial difficulties. Long-term sustainability of PV systems in rural areas is still a challenge in PV rural electrification.

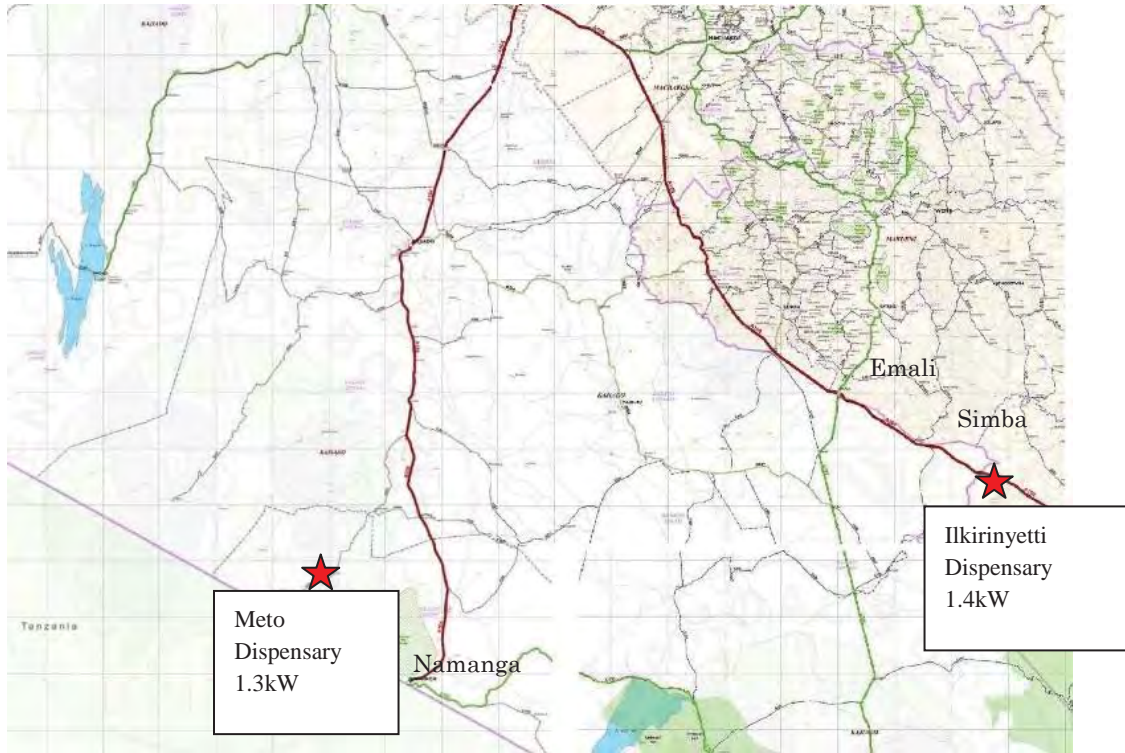
2.2 Selected Facilities and their locations

The following sites have been selected for the Lot 1 pilot projects.

Table 2.2.1 Lot 1 Sites

Community	Type	District	County	Location Map
Ilkirinyetti	Dispensary	Kajiado Central	Kajiado	Figure 2.2.1
Meto	Dispensary	Kajiado South	Kajiado	Figure 2.2.1
Iltumtum	Primary Boarding School	Narok North	Narok	Figure 2.2.2
Olkinyei	Dispensary	Narok South	Narok	Figure 2.2.2
Olemoncho	Primary Boarding School	Narok South	Narok	Figure 2.2.2

Prepared by JICA Expert Team



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Figure 2.2.1 Location of Lot 1 Sites in Kajiado



Prepared by JICA Expert Team

Figure 2.2.2 Location of Lot 1 Sites in Narok

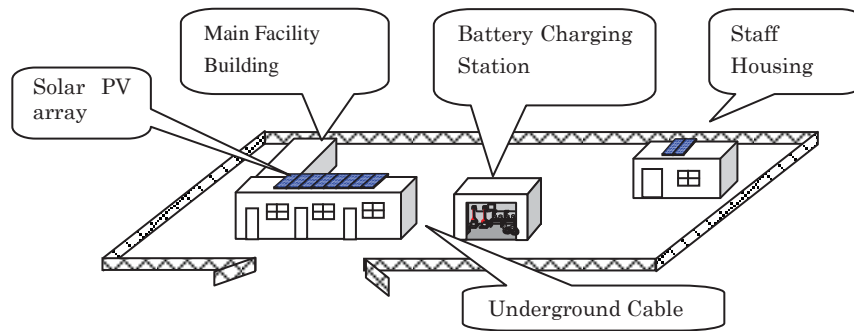
2.3 Solar PV Systems

Table 2.2.2 shows Solar PV systems for Lot1. Figure 2.2.3 shows a layout image of Lot1.

Table 2.2.2 Lot 1 PV Systems

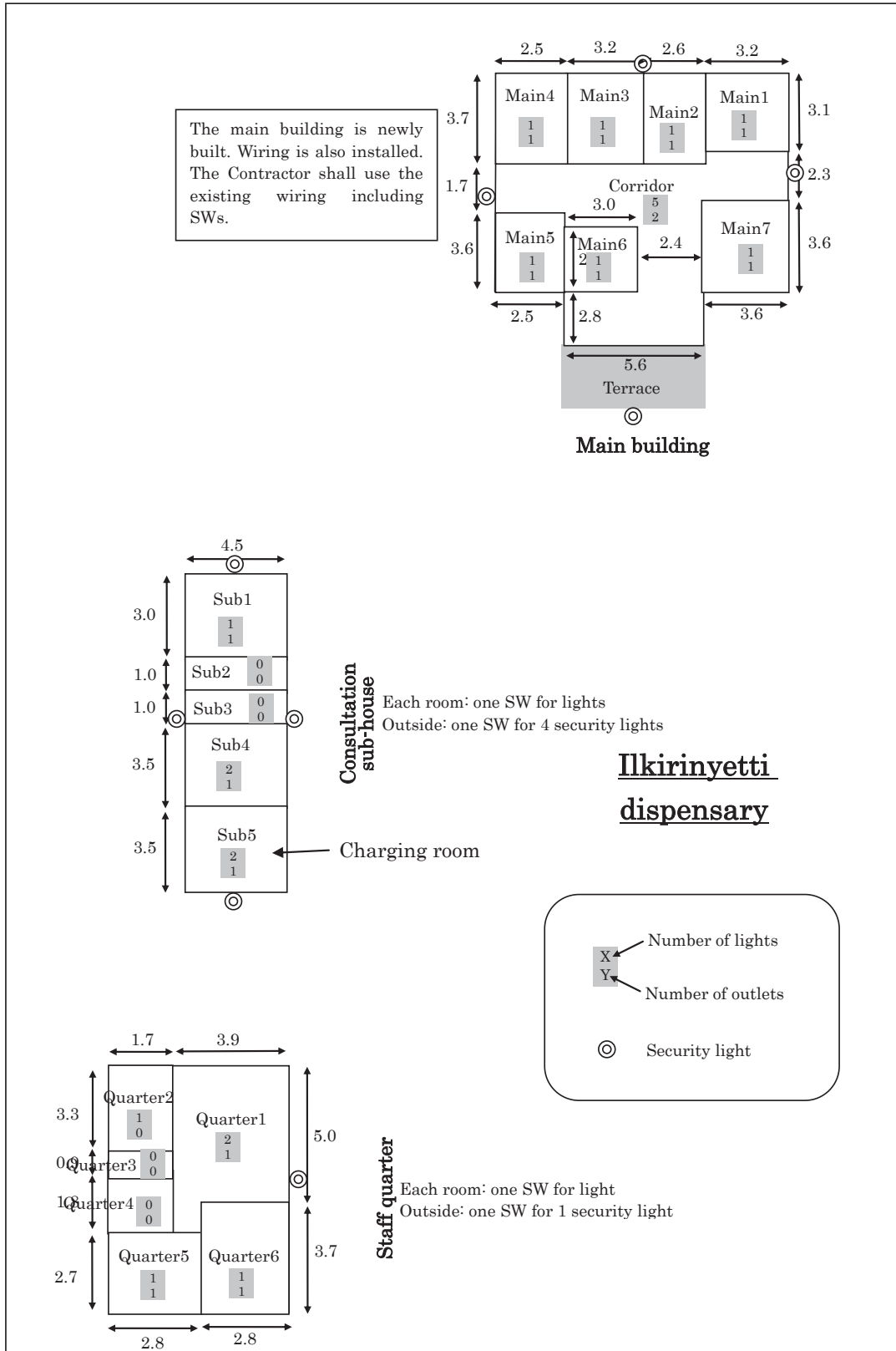
Community	Type	PV size	Drawing
Ilkirinyetti	Dispensary	1.4kW	Figure 2.2.4
Meto	Dispensary	1.4kW	Figure 2.2.5
Iltumtum	Primary Boarding School	4.2kW	Figure 2.2.6
Olkinyei	Dispensary	1.1kW	Figure 2.2.7
Olemoncho	Primary (Boarding) School	3.0kW	Figure 2.2.8

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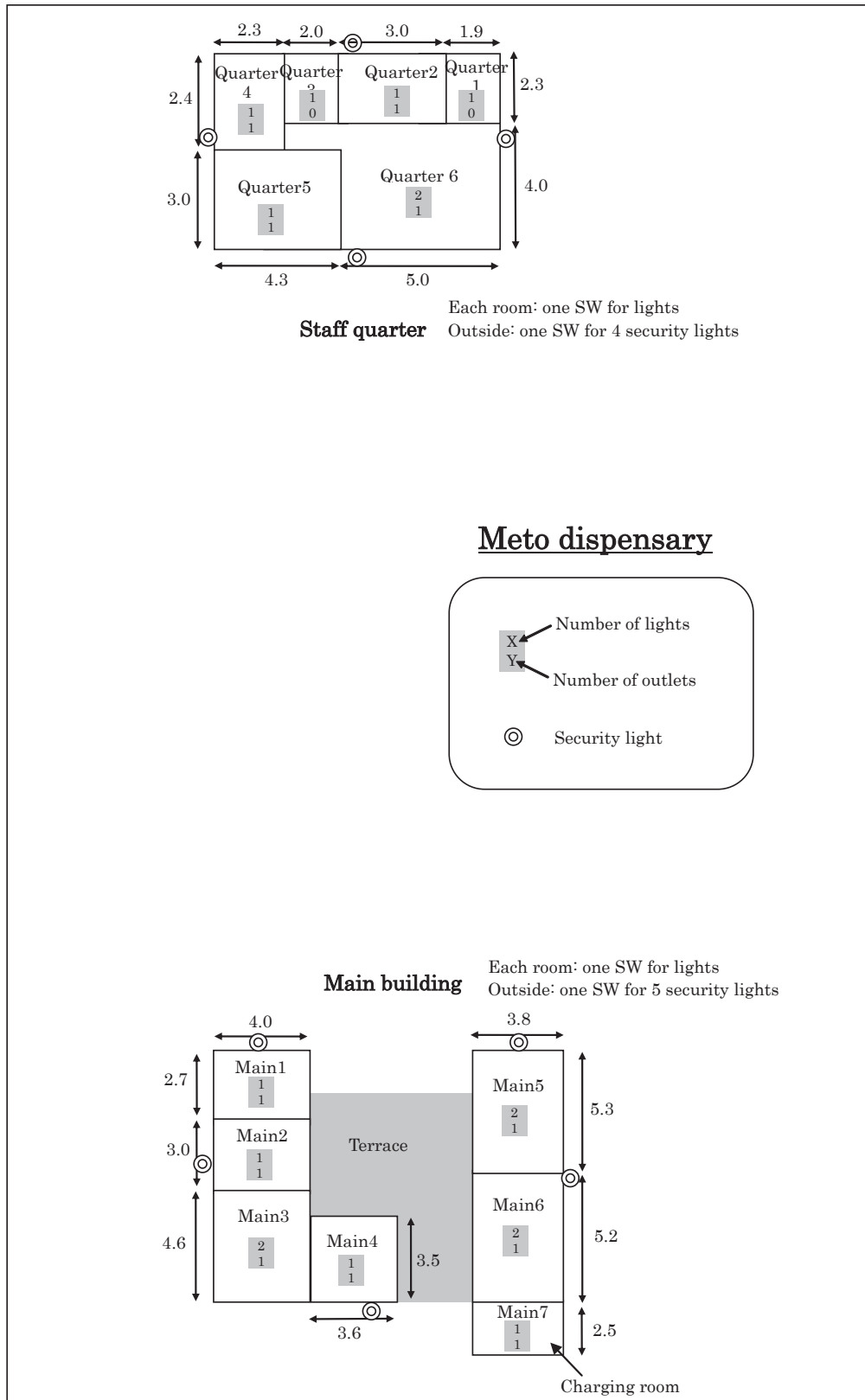
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Figure 2.2.3 Layout Image of solar PV facility of Lot 1



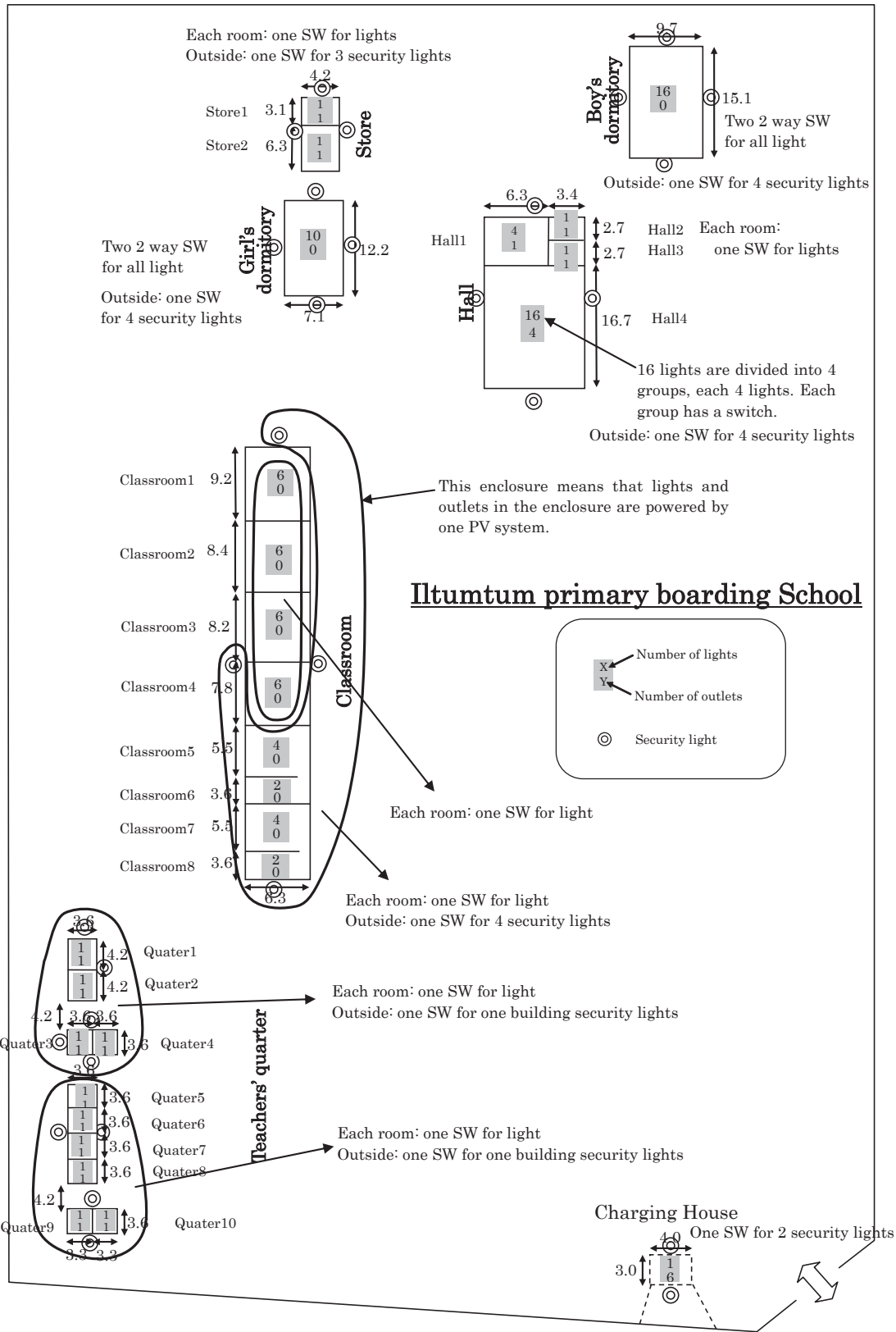
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Figure 2.2.4 Drawing of Ilkirinyatti dispensary (Lot1: Solar PV system)



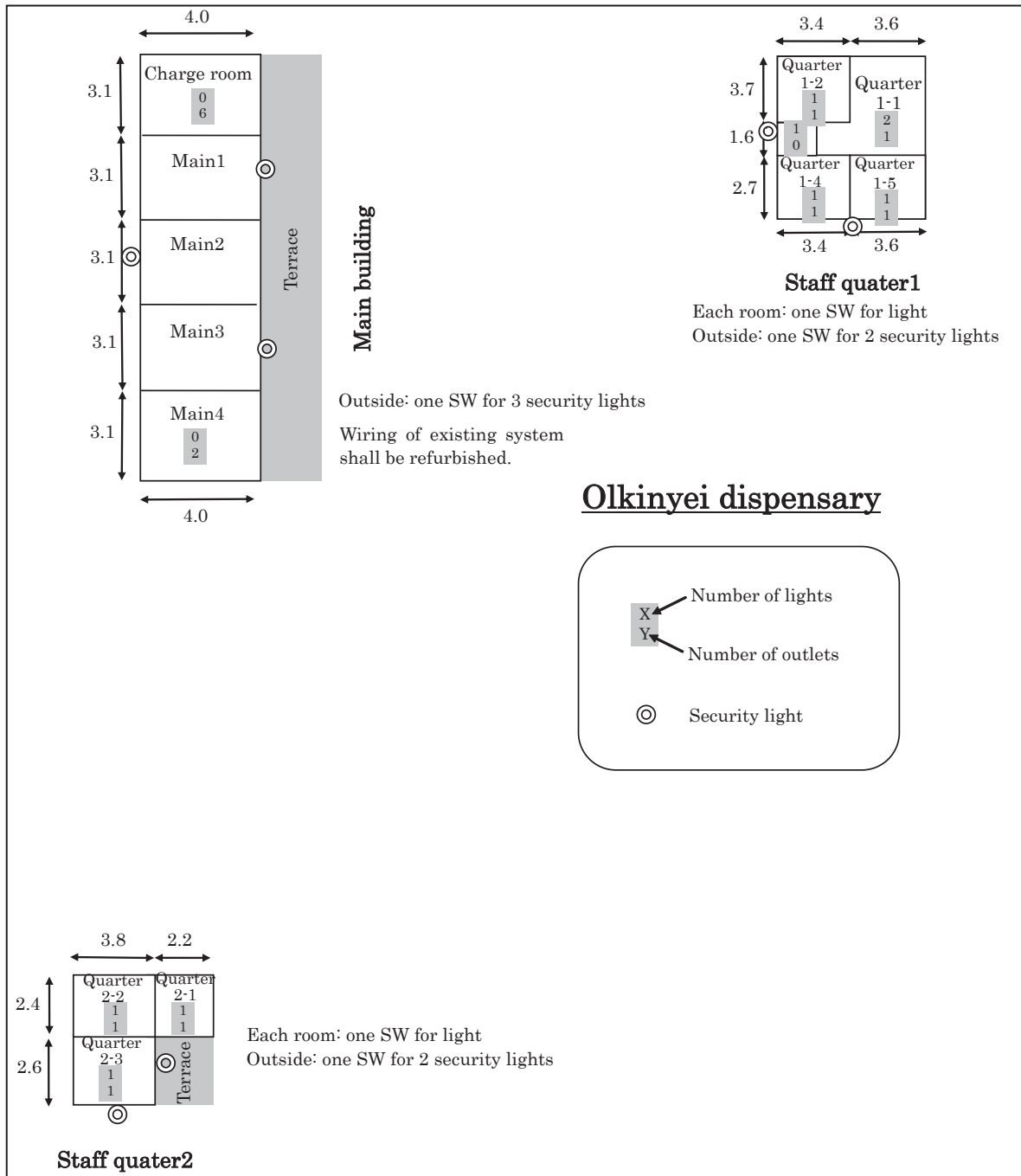
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Figure 2.2.5 Drawing of Meto dispensary (Lot1: Solar PV system)



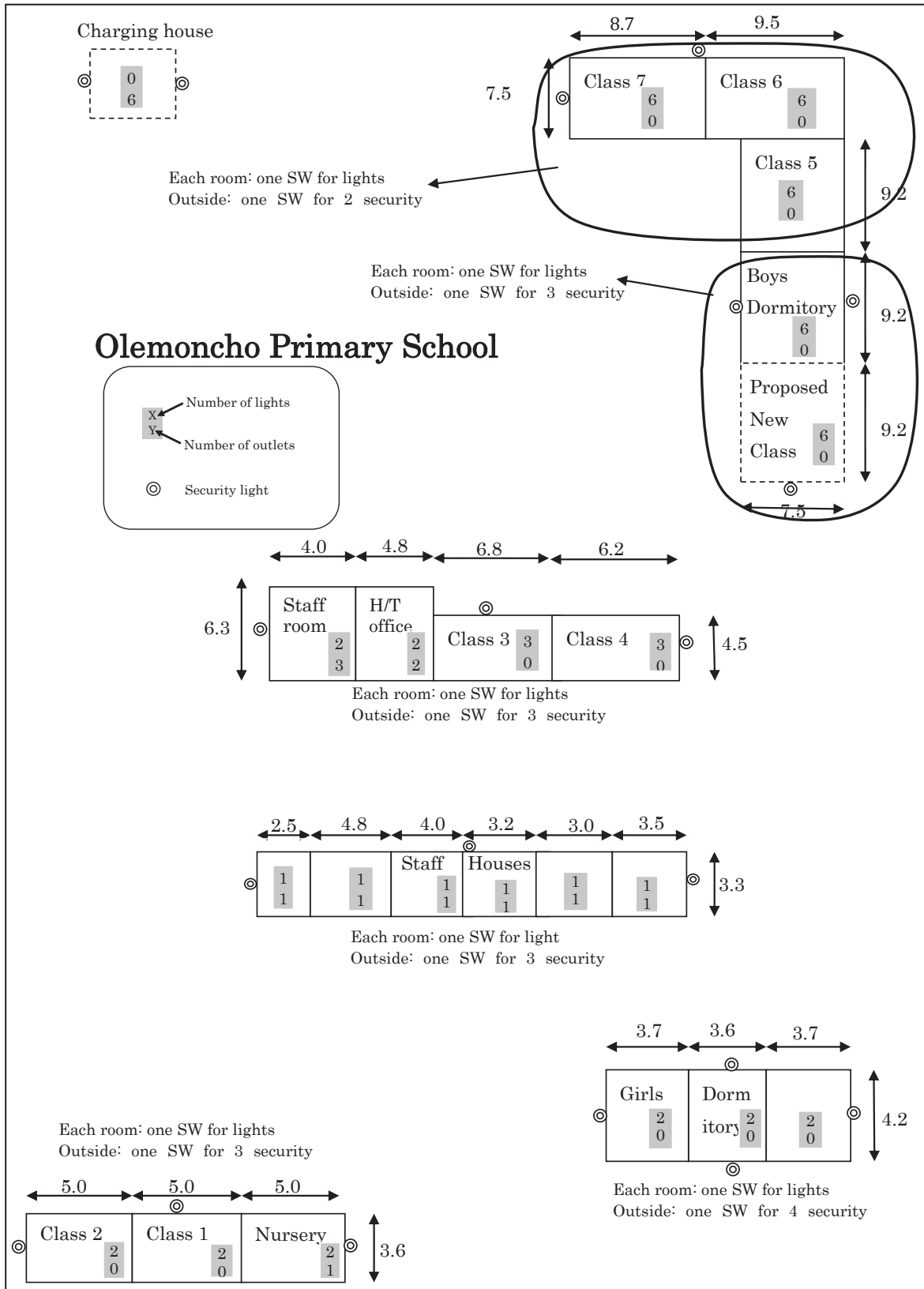
Prepared by JICA Expert Team

Figure 2.2.6 Drawing of Iltumtum primary boarding School (Lot1: Solar PV)



Prepared by JICA Expert Team

Figure 2.2.7 Drawing of Olkinyei dispensary (Lot1: Solar PV system)



Prepared by JICA Expert Team

Figure 2.2.8 Drawing of Olemoncho primary boarding School (Lot1: Solar PV system)

2.4. Stakeholders Meeting

Stakeholders meetings were held at each Lot 1 site, the outline of the project and the concept of Community Solar System shared with the project participants. The role of each stakeholder was explained to the staff of relevant ministries (education and health) at the district offices, management of the target public institutions, management of the target communities and some users.

3. Surrounding Environment and Social Situation of Lot 1 Sites

Table 2.2.3 and 2.2.4 summarize the surroundings of Lot sites

Table 2.2.3 Surroundings of Kajiado Sites

	Ilkilnyeti	Meto
Facility	Dispensary	Dispensary
District	Kajiado Central/ Kajiado County	Kajiado South/ Kajiado County
1. Site	<ul style="list-style-type: none"> ✓ 1 main building with construction almost complete (i.e. drainage and sewer infrastructure) ✓ 2 buildings which are fairly in good conditions ✓ 1 Concrete structure water tank ✓ One plastic water tank, approximately 1000 litres capacity ✓ 1 double door pit latrine ✓ 1 single door pit latrine ✓ No fence around the facility 	<ul style="list-style-type: none"> ✓ Two permanent buildings: The dispensary block and a block (near completion) housing 2 dispensary personnel ✓ Two blocks of double door pit latrines ✓ The dispensary is enclosed by a live fence and access is by a metallic gate
2. Topography	<ul style="list-style-type: none"> ✓ Generally flat 	The site has a gentle slope, with the slope taking a north easterly direction. General topography is rugged marked by alternating hills and valleys.
3. Soils and geology	<ul style="list-style-type: none"> ✓ The soils are characterised by fairly deep red volcanic soils ✓ The rocks are also of volcanic origin but having gone through some weathering process. 	<ul style="list-style-type: none"> ✓ The site is generally characterised with red volcanic soils ✓ The site has no visible rocks exposed to the surface
4. Flora & Fauna	<ul style="list-style-type: none"> ✓ The site and surrounding vegetation is majorly stressed shrubs and thorny acacia as is the common characteristic with arid and semi arid climatic conditions. 	<ul style="list-style-type: none"> ✓ The site and the general surrounding area is characterised by acacia trees, euphobia and scrubs denoting aridity of the area
5. Water & Sanitation	<ul style="list-style-type: none"> ✓ No natural stream, spring within or any natural water body in the immediate vicinity (at least not within 2kms radius) ✓ No piped water network available for the site ✓ A bore hole was sunk within a 500 metres radius to serve the dispensary and surrounding community but according to the hospital administration, the chemical composition of the water was found to be above limits allowable for human consumption ✓ One concrete built water tank ✓ One plastic water tank ✓ One double door pit latrine ✓ One single door pit latrine ✓ Incomplete soak pits and septic tanks 	<ul style="list-style-type: none"> ✓ A natural spring exists about 800 metres South West of the site ✓ The spring provides piped water system to the site. There is 1000 litres capacity plastic water storage tank for rain water harvesting. ✓ No permanent rivers within the immediate vicinity and within the general area of Kajiado South. What exist are dry river beds
6. Roads/ Access	<ul style="list-style-type: none"> ✓ The site is approximately 17kms off Mombasa-Nairobi highway ✓ Access road is earthen road in fairly good condition 	Site is approximately 35 kilometres East of Namanga-Kajiado road
7. Surrounding development	<ul style="list-style-type: none"> ✓ No visible homestead within a radius of 1km from the dispensary ✓ A primary school approximately 500 metres from site 	<ul style="list-style-type: none"> ✓ No major development in neighbouring the site ✓ Meto primary and Meto mixed Secondary are within the immediate vicinity of the dispensary

Prepared by JICA Expert Team

Table 2.2.4 Surroundings of Narok Sites

	Ilumtum	Olkinyei	Olemoncho
Facility	Primary Boarding School	Dispensary	Primary Boarding School
District	Narok North/Narok County	Narok South/ Narok County	Narok South/ Narok County
1. Site	<ul style="list-style-type: none"> ✓ 1 Class room block housing classes 1-8 (permanent structure) ✓ Two dormitory blocks (permanent structures); each for girls and boys ✓ One permanent structure block housing 4 teachers ✓ One semi permanent structure for 2 teachers ✓ One permanent block housing the kitchen ✓ The school is fenced with barbed wire and has a gate 	<ul style="list-style-type: none"> ✓ 1 main building housing the dispensary ✓ 2 staff houses housing 2 dispensary staff ✓ Three plastic tanks each with a capacity of 1000 litres (one plastic tank for the three buildings) ✓ 2 double door pit latrines ✓ No fence around the facility 	<ul style="list-style-type: none"> ✓ The school has two blocks of classroom; 1 permanent structure block and another of semi permanent material. ✓ Semi permanent structures used as girls dormitory, teachers houses and kitchen ✓ No fence around the school
2. Topography	<ul style="list-style-type: none"> ✓ The site is generally flat 	Generally flat	Generally flat
3. Soils and geology	<ul style="list-style-type: none"> ✓ The site is generally characterised with red soils ✓ The site has no visible rocks exposed to the surface 	<ul style="list-style-type: none"> ✓ The site is characterised with red soils in some areas and also white clay soils in some section ✓ The site has no visible exposed rock to the surface 	<ul style="list-style-type: none"> ✓ The site is characterised with red soils in some areas and also black cotton soils in other areas ✓ The site has no visible rocks exposed to the surface
4. Flora & Fauna	<ul style="list-style-type: none"> ✓ The site has a mix of planted and wild trees shrubs and grass ✓ The site's surrounding environment has thickets, shrubs and short trees ✓ The area (according to information from the teacher on site) is inhabited with wild animals like elephants, leopard hyenas among others. 	<ul style="list-style-type: none"> ✓ The site and surrounding vegetation is majorly shrubs and thorny acacia, euphorbia plants and grass depicts the arid and semi arid conditions as is the common characteristic with arid and semi arid climatic conditions. ✓ The area generally within the Maasai mara game reserve hence wild animals generally roam the area 	<ul style="list-style-type: none"> ✓ The site and the immediate vicinity (approximately 500 metres) is generally bare of vegetation apart from patches of grass. ✓ The site generally within the Maasai mara game reserve hence wild animals generally roam the area
5. Water & Sanitation	<ul style="list-style-type: none"> ✓ No spring, stream or River within the immediate environment. ✓ No piped water system; but water storage tanks (1 permanent structure measuring 50 cubic metres and 1000 litres capacity) for rain water harvesting ✓ Two pit latrine blocks and 2 bath shelters serving boys and girls ✓ 1 pit latrine serving the teachers 	<ul style="list-style-type: none"> ✓ No natural stream, spring within or any natural water body in the immediate vicinity (at least not within 2kms radius) ✓ Piped water system with the source being a bore hole ✓ Three water tanks for storing the water from the bore hole and rain water harvesting ✓ Two-double-door pit latrines to handle human waste 	<ul style="list-style-type: none"> ✓ There is a stream approximately 1.5 kilometres to the south of the site. ✓ No piped water system ✓ 1 small plastic tank for rain water harvesting (only at the wooden structures and only approximately 100 litres in capacity) ✓ One bath shelter
6. Roads/ Access	<ul style="list-style-type: none"> ✓ Site is approximately 25 kilometres South of Narok Town. ✓ Road from Narok town is earth road in a motor able condition 	<ul style="list-style-type: none"> ✓ Site is approximately 50 kilometres South West of Narok Town ✓ Access road is earthen road in fairly good condition 	<ul style="list-style-type: none"> ✓ Site is approximately 1.5 kilometres from Aitong centre and 60 kilometres South West of Narok Town ✓ The road from Aitong centre is in a condition that renders it impassable during rainy periods.
7. Surrounding development	<ul style="list-style-type: none"> ✓ No major development in neighbouring the site ✓ A shopping centre called Ntulele market is approximately 800 metres North of the Ilumtum 	<ul style="list-style-type: none"> ✓ No visible homestead within a radius of 1km from the dispensary ✓ A shopping centre 500 metres North of the site 	<ul style="list-style-type: none"> ✓ There exists homesteads around the site ✓ A shopping centre (Aitong) is within 1.5 kilometre radius

Prepared by JICA Expert Team



Photo 1.1 Dispensary Structure



Photo 1.2 Main Dispensary Building



Photo 1.3 Access road to the Dispensary



Photo 1.4 Soil Characteristics



Photo 1.5 Primary School 500m from the Site



Photo 1.6 Soil & vegetation

Photos by the JICA Expert Team

Photo 1 Ilkilnyeti Dispensary Kajiado Central

Project for Establishment of Rural Electrification Model Using Renewable Energy in the Republic of Kenya

Pilot Project Description (Lot 1: Solar PV Systems)



Photo 2.1 Meto Dispensary Building



Photo 2.2 Staff house with live fencing



Photo 2.3 Entrance to the Dispensary Compound



Photo 2.4 Access together with Vegetation



Photo2.5 Local Market (about 1km from Dispensary)



Photo 2.6 Local Market (about 1km from Dispensary)

Photos by the JICA Expert Team

Photo 2 Meto Dispensary Kajiado South

Project for Establishment of Rural Electrification Model
Using Renewable Energy in the Republic of Kenya

Pilot Project Description (Lot 1: Solar PV Systems)



Photo 3.1 Classroom of the School



Photo 3.2 Teacher quarters



Photo 3.3 School Compound with Classroom



Photo 3.4 School Fence with Vegetation



Photo 3.5 Teachers quarter (temporary structure)



Photo 3.6 Classroom and Volleyball court

Photos by the JICA Expert Team

Photo 3 Iltumtum Primary Boarding School Narok North

Project for Establishment of Rural Electrification Model
Using Renewable Energy in the Republic of Kenya

Pilot Project Description (Lot 1: Solar PV Systems)



Photo 4.1 Dispensary Block-Olikinyei



Photo4.2 Dispensary Block in the Background



Photo 4.3 Vegetation – Euphorbia Plants



Photo4.4 Sisal plant in the background



Photo 4.5 Access Road (Flat topography)



Photo 4.6 Showing Nature of Soil\

Photos by the JICA Expert Team

Photo 4 Olkinyei Dispensary Narok South

Project for Establishment of Rural Electrification Model
Using Renewable Energy in the Republic of Kenya

Pilot Project Description (Lot 1: Solar PV Systems)



Photo 5.1 Classroom Block - Olemoncho



Photo 5.2 Dormitory (temporary structure)



Photo 5.3 Vegetation and General Topography



Photo 5.4 Livestock denoting the major economic activities



Photo 5.5 Hilly Topography



Photo 5.6 Livestock shed surrounding the site

Photos by the JICA Expert Team

Photo 5 Olemoncho Primary Boarding School Narok South

4. Social and Economic Situation

Table 2.2.5, 2.2.6 and 2.2.7 summarize social and economic situation of the Lot 1 sites

Table 2.2.5 Actual Energy Use at Target Public Facilities

Item	Itumtum primary school	Ilkilnyeti Dispensary	Meto Dispensary	Olkinyei Dispensaries	Olemoncho primary school
Lighting device/energy	Solar	Kerosene Lamp	Solar	Solar panel	Solar
Radio and/or TV	Solar	Dry Cell	Dry Cell	Dry cells	
Refrigerator	No	Gas	LPG Gas	Solar	
Who operates the solar system?	Teachers	-	the facility committee	dispensary staff	teachers and prefects
Operator's fee	None	-	No	No	No
skills to operate/maintain	No	-	No	No	Yes
Person in charge of O&M	Head teacher & teachers	-	facility in charge	No one	One of the teachers and an electrician based at Aitong' shopping centre
Maintenance fees	No	-	facility collection	None	yes
Problem of existing solar system	when there is cool weather, the amount of elec. accumulated reduces		It has no controller (from beginning)	Three panels are not fully functioning	The students often tamper with it sometimes until it goes off

Prepared by JICA Expert Team

Table 2.2.6 Household Economy of Surrounding Communities

Item		Ilkilnyeti	Meto	Itumtum	Olkinyei	Olemoncho
Occupation	Occupation (domestic use/subsistence)	cattle, goat, sheep, milk	maize, beans	goat, cattle	cattle, goats	cattle, sheep, goat
	Occupation (income source/commercial)	goat, sheep, milk, cattle	maize, beans, goat, cow	goat, maize, beans	cattle	eggs, milk, goat, sheep, cattle
Household economy (KSh)	Income Last year	170,400	208,800	196,000	273,600	160,800
	Income Last month	14,200	17,400	16,333	22,800	15,600
	Expenditure last year	151,200	98,400	124,000	177,600	89,280
	Expenditure last month	12,600	8,200	10,333	14,800	7,280

Prepared by JICA Expert Team

Table 2.2.7 Actual Energy Use and Expectations of Electricity

Item		Ilkilnyeti	Metu	Itumtum	Olkinyei	Olemoncho
Actual energy use	Lighting	kerosene lamp firewood tin lamp	kerosene lamp solar lantern candle, tin lamp	kerosene lamp firewood	firewood kerosene lamp torch	kerosene lamp candle tin lamp
	radio/TV	dry cells	dry cells	dry cells	dry cells	dry cells
Expenditure for energy (KSh)	kerosene/ litre	130	100	100	130	140
	kerosene/ month	430	513	310	546	724
	radio/TV	60 per pair dry cells	70 per pair dry cells	65 per pair dry cells	65 per pair dry cells	60 per pair dry cells
	mobile phone/ charge	20.00	32.50	20.00	36.25	26.00
	Mobile phone/month	333	420	400	890	408
Afford to pay for electricity	KSh/ month/ household	400	348	150	420	516
	Lighting	kerosene lamp	kerosene lamp	kerosene lamp	firewood	kerosene lamp

Prepared by JICA Expert Team

5. Overall Project Schedule (draft)

Calendar Year	2012												2013												2014												2015												2015	
	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2		
0 Preparatory activities																																																		
0-1 0-1. Set up a Working Group (WG) consisting of 3 sub-groups for Outputs 1, 2 and 3, with clarified roles and functions of the counterpart personnel.	■																																																	
1 Output 1 (Health service institution Model)																																																		
1-1 1-1. Review policies, studies, surveys and projects related to electrification of health service institutions using Solar PV.	■																																																	
1-2 Select 5 health institutions for pilot projects (Lot 1: 3sites, Lot 2: 2 sites)	■																																																	
1-3 Conduct capacity & needs assessment of target communities, institutions and the private sectors in dealing with the operation and maintenance of renewable energy facilities and the management of energy supply services.									■								■																																	
1-4 Conduct capacity & needs assessment of officers in relevant ministries, agencies and local governments in dealing with sensitization and education of communities, users, and service providers on renewable energy matters.									■								■																																	
1-5 Prepare detailed plans of the pilot projects consisting of "System design," "Sustainable O&M" and "Sustainable financial plan."	■				■																																													
1-6 Organize stakeholders meetings to verify the detailed plans.									■								■																																	
1-7 Formulate the implementation plans of the pilot projects, including procurement, information & knowledge dissemination, and stakeholders' training.									■				■				■																																	
1-8 Implement and monitor the projects' activities, and prepare policy recommendations with institutional framework to promote the health institution model(s).													■																																					
1-9 Monitor and report the progress of indicators to achieve Output 1.													■																																					
2 Output 2 (School Model)																																																		
2-1 Review policies, studies, surveys and projects related to electrification of schools using Solar PV.	■																																																	
2-2 Select 5 school sites for pilot projects (Lot 1: 2sites, Lot 2: 3 sites)	■																																																	
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2-9 Monitor and report the progress of indicators to achieve Output 2.													■																																					

Figure 2.2.9 Overall Project Schedule (draft) of Lot 1 and Lot 2 (Solar PV)

**Project for Establishment of Rural Electrification Model
Using Renewable Energy in the Republic of Kenya
(JICA Technical Cooperation Project)**

**Project Description
For the Pilot Project
(Lot 2: Solar PV System)**

December 2013

Rural Electrification Authority (REA)

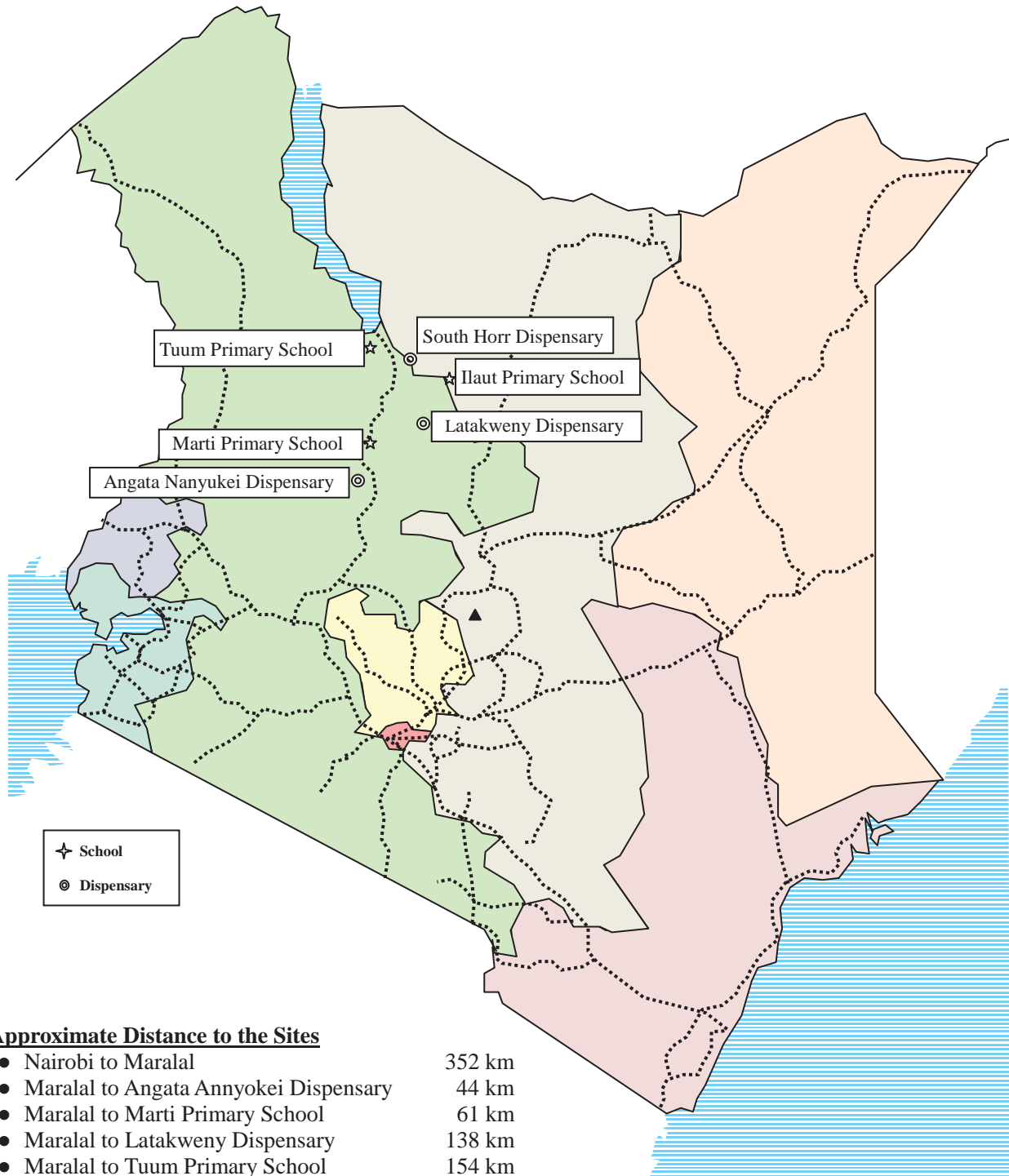


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Source: JICA Expert Team

Pilot Project Location Map (Lot2: Solar PV System)

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1.1 Project Objectives

The project aims to establish a practical model for rural electrification using renewable energy in public facilities (schools and health centers).

1.2 Overall Goal

Rural electrification models using renewable energy are disseminated to improve the quality of life of Rural Communities in Kenya.

1.3 Project Purpose

Rural electrification models using renewable energy are established.

1.4 Project Outputs

- (1) To develop a practical model for electrification of health service institutions in non-electrified areas using solar PV pilot projects.
- (2) A practical model for electrification of schools in non-electrified areas using Solar PV (Photovoltaic) is to be developed through pilot projects.
- (3) Necessary policy and institutional frameworks for applying the model to rural electrification using renewable energy are recommended.

2. Lot 2 Projects (Electrification of Public Facilities: Health Center and Schools)

2.1 Background and Current Situation

Kenya has sufficient experience in introducing PV systems into rural areas since the 1990’s. As a result, many PV companies and shops were established and are an expanding business in Kenya. There are many PV shops, not only in Nairobi but also in many rural towns. It is not difficult to find houses with PV systems in most rural communities. According to a World Bank (WB) report, around 300,000 Solar Home Systems (SHS) have been installed in Kenya so far. A Dutch company, Ubbink has a panel assembly factory in Naivasha, whose maximum production capacity is around 10MW per year. The retail price of the company’s panels is around 180-200KShs/W (larger panels are cheaper). The price level is very competitive in comparison to Chinese companies’ panels.

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REPF.

Based on its experiences, REA has developed a design method for PV systems, composed of systems for schools, dispensaries and their staff quarters. The method is very reasonably formulated. For example, PV systems at dispensaries have a larger battery capacity to ensure longer autonomy days. Installation of PV systems is also well achieved. Taking these into consideration, Kenya has sufficient PV technologies in terms of design and installation. On the other hand, the PV systems which were installed more than 4 years ago have problems with battery replacement. Most of these batteries come to the end of their life span and are not replaced because of financial difficulties. Long-term sustainability of PV systems in rural areas is still a challenge in PV rural electrification.

In this regard, REA in cooperation with the JICA Expert team started the Lot 1 Pilot Project using solar PV systems which were installed in several primary schools and dispensaries located in Narok and Kajiado counties in the last fiscal project year 2012-2013.

For this fiscal project year of 2013-2014 REA with the JICA Expert team have decided, in the same manner of Lot 1, to launch Lot 2 Pilot Projects using solar PV systems to be installed in several primary schools and dispensaries located in Samburu County (see location map in Page iv) as summarized in the following section.

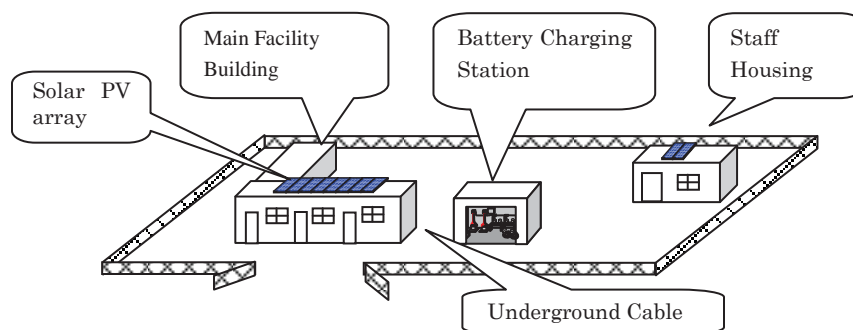
2.2 Solar PV Systems for Lot 2

Table 2.2.1 shows Solar PV systems for Lot 2. Figure 2.2.1 shows a layout image of Lot 2.

Table 2.2.1 Lot 2 PV Systems

County	Community	Type	PV size	Drawing
Samburu	Tuum	Primary (Boarding) School	4.92kW	Figure 2.2.4
Samburu	Ilaut	Primary (Boarding) School	4.2kW	Figure 2.2.5
Samburu	Marti	Primary (Boarding) School	6.36kW	Figure 2.2.6
Samburu	Latakweny	Dispensary	2.4kW	Figure 2.2.7
Samburu	South Horr	Dispensary	0.48kW	Figure 2.2.8
Samburu	Angata Nanyukie	Dispensary	0.72kW	Figure 2.2.9

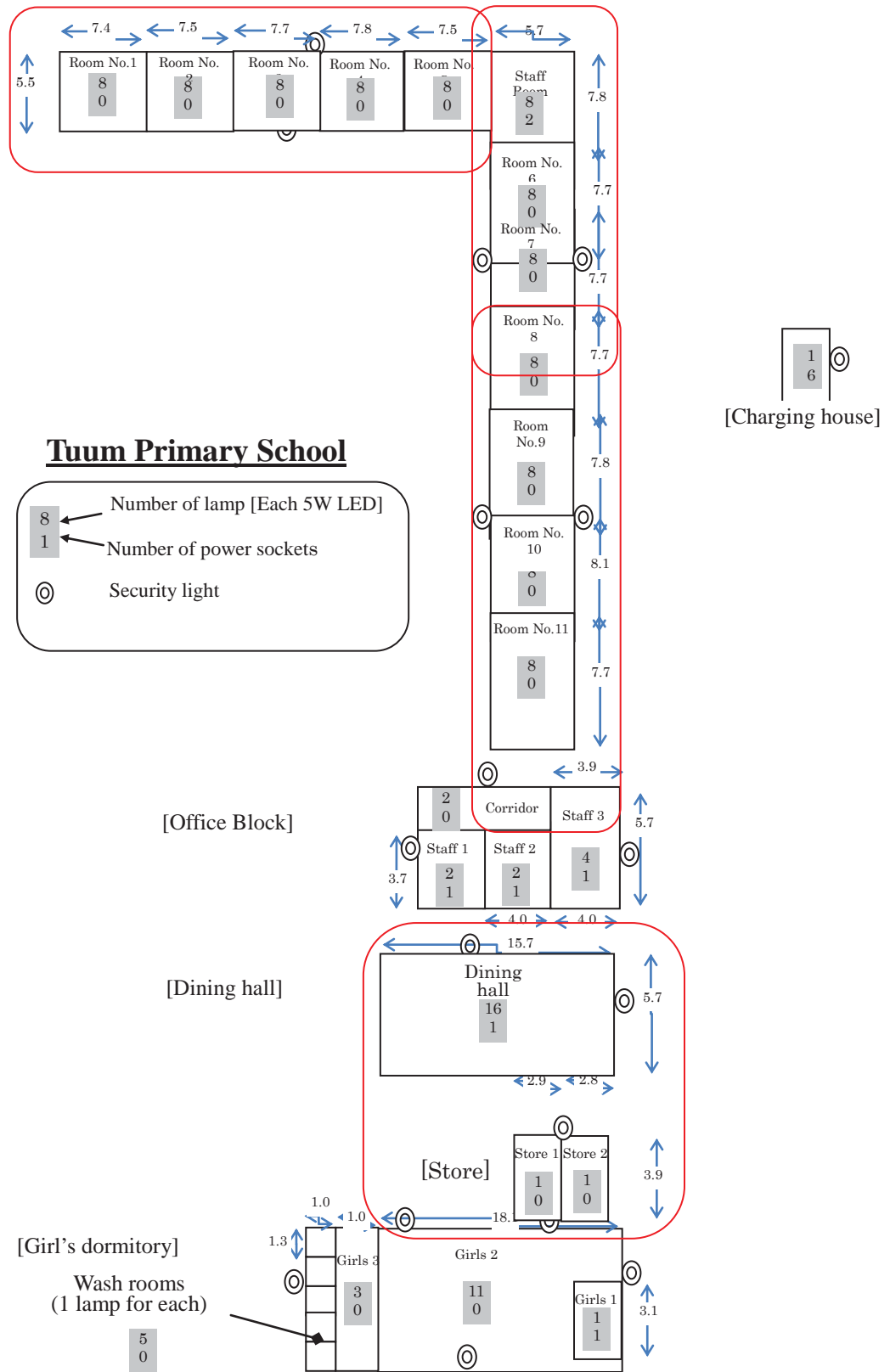
Source: JICA Expert Team



Source: JICA Expert Team

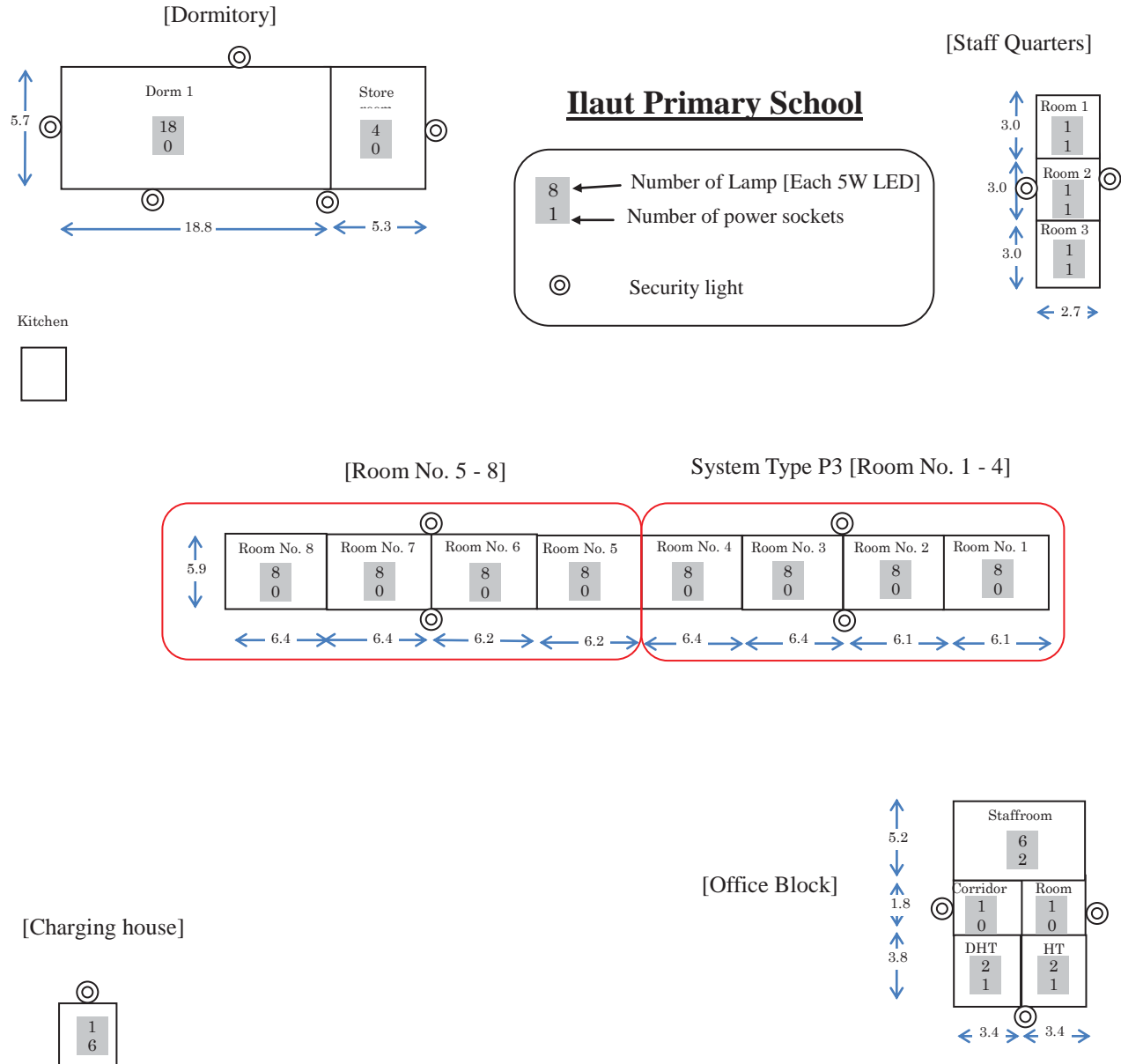
Figure 2.2.1 Layout Image of Solar PV Facilities of Lot 2

In addition proposed drawings of Lot 2 sites are shown in from Figure 2.2.2 to Figure 2.2.7.



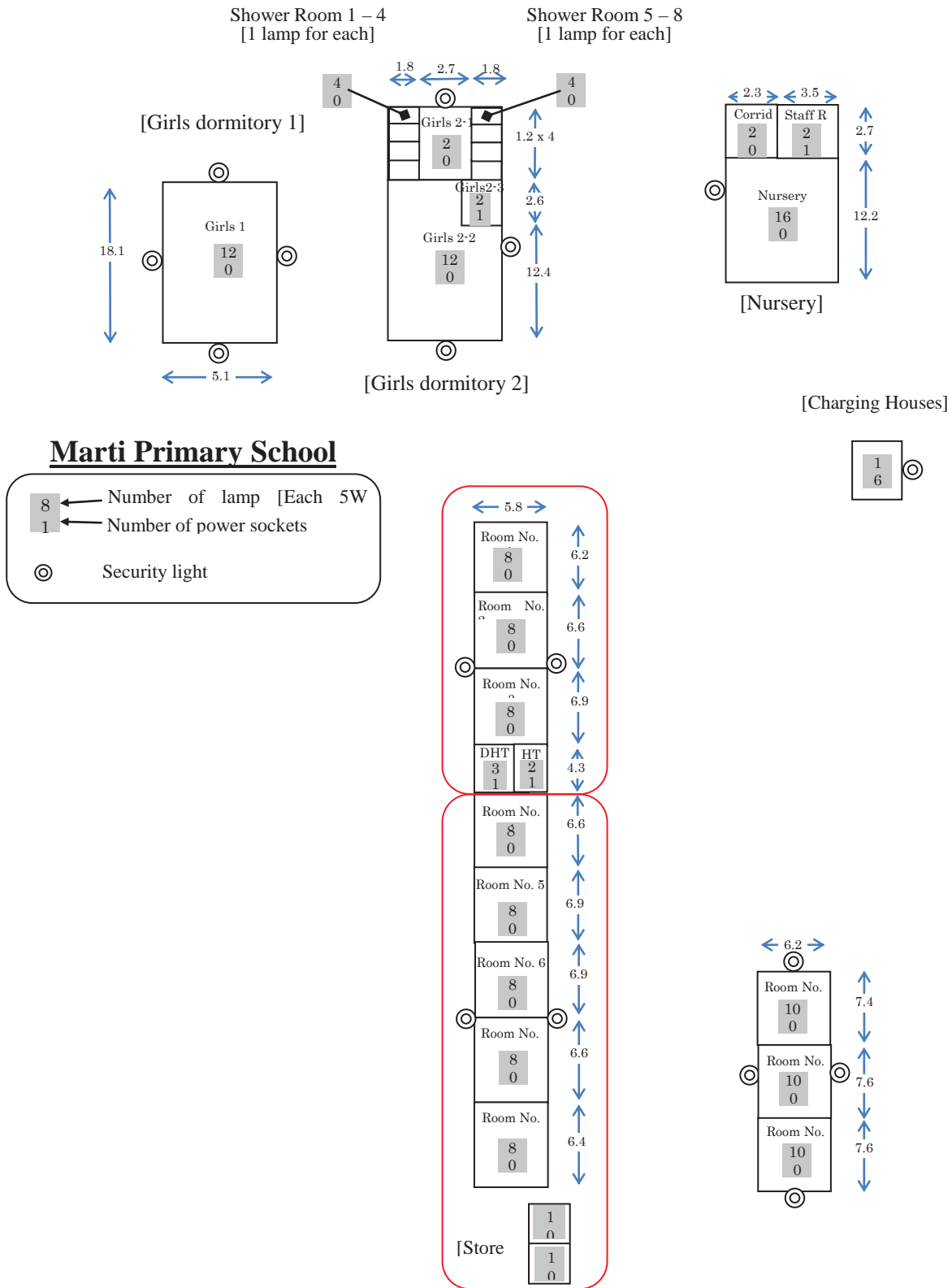
Source: JICA Expert Team

Figure 2.2.2 Proposed Drawing of Tuum Primary School (Lot 2: Solar PV System)



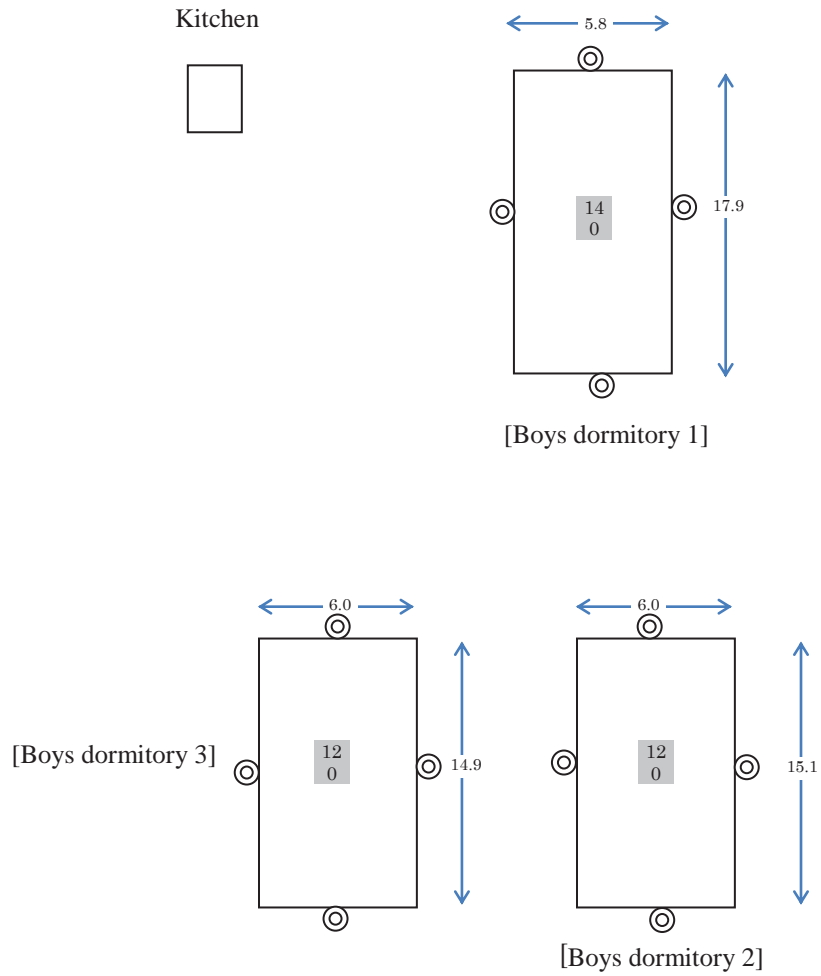
Source: JICA Expert Team

Figure 2.2.3 Drawing Ilaut Primary School



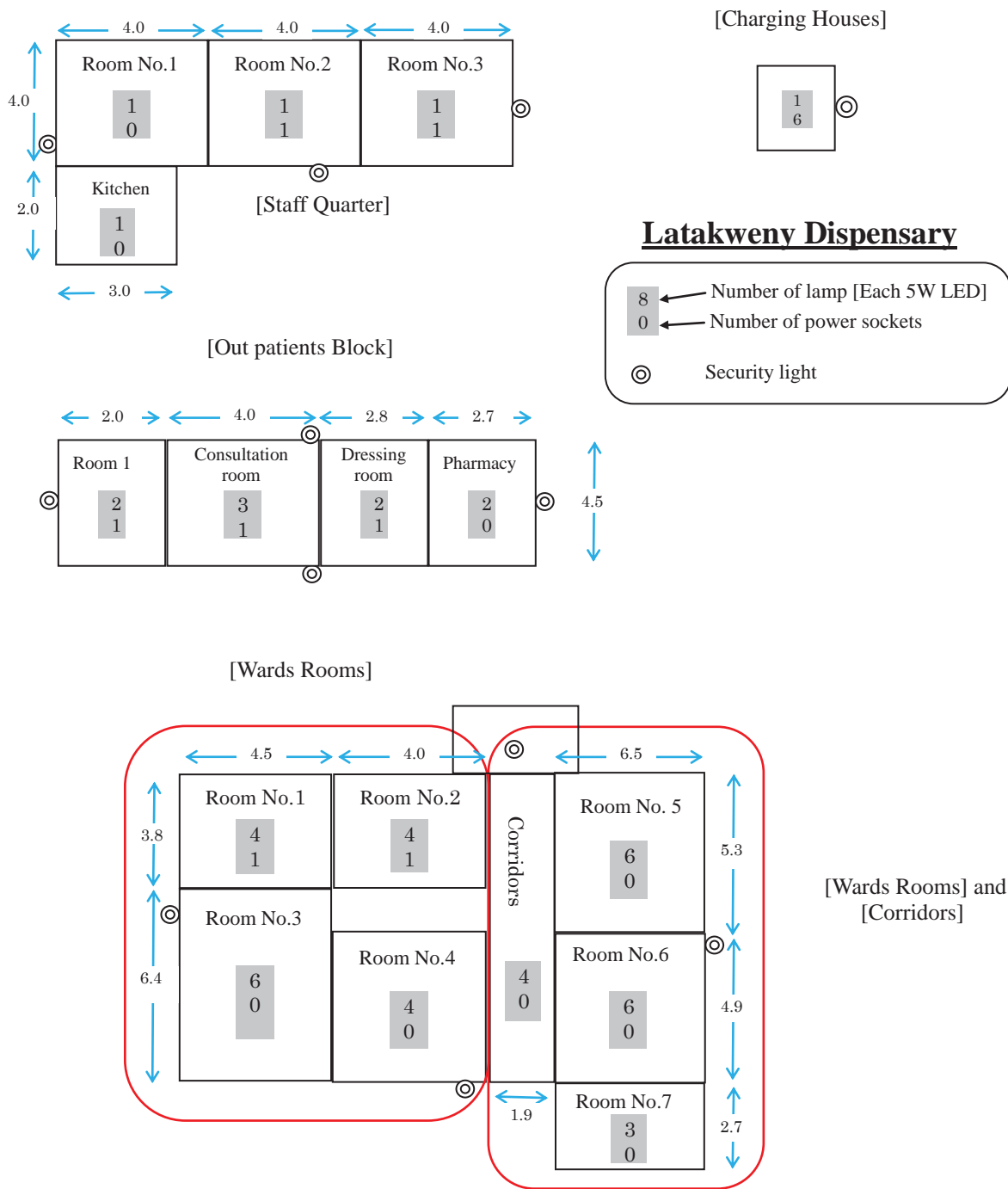
Source: JICA Expert Team

Figure 2.2.4 Drawing of Marti Primary School (1/2)



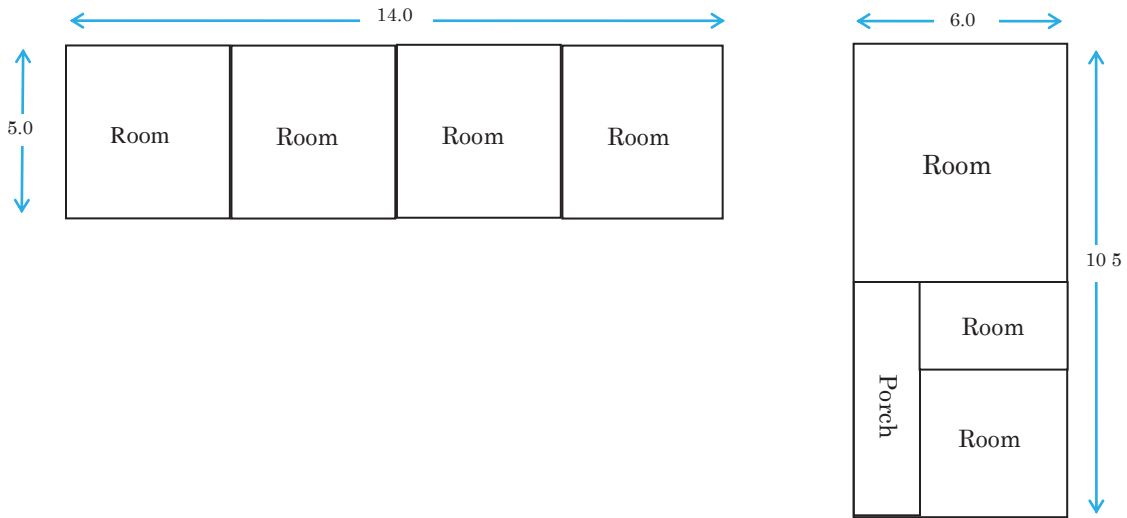
Source: JICA Expert Team

Figure 2.2.4 Drawing of Marti Primary School (2/2)

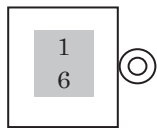


Source: JICA Expert Team

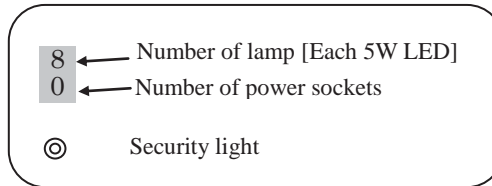
Figure 2.2.5 Drawing of Latakweny Primary School



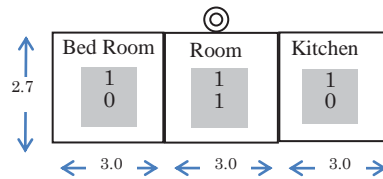
[Charging Houses]



South Horr Dispensary

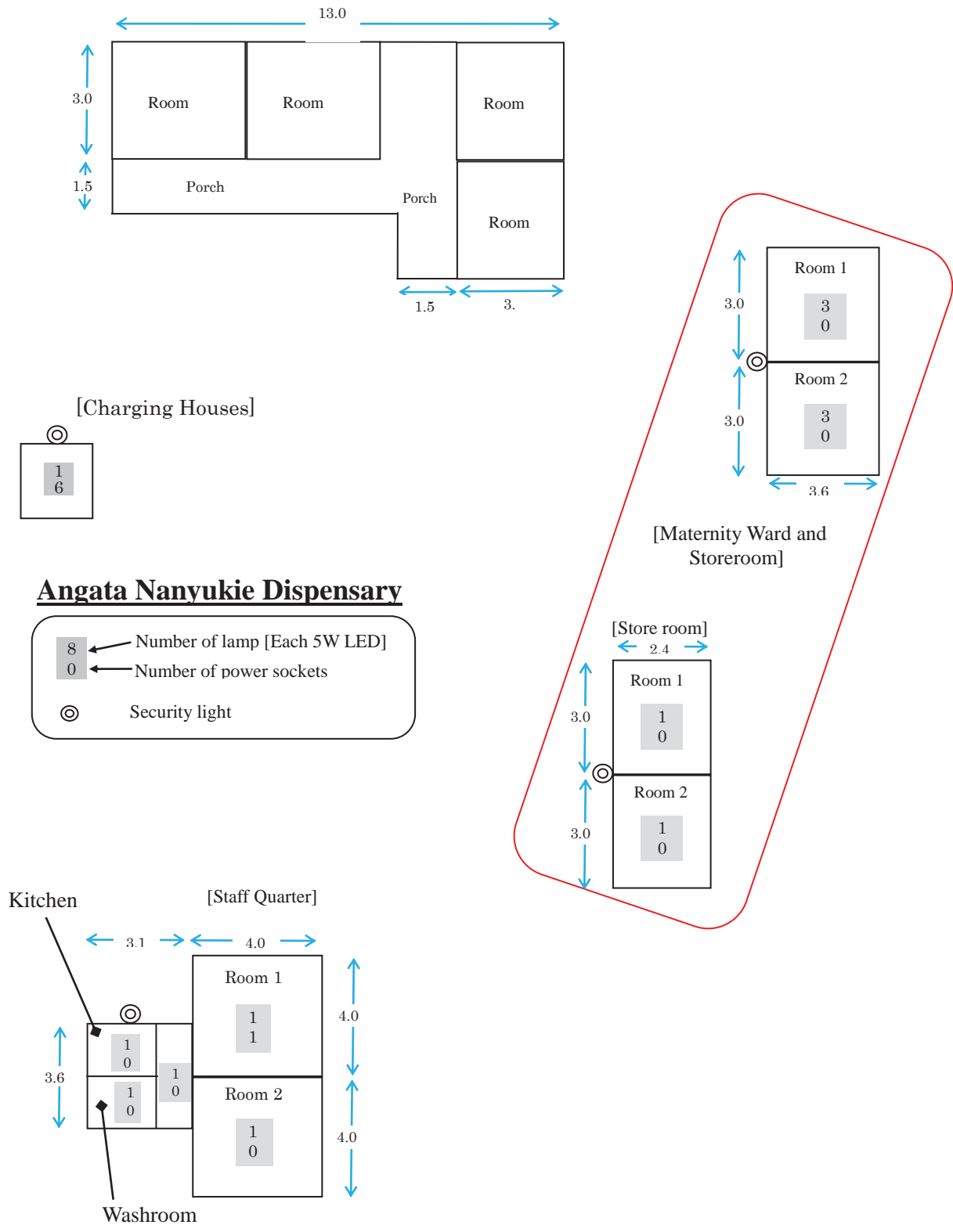


[Staff Quarters]



Source: JICA Expert Team

Figure 2.2.6 Drawing of South Horr Dispensary



Source: JICA Expert Team

Figure 2.2.9 Drawing of Angata Nanyukie Dispensary

2.3. Consultations and Meeting with Stakeholders

Meetings and consultations with relevant stakeholders were carried out at the initial stage (site selection for Lot 2 pilot projects) of the project to share the outline of the project and the concept of solar PV systems and the role of each stakeholder and which included establishing contacts with the relevant stakeholders and convening discussions on project implementation, as summarized in the tables below.

Table 2.3.1 Meetings/Consultations on Site Selection for Lot 2

Date	Venue	PAP & Focus Group/ Local People	JICA Expert Team	Total
15/10/2013	Tuum Primary School	2	2	4
16/10/2013	Ilaut Primary School	1	2	5
17/10/2013	South Horr Dispensary	3	2	5
22/10/2013	Latakweny Dispensary	1	2	3
23/10/2013	Angata Nanyukie Dispensary	2	2	4
24/10/2013	Marti Primary School	3	2	5

Source: The JICA Expert Team

Table 2.3.2 Discussion points at Tuum Primary School (Date: 15/10/2013)

No	Name of Key Informants	Profession	Issues Discussed/ Suggestion	REA/JICA Team Response
1	Gabriel Letipila	Head teacher	Lighting will highly improve the academic performance of the pupils	Urgent need for PV system
2	Nkestinten Lengorien	Member-school management committee	Reduce burden on parents in providing lighting to pupils	The project will be appreciated well.

Source: The JICA Expert Team

Table 2.3.3 Discussion points at Ilaut Primary School (Date: 16/10/2013)

No	Name of Key Informants	Profession	Issues Discussed/ Suggestion	REA/JICA Team Response
1	Alex Lesamachale	Head teacher	High welcome for the project	Appreciation of Solar PV attribute

Source: The JICA Expert Team

Table 2.3.4 Discussion points at South Horr Dispensary (Date: 17/10/2013)

No	Name of Key Informants	Profession	Issues Discussed/ Suggestion	REA/JICA Team Response
1.	Mike Lenkak	Nurse In charge	The project will solve energy demand for refrigeration of vaccine storage	Positive comment
2	Josphine Lenkak	Community Health Worker	Clean and healthy energy solution	Positive comment
3	Irene	Nurse	Tribute to the REA/JICA project	Positive comment

Source: The JICA Expert Team

Table 2.3.5 Discussion points at Latakweny Dispensary (Date: 22/10/2013)

No	Name of Key Informants	Profession	Issues Discussed/ Suggestion	REA/JICA Team Response
1	Harrison	Nurse in charge	Revenue from the charging system will help in maintaining the system	Positive comment

Source: The JICA Expert Team

Table 2.3.6 Discussion points at Angata Nanyukie Dispensary (Date: 23/10/2012)

No	Name of Key Informants	Profession	Issues Discussed/ Suggestion	REA/JICA Team Response
1	Longiro	Chairman-management committee	Welcomed the move to train the users on maintenance of the already installed PV system	Positive comment
2	Jacob Lekupe	Community health worker	Charging system will highly help in financing of maintenance of the system	Positive comment

Source: The JICA Expert Team

Table 2.3.7 Discussion points at Marti Primary School (Date: 24/10/2013)

No	Name of Key Informants	Profession	Issues Discussed/ Suggestion	REA/JICA Team Response
1	Samuel Akuwan	Head teacher	PV lighting system to improve quality of study among pupils	Positive comment
2	Philip Lousiye	Deputy head teacher	Solar power is clean and almost free	Cognizance to the importance of solar power
3	Petro Echuka	Chairman-School management committee	Lighting of the school will also improve security	Stressed on the advantage of solar PV system

Source: The JICA Expert Team

3. Surrounding Environment and Social Situation for Lot 2 Sites

Table 3.1.1 summarize the surroundings of Lot 2 sites

Table 3.1.1 Surroundings of Samburu Sites (1/3)

Community	Tuum	Ilaut
Facility	Primary School	Primary School
County	Samburu	Samburu
1. Site	<ul style="list-style-type: none"> ✓ Site location is at N02°08.715' and E036°46.385' with an elevation of 1421 metres above sea level ✓ One 'L' shaped permanent structure partitioned into classes staffroom and administration office ✓ One hall to be used for girls dormitory ✓ A pre-school building ✓ School compound is secured by barbed wire and wire mesh and entry to the school is restricted to two gates strategically placed in front and at the back ✓ One solar panel donated by a catholic mission serving class 8 	<ul style="list-style-type: none"> ✓ Site location is at N01°52.046' and E037°14.472' with an elevation of 765 metres above sea level ✓ Administration block, Classrooms, boys dormitory, kitchen and staff houses built with permanent material and all detached from each other ✓ 10 water tanks each with a capacity of 10,000 litres ✓ One solar panel installed providing light for standard 8 pupils ✓
2. Topography	<ul style="list-style-type: none"> ✓ Topography of the site slopes from the highest peak of Mt. Ng'iro (North of school) and reaches almost zero gradient at the school 	<ul style="list-style-type: none"> ✓ Site lies in a fairly flat ground sandwiched between two hills; Poi to the South and Ngiri mountains to the North
3. Soils and geology	<ul style="list-style-type: none"> ✓ The site and the surrounding areas have a soil characteristic ranging from thin & rocky soils towards the mountain to fairly deep fine sandy soil on the lower areas ✓ Rock formation display a layer like property 	<ul style="list-style-type: none"> ✓ The soil and geological formation is characterised by sandy soils and exposed rocks.
4. Flora & Fauna	<ul style="list-style-type: none"> ✓ Vegetation includes acacia and mainly grass ✓ Undomesticated fauna reportedly includes hyenas, jackals, leopards, ostriches and antelopes 	<ul style="list-style-type: none"> ✓ Mainly acacia trees and scanty patches of grass ✓ Undomesticated fauna reportedly include hyenas (most common), elephants (from nearby <i>Keno</i> community conservancy), leopards and occasional lions
5. Water & Sanitation	<ul style="list-style-type: none"> ✓ Water for use in the school is sourced from natural spring at the foot of Ng'iro mountain about 5 kilometres from the school ✓ The roofs have been fitted with gutters for rain water harvesting although only one plastic tank with a capacity of 10000 litres is available ✓ Pit latrines are available for both pupils and teachers 	<ul style="list-style-type: none"> ✓ 10 water tanks each with a capacity of 10000 litres for rain water harvesting ✓ Pit latrines constructed at strategic places for human waste disposal
6. Solid Waste Management	<ul style="list-style-type: none"> ✓ No public solid waste collection and disposal system available ✓ Solid wastes (mainly waste papers) are managed by burning and disposal in a dug out pit 	<ul style="list-style-type: none"> ✓ Solid wastes mainly consist of waste papers and food remains disposed by burning and burying ✓ No public waste collection system available
6. Roads/ Access	<ul style="list-style-type: none"> ✓ Accessed by Baragoi-Tuum road, an earthen road fairly in good condition during dry seasons 	<ul style="list-style-type: none"> ✓ Access is via Leisamis-South Horr road in fairly usable by all types of vehicles during the dry seasons ✓ Sections of the road usually become impassable due to rapid storm water cutting across during rainy seasons
7. Surrounding development	<ul style="list-style-type: none"> ✓ Surrounding environment is marked by a trading centre (Tuum), and villages ✓ Major economic activities include small livestock rearing, scale trading, and an small scale farming 	<ul style="list-style-type: none"> ✓ Scattered <i>manyattas</i> (homesteads) with livestock keeping as the main economic activity

Source: JICA Expert Team

Table 3.1.1 Surroundings of Samburu Sites (2/3)

Community	Marti	Latakweny
Facility	Primary School	Dispensary
County	Samburu	Samburu
1. Site	<ul style="list-style-type: none"> ✓ Site is located at N01.607611 E36.919944 ✓ School has permanent and temporary structures housing classrooms, dormitories kitchen and administration office ✓ The boundary of the school is marked by barbed wire and live fencing ✓ 6 water tanks-1 concrete and 5 plastic ranging each with a capacity of 1,000 litres ✓ Three solar panels installed; one each in both girls and boys dormitories and one of the classes 	<ul style="list-style-type: none"> ✓ Site is located at N01⁰32.850⁰ and E037⁰06.180⁰ with an elevation of 906 metres above sea level ✓ The dispensary has one main building as the consultation and treatment area, a staff house and one recently completed structure proposed to be used as maternity ward ✓ The compound of the dispensary is secured by a barbed wire fence and a metal gate ✓ 4 water tanks; one concrete and the other three are made of plastic with capacities of 5,000 litres and 10,000 litres for harvesting and storing rain and borehole water ✓ One concrete built tank not yet in use
2. Topography	<ul style="list-style-type: none"> ✓ The site is generally smooth and flat 	<ul style="list-style-type: none"> ✓ The site lies on a slightly sloping land with surrounding comprising of hills and valleys ✓ The surrounding hills is called Sererit Mountain
3. Soils and geology	<ul style="list-style-type: none"> ✓ Surface soils are red in colour ✓ Site is also stony and rocky 	<ul style="list-style-type: none"> ✓ The site and the surrounding areas is made up of thin sandy soils with most areas having stones and rocks exposed to the surface
4. Flora & Fauna	<ul style="list-style-type: none"> ✓ Main vegetations are shrubs acacia trees and aloe which is a special plant due to its medicinal value ✓ Among the wild game found around the site include gazelle, ostrich, cheetah, leopard, hyena ✓ Gravy zebra also exist and it is protected due to its dwindling numbers 	<ul style="list-style-type: none"> ✓ The site and surrounding is majorly characterized by the stressed vegetation ✓ Main vegetation consist of acacia, aloe, shrubs and patches of grass ✓ Wild animals consisting of hyenas, jackals, foxes wild and elephants, and gazelles reportedly roam the area
5. Water & Sanitation	<ul style="list-style-type: none"> ✓ No spring, stream or River within the immediate environment. ✓ Piped water sourced from community borehole approximately 2km away serves the school ✓ 6 Water tanks used for storing borehole water and harvesting rain water ✓ A total of 10 pit latrines are available 	<ul style="list-style-type: none"> ✓ Nearest rivers, Barsaloi and Seya intersect join into each other approximately 12 kilometres from the site ✓ The point of the intersection of the two rivers is referred to as <i>Milgis</i> according to the local dialect ✓ Piped water is sourced from a community borehole approximately 5 km away ✓ Rain water harvesting and storage is done by the plastic and concrete water tanks ✓ A total of three (two-double doors and one single door) pit latrines serving both in usable condition serving both patients and staff
6. Solid Waste Management	<ul style="list-style-type: none"> ✓ Major solid wastes include waste papers, food remains and fallen leaves ✓ No public solid waste management system ✓ Solid waste mainly handled through burning in a dug out pit 	<ul style="list-style-type: none"> ✓ No public solid waste collection system available around ✓ Major solid wastes consist of medical wastes including used needles and syringes, bandages, gloves expired drugs and minor surgical equipment ✓ Sharps (used needles and surgical knives are usually packed in safety boxes provided by the Ministry of health and periodically transported to Baragoi for incineration ✓ Other forms of solid wastes are disposed of by burning in a dug out pit within the dispensary compound
6. Roads/ Access	<ul style="list-style-type: none"> ✓ The site is accessible Maralal-Baragoi road, fairly in good condition 	<ul style="list-style-type: none"> ✓ Site is accessible via Baragoi Wamba Road ✓ The road is usable mostly by four where drive cars
7. Surrounding development	<ul style="list-style-type: none"> ✓ Surrounding area is basically an expanse of plain land dotted with scattered homesteads 	<ul style="list-style-type: none"> ✓ The surrounding area is basically an expanse of fairly rough topography with hills alternating with valleys dotted with scattered <i>manyattas</i> (villages)

Source: JICA Expert Team

Table 3.1.1 Surroundings of Samburu Sites (3/3)

Community	South Horr	Angata Nanyukie
Facility	Dispensary	Dispensary
County	Samburu	Samburu
1. Site	<ul style="list-style-type: none"> ✓ Situated at N02°05.504' and E036°55.197' with an elevation of 1029 metres above sea level ✓ Two blocks of permanent structure used as consultation and treatment and also as store ✓ One staff house ✓ The dispensary is not fenced 	<ul style="list-style-type: none"> ✓ Site is located at N 01°19.088', E036°40.412' with 2155 metres height above sea level ✓ Two permanent structures; one housing the dispensary and the other one serving as staff quarter for the nurse in charge ✓ Dispensary already installed with solar panels by ministry of Energy but the charging system is faulty ✓ Dispensary is fenced all round using barbed wire
2. Topography	<ul style="list-style-type: none"> ✓ The site lies adjacent to a hill on a gently sloping terrain ✓ Surrounding relief consists of Ng'iro mountains to the North and Ndonyo Mara hills to the South 	<ul style="list-style-type: none"> ✓ The site stands at a fairly flat ground at an elevation of 2155m
3. Soils and geology	<ul style="list-style-type: none"> ✓ Soils depth differ with the terrain with flat sections consisting of fairly deep and red in colour ✓ The hilly sections majorly range from sandy to stony and rocky 	<ul style="list-style-type: none"> ✓ The site is generally characterised with red soils with no visible rocks exposed to the surface
4. Flora & Fauna	<ul style="list-style-type: none"> ✓ Majorly acacia species and shrubs ✓ No major wild animals roam the site's surrounding areas 	<ul style="list-style-type: none"> ✓ The site is approximately 3kilometres from the hedge of a gazetted forest-Kirisia forest ✓ Wild game like lions, leopards, buffalo, among others from the nearby forest ✓ The forest influences the rainfall and temperature of the site
5. Water & Sanitation	<ul style="list-style-type: none"> ✓ Piped water is sourced directly from South Horr River without any form of treatment ✓ One plastic tank with a capacity of 5,000 litres for storing the piped water ✓ No rain water harvesting ✓ Two double door pit latrine for 	<ul style="list-style-type: none"> ✓ Nearby stream-Ntumot River is approximately 5 kilometres away ✓ Water for the dispensary use is harvested rain water stored in two 5,000 litres capacity tanks ✓ No piped water system ✓ One double door pit latrine for handling defecation
6. Solid Waste Management	<ul style="list-style-type: none"> ✓ Medical sharps including used needles and surgical blades are collected in safety boxes and transported to Baragoi for incineration ✓ However when no transport is available, the said waste is burned and buried alongside other common wastes like waste papers ✓ No public solid waste collection and handling services available to the dispensary 	<ul style="list-style-type: none"> ✓ No solid waste management service provided by public institution ✓ All types solid wastes are managed by on site burning done indiscriminately in a shallow dug out pit ✓ No waste segregation system available ✓ No incineration facility for the medical wastes hence used needles and other sharps are packed in safety boxes and transported to Maralal on a monthly basis for incineration
6. Roads/ Access	<ul style="list-style-type: none"> ✓ The site is accessible via Baragoi-South Horr-Leisamis Road which, an earth road in fairly good condition 	<ul style="list-style-type: none"> ✓ Site is accessible via an earthen road in fairly good condition approximately 20 km North East of Maralal town. ✓ The road is in fairly well maintained and in a motor able condition
7. Surrounding development	<ul style="list-style-type: none"> ✓ The surrounding is marked by settlement villages, South Horr centre and a hilly topography on both Northern and Southern expanse 	<ul style="list-style-type: none"> ✓ The surrounding is characterised by farms and livestock rearing activities

Source: JICA Expert Team



Photo 1.1 Classrooms' structure



Photo 1.2 Proposed girls' dormitory



Photo 1.3 Prevailing vegetation



Photo 1.4 Solid waste disposal pit



Photo 1.5 Surrounding Land Features



Photo 1.6 Nearest Market

Photos by the JICA Expert Team

Photo 1 Tuum Primary School, Samburu County



Photo 2.1 Main School block



Photo 2.2 Administration block



Photo 2.3 Soil & geology



Photo 2.4 Solid waste disposal pit



Photo 2.5 Access to School



Photo 2.6 Surrounding environment

Photos by the JICA Expert Team

Photo 2 Ilaot Primary School, Samburu County



Photo 3.1 Classroom structures



Photo 3.2 Girls' dormitory



Photo 3.3 Soil and rock characteristic



Photo 3.4 Solid waste disposal pit



Photo 3.5 Rainwater Harvesting



Photo 3.6 Neighboring Community

Photos by the JICA Expert Team

Photo 3 Marti Primary School, Samburu County



Photo 4.1 Main Dispensary Building



Photo 4.2 Proposed Maternity block



Photo 4.3 Prevailing vegetation and soil



Photo 4.4 Solid waste disposal pit



Photo 4.5 Medical Waste Treatment Pit



Photo 4.6 Neighboring Community

Photos by the JICA Expert Team

Photo 4 Latakweny Dispensary, Samburu County



Photo 5.1 Main Dispensary Building (Back Side)



Photo 5.2 Staff House



Photo 5.3 Pit Latrine



Photo 5.4 Pit for burning of solid waste



Photo 5.5 Vegetation and soil



Photo 5.6 Surrounding Community

Photos by the JICA Expert Team

Photo 5 South Horr Dispensary, Samburu County



Photo 6.1 Main Dispensary Structure



Photo 6.2 Staff House



Photo 6.3 Prevailing vegetation and soil



Photo 6.4 Solid waste management pit



Photo 6.5 Access and soil type



Photo 6.6 Neighbouring development

Photos by the JICA Expert Team

Photo 6 Angata Nanyukie Dispensary Samburu County

4. Social and Economic Situation

Table 2.4.1 summarizes social and economic situation of the Lot 2 sites

Table 2.4.1 Household Socio-Economy Situation of Surrounding Communities

Item			Tuum	Ihaut	Marti	Latakweny	South Horr	Angata Nanyukie
Ethnic Group			Samburu	Samburu	Samburu	Samburu	Samburu	Samburu
Occupation of community people in order of importance			Retail Business, Livestock keeping and Farming	Livestock keeping	Small jobs and construction of manyatas (Traditional Houses)	Livestock keeping, Basket and ornament making	cattle, goats	Livestock keeping, Farming and Government Employment
Household economy (KSh)	Income Sep 2013	Max	15,000	5,000	2,000	10,000	4,000	4,000
		Min	0	0	1,500	5,000	500	300
		Ave.	7,500	2,500	1,750	7,500	2,250	2,150
	Income 2012	Max	65,000	120,000	15,000	120,000	40,000	48,000
		Min	0	0	1,500	60,000	0	0
		Ave.	32,500	60,000	8,250	90,000	20,000	24,000
	Expenditure Sep 2013	Max	10,000	5,000	2,000	4,500	4,000	4,000
		Min	0	0	0	1,500	1,500	200
		Ave.	5,000	2,500	1,000	3,000	2,750	2,100
	Expenditure 2012	Max	24,000	100,000	15,000	54,000	40,000	48,000
		Min	0	0	0	16,000	0	0
		Ave.	12,000	50,000	7,500	35,000	20,000	24,000

Source: JICA Expert Team

5. Overall Project Schedule (draft)

Japanese Fiscal Year (April-March)		2011			2012						2013						2014																						
Kenyan Fiscal Year (July - June)		2011/2012			2012			2012/2013			2013			2013/2014			2014			2014/2015			2015																
Calendar Year		3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2		
0	Preparatory activities																																						
0-1	Set up a Working Group (WG) consisting of 3 sub-groups for Outputs 1,2 and 3, with clarified roles and functions of the counterpart personnel.																																						
1	Output 1 (Health service institution Model)																																						
1-1	Review policies, studies, surveys and projects related to PV electrification of health institutions.																																						
1-2	Select 5 health institutions for pilot projects.																																						
1-3	Conduct capacity & needs assessment of target communities, institutions and the private sectors in dealing with the operation and maintenance of renewable energy facilities and the management of energy supply services.																																						
1-4	Conduct capacity & needs assessment of officers in relevant ministries, agencies and local governments in dealing with sensitization and education of communities, users, and service providers on renewable energy matters.																																						
1-5	Prepare detailed plans of the pilot projects consisting of "System design," "Sustainable O&M" and "Sustainable financial plan."																																						
1-6	Organize stakeholders meetings to verify the detailed plans.																																						
1-7	Formulate the implementation plans of the pilot projects, including procurement, information & knowledge dissemination, and stakeholders' training.																																						
1-8	Implement and monitor the projects' activities, and prepare policy recommendations with institutional framework to promote the health institution model(s).																																						
1-9	Monitor and report the progress of indicators to achieve Output 1.																																						
2	Output 2 (School Model)																																						
2-1	Review policies, studies, surveys and projects related to electrification of schools using Solar PV.																																						
2-2	Select 5 school sites for pilot projects.																																						
2-3	Conduct capacity & needs assessment of target communities, institutions and the private sectors in dealing with the operation and maintenance of renewable energy facilities and the management of energy supply services.																																						
2-4	Conduct capacity & needs assessment of officers in relevant ministries, agencies and local governments in dealing with sensitization and education of communities, users, and service providers on renewable energy matters.																																						
2-5	Prepare detailed plans of the pilot projects consisting of "System design," "Sustainable O&M" and "Sustainable financial plan."																																						
2-6	Organize stakeholders meetings to verify the detailed plans.																																						
2-7	Formulate the implementation plans of the pilot projects, including procurement, information & knowledge dissemination, and stakeholders' training.																																						
2-8	Implement and monitor the projects' activities, and prepare policy recommendations with institutional framework to promote the school model(s).																																						
2-9	Monitor and report the progress of indicators to achieve Output 2.																																						

Figure 2.2.9 Overall Project Schedule (draft) of Lot 1 and Lot 2 (Solar PV)

Attachment N-4 Details of Environmental and Social Considerations in Kenya

N-4.1 Details of Environment Aspect

N-4.1.1 Biodiversity

Kenya is known as one of the biodiversity rich countries in the world. “Kenya State of the Environment and Outlook 2010 (NEMA 2011)” summarizes the biodiversity in Kenya as follows.

- ✓ Kenya’s known biodiversity assets include 7,000 plants, 25,000 invertebrates (21,575 of which are insects), 1,133 birds, 315 mammals, 191 reptiles, 180 freshwater fish, 692 marine and brackish fish, 88 amphibians, and about 2,000 species of fungi and bacteria (Reference : National Environment Research Agenda 2008 -2030, NEMA 2009).
- ✓ Kenya is ranked third in Africa in terms of mammalian species’ richness with 14 of these species being endemic to the country (Reference: IGAD Environmental Outlook, IGAD (Intergovernmental Authority on Development) 2007, Djibouti).
- ✓ In Kenya, KWS (Kenya Wildlife Services) has documented approximately 50 endangered or threatened ecosystems of national and global importance.

Table below shows a list of the endangered ecosystems and environmentally significant areas in Kenya.

Table N-4.1.1 Endangered Ecosystems and Environmentally Significant Areas

1. Endangered Ecosystems		2. Environmental Significant Areas
Mara National Reserve	Machakos ranches	Baringo Ecosystem
Mara Conservancy	Lake Nakuru NP and its catchment	Boni-Dodori -Kiunga
Siana	Mau Forest Complex	Malindi- Watamu Ecosystem
Koiyaki	Soysambu Ranch	Mt Elgon Ecosystem
Olare Orok Lemek	Marula Ranch	Mt Kenya Ecosystem
Ol Pieyei Loita hills	Lake Elementaita and its catchment and basin	Marsabit Ecosystem
Plains and forests	Soysambu Ranch	Lake Naivasha Ecosystem
Suswa	Marula ranch	Aberdare Ecosystem Ranges
Nguruman	Eburru Forest	Tsavo Ecosystem
Maji Moto	Sibiloi National Park	Shimba Hills Ecosystem
Ol Choro Orua	Kerio valley	
Ol Gulului/ Lolorashi Group Ranch	Lake Turkana	
Mbirikani Group Ranch	Mt Kulal	
Kuku A and B Group Ranches	Loima hills	
Selengei Group Ranch	Mt Nyiro	
Ol Gulului Trust Land	Central and Southern Islands National Parks	
Kimana Group Ranch	Nairobi Ranch	
Rombo Group Ranch	Kipini	
West Chyulu National Park	Witu forest	
Mashuru	Tana Primate National Primate Reserve	
Nairobi National park	Lango la Simba Ranch	
Athi-Kitengela & Kaputei Plains	Sheikh Salim Ranch	

Source: Kenya Wildlife Services (http://www.kws.org/research/priority_ecosystems.html)

N-4.1.2 Fauna

1) Mammals

Table below shows a list of the endangered and threatened mammals in Kenya.

Table N-4.1.2 Endangered and Threatened Mammals

Common Name	Scientific Name	Common Name	Scientific Name
Aders' duiker	<i>Cephalophus adersi</i>	Barbour's vlei rat	<i>Otomys barbouri</i>
Black rhinoceros	<i>Diceros bicornis</i>	Mount Elgon vlei rat	<i>Otomys jacksoni</i>
Hirola	<i>Beatragus hunteri</i>	Golden-rumped elephant shrew	<i>Rhynchocyon chrysopygus</i>
Eastern red colobus	<i>Procolobus rufomitratus</i>	Eastern bongo	<i>Tragelaphus eurycerus isaaci</i>
Tana crested mangabey	<i>Cercocebus galeritus</i>	African elephant	<i>Loxodonta Africana</i>
Roan antelope	<i>Hippotragus equinus</i>	African lion	<i>Panthera leo</i>
Sable antelope	<i>Hippotragus niger</i>	Cheetah	<i>Acinonyx jubatus</i>
White rhino	<i>Ceratotherium simum simum</i>	Striped hyaena	<i>Hyaena Hyaena</i>
Coalfish whale	<i>Balaenoptera borealis</i>	Sitatunga	<i>Tragelaphus spekii</i>
Blue whale	<i>Balaenoptera musculus</i>	Leopard	<i>Panthera pardus</i>
Grevy's zebra	<i>Equus grevyi</i>	Lelwel hartebeest	<i>Alcelaphus buselaphus</i>
African wild dog	<i>Lycaon pictus</i>	Rothschild's giraffe	<i>Giraffa camelopardalis rothschildi</i>
Giant thicket rat	<i>Grammomys gigas</i>	-	-

Source: Kenya Wildlife Services (http://www.kws.org/research/priority_ecosystems.html)

2) Birds

Kenya is a home to 61 Important Bird Areas (IBAs) (See Figure 2.10.2). According to "Kenya State of the Environment and Outlook 2010 (NEMA 2011)", Taita apalis (*Apalis fuscicularis*) and Taita thrush (*Turdus helleri*) which are endemic to the upland forests of the Taita Hills in south-east Kenya are critically endangered.

Table below shows a list of the endangered and threatened birds in Kenya.

Table N-4.1.3 Endangered and Threatened Birds

Common Name	Scientific Name	Common Name	Scientific Name
Taita apalis	<i>Apalis fuscicularis</i>	Lesser kestrel	<i>Falco naumanni</i>
Taita thrush	<i>Turdus helleri</i>	White-headed vulture	<i>Trigonoceps occipitalis</i>
Madagascar pond-heron	<i>Ardeola idae</i>	Lappet-faced vulture	<i>Torgos tracheliotos</i>
Saker falcon	<i>Falco cherrug</i>	Greater spotted eagle	<i>Aquila clanga</i>
Egyptian vulture	<i>Neophron percnopterus</i>	Eastern imperial eagle	<i>Aquila heliaca</i>
Sokoke scops-owl	<i>Otus ireneae</i>	Madagascar pratincole	<i>Glareola ocularis</i>
Aberdare cisticola	<i>Cisticola aberdare</i>	Blue swallow	<i>Hirundo atrocaerulea</i>
Basra reed-warbler	<i>Acrocephalus griseldis</i>	White-winged apalis	<i>Apalis chariessa</i>
Turner's eremomela	<i>Eremomela turneri</i>	Karamoja apalis	<i>Apalis karamojae</i>
Spotted ground-thrush	<i>Zoothera guttata</i>	Papyrus yellow warbler	<i>Chloropeta gracilirostris</i>
Amani sunbird	<i>Anthreptes pallidigaster</i>	Hinde's pied-babbler	<i>Turdoides hindei</i>
Clarke's weaver	<i>Ploceus golandi</i>	Abbott's starling	<i>Cinnyricinclus femoralis</i>
Sharpe's longclaw	<i>Macronyx sharpei</i>	Chapin's flycatcher	<i>Muscicapa lendu</i>
Sokoke pipit	<i>Anthus sokokensis</i>	-	-

Source: Kenya Wildlife Services (http://www.kws.org/research/priority_ecosystems.html)

3) Reptiles and Amphibians

Table below shows a list of the endangered and threatened reptiles and amphibians in Kenya.

Table N-4.1.4 Endangered and Threatened Reptiles and Amphibians

Common Name	Scientific Name	Common Name	Scientific Name
Hawksbill turtle	<i>Eretmochelys imbricata</i>	Günther's centipede-eater	<i>Aparallactus turneri</i>
Du toit's torrent frog	<i>Petropedetes dutoiti</i>	East African egg eating snakes	<i>Dasypeltis medici</i>
Green turtle	<i>Chelonia mydas</i>	Large brown spitting cobra	<i>Naja ashei</i>
Olive ridley	<i>Lepidochelys olivacea</i>	Black necked spotters	<i>Naja nigricollis</i>
Rock python	<i>Python sebae</i>	Savannah monitor lizard	<i>Varanus albigularis</i>
Shimba hills banana frog	<i>Afrixalus sylvaticus</i>	Speckled bush snake	<i>Philothamnus punctatus</i>
Shimba hills reed frog	<i>Hyperolius rubrovermiculatus</i>	Puff adder	<i>Bitis arietans</i>
Forest frog	<i>Afrixalus sylvaticus</i>	Green mamba	<i>Dendroaspis angusticeps</i>
Treefrog	<i>Hyperolius rubrovermiculatus</i>	Nairobi toad	<i>Bufo nairobiensis</i>
Mount Kenya frog	<i>Phrynobatrachus irangi</i>	Silvery tree frog	<i>Leptopelis argenteus</i>
Crevice tortoise	<i>Malacochersus tornieri</i>	Taita toad	<i>Bufo taitanus</i>
Turkana mud turtle	<i>Pelusios broadleyi</i>	Yellow-spotted tree frog	<i>Leptopelis flavomaculatus</i>
Montane toad	<i>Bufo kerinyagae</i>	Turkana toad	<i>Bufo turkanae</i>
Montane tree frog	<i>Hyperolius cystocandicans</i>	Delicate spiny reed frog	<i>Afrixalus delicatus</i>
Mt. Kenya bush viper	<i>Atheris desaixi</i>	Painted reed frog	<i>Hyperolius marmoratus</i>
Kemp's ridley	<i>Lepidochelys kempii</i>	Long reed frog	<i>Hyperolius nasutus</i>
Black turtle	<i>Chelonia agassizi</i>	Spotted reed frog	<i>Hyperolius puncticulatus</i>
Loggerhead	<i>Caretta caretta</i>	Water lily reed frog	<i>Hyperolius pusillus</i>
Leatherback	<i>Dermochelys coriacea</i>	Kenya sand boar	<i>Eryx colubrinus</i>
Yellow-bellied hinged terrapin	<i>Pelusios castanoides</i>	Side-striped chameleon	<i>Chamaeleo bitaeniatus</i>
Tropical geckos	<i>Hemidactylus modestus</i>	Flap-neck chameleon	<i>Chamaeleo dilepis</i>
Baobab gecko	<i>Hemidactylus platycephalus</i>	Elliot's chameleon	<i>Chamaeleo ellioti</i>
Writhing skink	<i>Lygosoma tanae</i>	High casqued chameleon*	<i>Chamaeleo Hohnelii</i>
Keel-bellied lizard	<i>Gastropholis prasina</i>	Jackson's chameleon	<i>Chamaeleo jacksoni</i>
Girdled-lizard	<i>Cordylus tropidosternum</i>	Mount Kenya chameleon	<i>Chamaeleo schubotzi</i>
Worm snakes	<i>Leptotyphlops boulengeri</i>	Gaboon viper	<i>Bitis gabonica gabonica</i>

* Another name: three-horned chameleon

Source: Kenya Wildlife Services (http://www.kws.org/research/priority_ecosystems.html)

4) Fish

“Kenya State of the Environment and Outlook 2010 (NEMA 2011)” notes that because of inadequate data, many species have not been evaluated and hence threatened species could be as high as 71 (Reference: Froese, R. and Pauly, D. (eds). 2008; Fish Base. World Wide Web electronic publication, <http://www.fishbase.org>, version 07/2008) and probably include *Haplochromis ishmaeli* which was previously recorded in Lake Victoria.

Table below shows a list of the endangered and threatened fish in Kenya.

Table N-4.1.5 Endangered and Threatened Fish

Common Name	Scientific Name	Common Name	Scientific Name
Singidia tilapia	<i>Oreochromis esculentus</i>	Whale shark	<i>Rhincodon typus</i>
Lake Chala tilapia	<i>Oreochromis hunter</i>	Porcupine ray	<i>Urogymnus asperrimus</i>
Jipe tilapia	<i>Oreochromis jipe</i>	Oceanic whitetip shark	<i>Carcharhinus longimanus</i>
Victoria tilapia	<i>Oreochromis variabilis</i>	Great white shark	<i>Carcharodon carcharias</i>
Rainbow sheller	<i>Ptyochromis sp.</i>	Bowmouth guitarfish	<i>Rhina ancylostoma</i>
Lake Victoria deepwater catfish	<i>Xenoclaris eupogon</i>	Black-blotched stingray	<i>Taeniura meyeni</i>
Montane dancing-jewel	<i>Platycephala amboniensis</i>	Giant guitarfish	<i>Rhynchobatus djiddensis</i>

Common Name	Scientific Name	Common Name	Scientific Name
Magadi tilapia	<i>Alcolapia alcalicus</i>	Shorttail nurse shark	<i>Pseudoginglymostoma brevicaudatum</i>
Giant wrasse	<i>Cheilinus undulates</i>	Brindle bass	<i>Epinephelus lanceolatus</i>
Victoria stonebasher	<i>Marcusenius victoriae</i>	Blue notho	<i>Nothobranchius patrizii</i>
Kyoga flameback	<i>Xystichromis nuchisquamulatus</i>	Boji plains nothobranch	<i>Nothobranchius bojiensis</i>
Grey nurse shark	<i>Carcharias Taurus</i>	Elongate nothobranch	<i>Nothobranchius elongatus</i>
Bigeye tuna	<i>Thunnus obesus</i>	Ewaso nyiro labeo	<i>Labeo percivali</i>

Source: Kenya Wildlife Services (http://www.kws.org/research/priority_ecosystems.html)

N-4.1.3 Flora

According to “Kenya State of the Environment and Outlook 2010 (NEMA 2011)”, of the 7,000 plant species occurring in Kenya, 146 species have been assessed according to the IUCN Threat Criteria (2008) and 103 have been categorized as being threatened (critically endangered, endangered or vulnerable).

Table below shows a list of the endangered and threatened plants in Kenya.

Table N-4.1.6 Endangered and Threatened Plants

Common Name	Scientific Name	Common Name	Scientific Name
Mugurure (Swahili name)	<i>Combretum tenuipetiolatum</i> ,	Red stinkwood	<i>Prunus africana</i>
Camel foot	<i>Bauhinia mombassae</i> ,	Meru oak	<i>Vitex keniensis</i>
Mutingombe (Kikuyu name)	<i>Brucea macrocarpa</i> ,	Camphor	<i>Ocotea kenyensis</i>
Bally	<i>Euphorbia tanaensis</i>	Parasol tree	<i>Polyscias kikuyuensis</i>
Mkunguma (Swahili name)	<i>Sorindeia</i>	Rat aloe	<i>Aloe ballyi</i>
Voi cycad	<i>Encephalartos kisambo</i>	Tana river poplar	<i>Populus ilicifolia</i>
East African sandalwood	<i>Osyris lanceolata</i>	-	-

Source: Kenya State of the Environment and Outlook 2010 (NEMA 2011), Kenya Wildlife Services (http://www.kws.org/research/priority_ecosystems.html)

N-4.2 Details of Social Aspects

N-4.2.1 Linguistic

The main ethno-linguistic minorities in Kenya are shown in the table below

Table N-4.2.1 Main Ethno-linguistic Minorities

Bantu-speaking peoples	Nilotic-speaking peoples	Cushitic-speaking peoples
Western Bantu 1. Abaluyia (Bakhayo, Banyala, Banyore, Bukusu, Idakho, Isukha, Kabras, Kisa, Marachi, Maragoli, Marama, Samia, Tachoni, Tiriki, Wanga) 2. Abagusii, 3. Abakuria	Plains Nilotes Elmolo, Dorobo, Ilchamus, Maasai, Sakweri, Samburu, Teso, Turkana	Boni, Borana, Burji, Dushnek, Gabbra, Munyoyaya, Oromo, Rendile, Sakuye, Somali, Waata
Central Bantu Aembu, Agikuyu, Akamba, Ambeere, Ameru (Achuka, Aigembe, Aimenti, Amuthambi, Amwimbi, Atharaka, Atigania)	Highland Nilotes Elgeyo, Elkony, Kipsigis, Lembus, Mandi, Marakwet, Nandi, Ogiek, Pokot, Sabaots, Sengwer, Terek, Turgen	-
Coastal (Eastern) Bantu Adawida; Amalita; Ataita; Ataveta; Kenda (Chonyi, Digo, Duruma,	River-Lake Nilotes Luo, Nubians	-

Bantu-speaking peoples	Nilotic-speaking peoples	Cushitic-speaking peoples
Giriama, Jibana, Kambe, Kauma, Rabai, Ribe); Miji; Pokomo; Segeju; Waswahili (Amu, Bajun, Fundi, Mvita, Ozi, Pate, Shela, Siyu, Vumba)		

(Original Source: CONSTITUTION OF KENYA REVIEW COMMISSION, *REPORT ON CULTURE*, AUGUST 2003)

Source: Kenya: Minority, Indigenous Peoples and Ethnic Diversity, by Maurice Odhiambo Makoloo with a preface by Yash Ghal, Minority Rights Group International (2005)

N-4.2.2 Archeological and Cultural Sites in Kenya

The principal archeological and cultural sites in Kenya are located in four areas of Eastern shore of Lake Turkana (Koobi Fora), near Nakuru (Hyrax Hill) and the sea coast areas (Gedi Ruins and Lamu Archipelago) as summarized in the table below.

Table N-4.2.2 Archeological Sites in Kenya

Site Name	Category	Description	Era	Location
Koobi Fora	Paleontological Sites	Australopithecus boisei, Homo Habilis	2.5 million years ago	Eastern shore of Lake Turkana
Hyrax Hill	Archaeological Site	Artifacts (pottery fragments, hut and village remains, and burial mounds)	Iron Age & Neolithic	Near Nakuru
Gedi Ruins	Archaeological Sites	Swahili settlements and architecture	800 AD to present	Near Malindi
Lamu Archipelago	Archaeological Sites	Swahili settlements and architecture	800 AD to present	Northern Coast

Source: East Africa Living Encyclopedia, the African Studies Center at the University of Pennsylvania

(<http://www.africa.upenn.edu/NEH/karchaeology.htm>)

Three areas have been inscribed as “Cultural Heritage” sites of “World Heritage” by UNESCO, as shown in the table below.

Table N-4.2.3 UNESCO Cultural Heritage Sites in Kenya

Cultural Heritage	Individual Site Name	Location	Year Inscribed
Sacred Mijikenda Kaya Forests	Kaya Giriama	along the Coast*	2008
	Kaya Jibana	along the Coast*	2008
	Kaya Kambe	along the Coast*	2008
	Kaya Kauma	along the Coast*	2008
	Kaya Ribe	along the Coast*	2008
	The Rabai Kayas	along the Coast*	2008
	The Duruma Kayas	along the Coast*	2008
	Kaya Kinondo	along the Coast*	2008
Lamu Old Town	Lamu Old Town	Lamu Island	2001
Fort Jesus, Mombasa	Fort Jesus	Mombasa	2011

Note*: The Mijikenda Kaya Forests consist of 11 separate forest sites spread over some 200 km along the coast on the Indian ocean

Source: UNESCO World Heritage Kenya (<http://whc.unesco.org/en/statesparties/ke>)

Archeological, Cultural Sites and Facilities (including “World Heritage” sites) in Kenya are shown in the figure below.



Note 1; ①~⑳ see Table N-4.2.4

Note 2; N.P.: National Park, N.R.: National Reserve, N.F.: Natural Forest

Source: Base Map; National Museums of Kenya (<http://www.museums.or.ke/content/view/248/137/>) amended and modified by the JICA Expert Team

Figure N-4.2.1 Archaeological, Cultural Sites and Facilities in Kenya

Table N-4.2.4 List of Archeological, Cultural Sites and Facilities in Kenya

No.	Name	Brief Description
1	Nairobi National Museum	The Museum was initiated in 1910 by the East Africa and Uganda Natural History Society (Currently the East African Natural History Society). After independence, the National Museums of Kenya was formed and renamed as Nairobi Museum, which was reopened on June 14th, 2008.
2	Nairobi Snake Park	The park has Crocodiles, turtles and other different reptiles and birds. The aquarium holds unique variety of marine and fresh water fish. Adjacent to the aquarium are succulent gardens and the botanic gardens.
3	Nairobi Botanical Garden	Situated at 1.5Km from the city center, the garden has 600 indigenous and 100 exotic plant species and cultivars growing in ten of the proposed seventeen thematic displays that integrate Kenya's natural, historical and cultural heritage.
4	Nairobi Gallery	Built in 1913, this old PC's office building was fondly referred to by the settler community as 'Hatches, Matches and Dispatches' because of the births, marriages and deaths that were recorded here. This museum holds temporary exhibitions that continuously rotate to give it spice and life.
5	Karen Blixen Museum	This museum was originally the home of Karen Blixen, who came to Kenya from Denmark in the early 20th century. The house was restored and used during the filming of the world renowned movie "Out of Africa", which immortalised Karen Blixen's book by the same name.
6	Meru Museum	Located in Meru town and is primarily designed to meet the needs of the District residents, thus in doing so it has exhibits of general interest including pre-history, cultural history and natural sciences.
7	Olorgesailie Site	This Acheullian site is located about 90kms South-West of Nairobi on Magadi Road. It is characterized by in situ displays of pre-historic materials including numerous hand axes, fossilised skeletons of extinct species of elephants and hippopotamus dating back from 1.2 million years ago.
8	Narok Museum	Situated in Narok town, Narok Museum depicts the beauty and strength of the rich traditional culture of the Maasai and other speakers of the Maa language through pictures and artifacts, for a better understanding of the whole community.
9	Kariandusi Site	Located 2Km east of Lake Elementaita next to the diatomite mine along the main Nairobi-Nakuru highway. It is an Acheullian site characterized, like Olorgesailie, by the presence of heavy hand axes and cleavers.
10	Desert Museum, Loiyangalani	Situated on top of a hill overlooking Lake Turkana, the museum, which opened in 2008 focuses on the lives of the 8 communities living in the area and on the natural environment in this harsh part of the country.
11	Koobi Fora	Lying on the Eastern shores of Lake Turkana, Koobi Fora is one of the world's leading pre-historic sites for study of the evolution of humankind. In 1972 the area was gazetted as the Sibiloi National Park and is a World Heritage Site since 1977.
12	Hyrax Hill Museum	Located near Nakuru Town, the results of numerous excavations yielded three major areas of pre-historic settlement: the oldest dating to 3,000 years and the youngest to possibly 300 years. The Museum displays ethnographic materials of the people in the Rift Valley, archeology and local ecology.
13	Kitale Museum	It has the collections of the late Col. H. Stoneham who had a private museum in Kitale before his collections were bequeathed to NMK. Other exhibits include material culture of the people in western Kenya, pre-history and natural history
14	Kisumu Museum	Located within Kisumu town, officially opened to the public in 1980, its, comprehensive exhibits focuses on displays of material culture of the people of Western Rift Valley and Nyanza Province.
15	Thimlich Ohinga Cultural Landscape	Located about 46kms north-west of Migori town in Nyanza Province. It represents some of the most striking dry stone wall enclosures, similar in construction to the well known ruins on Great Zimbabwe in Southern Africa.
16	Kapenguria Museum	It is the site where several of the founding fathers of the Kenyan Nation were detained during the struggle for independence. The Museum also has a focus on Pokot culture. The Kapenguria six were; Mzee Jomo Kenyatta, Kungu Karumba, Mr. Fred Kubai, Mr. Paul Ngei, Bildad Kaggia and the Hon. Ramogi Achieng Oneko.
17	Kabarnet Museum	It is set among the Tungen Hills of Baringo District. Established in the former District Commissioner's residence, this museum has four main public galleries which feature exhibits on the material culture of the local people and the natural environment.
18	Kakapel Museum	Situated at the Chelelemuk hills, Western Kenya the site has art forms dating over 2000 years ago and may be as much as 4,000 years old. It has paintings illustrating wild animals, rainmaking and initiation symbols.
19	Fort Jesus	Fort Jesus, overlooking the entrance to the Old Port of Mombasa, was built by the Portuguese in 1593 to protect their trade route to India. It is today hailed as one of the best examples of 16th century Portuguese military architecture. It displays mainly archeological findings. The

No.	Name	Brief Description
		Old Law Courts Gallery hosts temporary exhibitions.
20	Gede Museum	Located 16kms South of Malindi and founded in the 12th century A.D. Gede was a large and prosperous town which flourished until its abandonment in the 17th century. Excavation unearthed numerous domestic, religious and commercial structures. A walk through this ancient town reveals numerous species of flora and fauna.
21	Malindi Museum	Located in Malindi Town in a historic building dubbed "House of the Columns" on the sea promenade near the jetty. The museum offer exhibitions on the history of Malindi and the world oldest fish species that has remained unchanged since 400 million years ago. A visit to the museum includes a visit to Vasco da Gama Pillar, the Portuguese Chapel and the old Town of Malindi.
22	Mnarani Museum	The ruins of the Swahili settlement of Mnarani dating back to the 15th Century are located on the south bank of the Kilifi Creek on Kenya's north coast. Several tombs are found at the site.
23	Jumba la Mwana	Located approximately 20kms north of Mombasa, this site represents the remains of a 13th Century Swahili settlement. Jumba still boasts magnificent standing remains of domestic houses, curved niches, and arched doors forming part of the decorative motifs.
24	Rabai Museum	Rabai is well known in the annals of history as the place where Christianity and modern learning in Kenya started well over 150 years ago. Established by Dr. Ludwig Krapf in 1846 as the first Church edifice in Kenya, Rabai is situated about 25kms north-west of Mombasa, o_ the Nairobi-Mombasa highway on Mazerazs-Kaloleni road.
25	Shimoni Sacred Grove Caves	Located 75kms south of Mombasa, in the centre of the village, the caves have several chambers. The most prominent of the chambers is a religious shrine used by the local community, which is said to have been used in the past for hiding and imprisoning slaves.
26	Lamu Town	Founded around the 13th century, Lamu is host to four museums, namely; Lamu Museum, Lamu Fort, German Post Office Museum & Swahili House Museum. Lamu Town is one of the oldest living Swahili towns in East Africa, comparable to others such as Zanzibar and Lamu is currently a World Heritage Site.
27	Lamu Museum	The two storey house which is now the museum was originally used by the British colonial government. It now houses an unparalleled collection of ethnographic material from the Swahili, Orma and Pokomo ethnic groups. Of particular interest is the fascinating display of traditional Swahili craft, furniture, jewelry and siwa (A ceremonial side blown horn).
28	Lamu German Post Office	Built at the beginning of the 19th century as a private residence, it was later converted to first German Post Office in East Africa, from the 1888 to 1891 during the time when Witu, South of Lamu, was a German Protectorate.
29	Takwa Ruins	The ruins of Takwa are located on Manda Island, a 30 minute boat ride from Lamu Town. Here one can witness the remains of a thriving 16th century Swahili trading post.

Note: Each No. in the table shows 1-29 on the Maps of Figure N-4.2 and N-4.3

Source: National Museums of Kenya (<http://www.museums.or.ke/content/view/248/137/>) some modified by the JICA Expert Team

N-4.3 Decentralization of EIA

Public notice of Decentralization on EIA as of 1st of July 2012 is shown below.



NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY

PUBLIC NOTICE

DECENTRALIZATION OF NEMA FUNCTIONS AND SERVICES

The National Environment Management Authority (NEMA), effective 1st July 2012 implemented a decentralization programme to counties. This is in adherence to the Constitution of Kenya 2010 provisions for government agencies to devolve their operations and functions to counties to ensure efficient provision of their services. The decentralization will in particular address processing of Environmental Impact Assessment, Environmental Audit, Noise and Excessive Vibration Control and transportation of waste (garbage and sewage) licences.

SPECIFIC CRITERIA FOR DECENTRALIZATION

A. Low impact Environmental Impact Assessment (EIA) projects

The EIA for the following low impact projects shall be submitted and processed at respective offices of the County Director of Environment:

1. Residential houses (bungalows, maisonettes, flats) in zoned area (of not more than 30 units)
2. Commercial buildings (of not more than 10 storey/s) in zoned areas
3. Go-downs for storage of goods only in zoned areas
4. Community based and/or constituency development Fund (CDF) projects such as:
 - i. Water projects, boreholes and water pans
 - ii. Roads (small feeder roads) and bridges
 - iii. Markets
 - iv. Cattle dips
5. Cottage industry/jua kali sector/garages
6. Car and bus parks
7. Restaurants (excluding tourism facilities in or surrounding National parks and game reserves)
8. Expansion of existing facilities for same use especially socially uplifting projects (SUPs) such as schools and dispensaries
9. Afforestation/re-afforestation programmes
10. Sand harvesting, quarrying and brick making
11. Slaughter houses (handling not more than 15 animals a day)
12. Construction of churches and mosques
13. Timber harvesting

B. Medium and low risk Environmental Audit (EA)reports

Medium and low impact project audits will be processed at respective offices of County Directors of Environment. These include:

1. Animal feed milling
2. Apartments
3. Colleges
4. Campsites
5. Metal welding
6. Restaurants
7. Schools
8. Tea farms
9. Transport Companies
10. Timber Products
11. Warehouses
12. Stadiums

C. High impact/risk projects will be processed at NEMA headquarters

All high impact/risk projects will be processed at NEMA headquarters. These include:

1. Asbestos manufacturing /based industries
2. Battery recycling

3. Airports
4. Airports hangars
5. Base transceiver stations(BTS)
6. Cement factories
7. Chemical factories
8. Distilling and blending spirits
9. Geothermal plants
10. Hydroelectric power generation plants
11. Incinerators
12. Landfills
13. Large scale irrigated agriculture farming (exceeding 50ha)
14. Molasses plants
15. Petroleum refining
16. Paper mills
17. Vegetable oil refineries
18. Steel mills
19. Sewerage works
20. Thermal power generation
21. Tanneries
22. Tourist facilities in protected areas
23. Wood preservation

N.B: All other facilities/projects not included in the high risk category list shall be submitted and processed at the respective offices of the County Director of Environment.

D. Noise and excessive vibration control licensing

Noise and excessive vibration control licences and permits shall be issued at the county level for one off activities, where noise emitted is expected to go beyond maximum permissible noise levels. Such one off activities include: weddings and birthday parties, road shows, ceremonies, parties, religious festivals, mobile cinemas among others. The licence is valid for a maximum of seven days and costs KShs 2,200.

Permits will be issued for the following one off activities: demolition activities, construction sites, fireworks, mines and quarries, firing ranges, specific heavy duty industry. The permit shall be valid for a period of up to three months and costs KShs 5,500.

Commercial activities, discos/ live bands/ pubs, entertainment joints, places of worship among others, shall not be licenced as they are required to sound proof their premises to keep their noise to within permissible noise levels.

E. Waste transportation licensing

Licenses to transport garbage and sewage waste shall be issued at the county level. All the other categories of waste management license applications will continue to be received at county level. These will be forwarded to NEMA Headquarters for processing.

Office contacts of respective County Directors of Environment (CDE) can be found on the NEMA website at www.nema.go.ke.

For further information, please contact:

PROF. GEOFFREY WAHUNGU
DIRECTOR GENERAL
NEMA
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P.O. Box 67839- 00200, Nairobi, Kenya
Tel: (254 020) 6005522, 020 2101370, 0724 253398, 0735 010237
Fax (254 020) 6008997

Email: dg@nema.go.ke Website: www.nema.go.ke
Face book: [National Environment Management Authority](#)
Report any environmental related corruption to: anticorruption@nema.go.ke

Source: a Clip DAILY NATION, Monday July 9, 2012

Figure N-4.3.1 Public Notice on Decentralization of NEMA Functions and Services

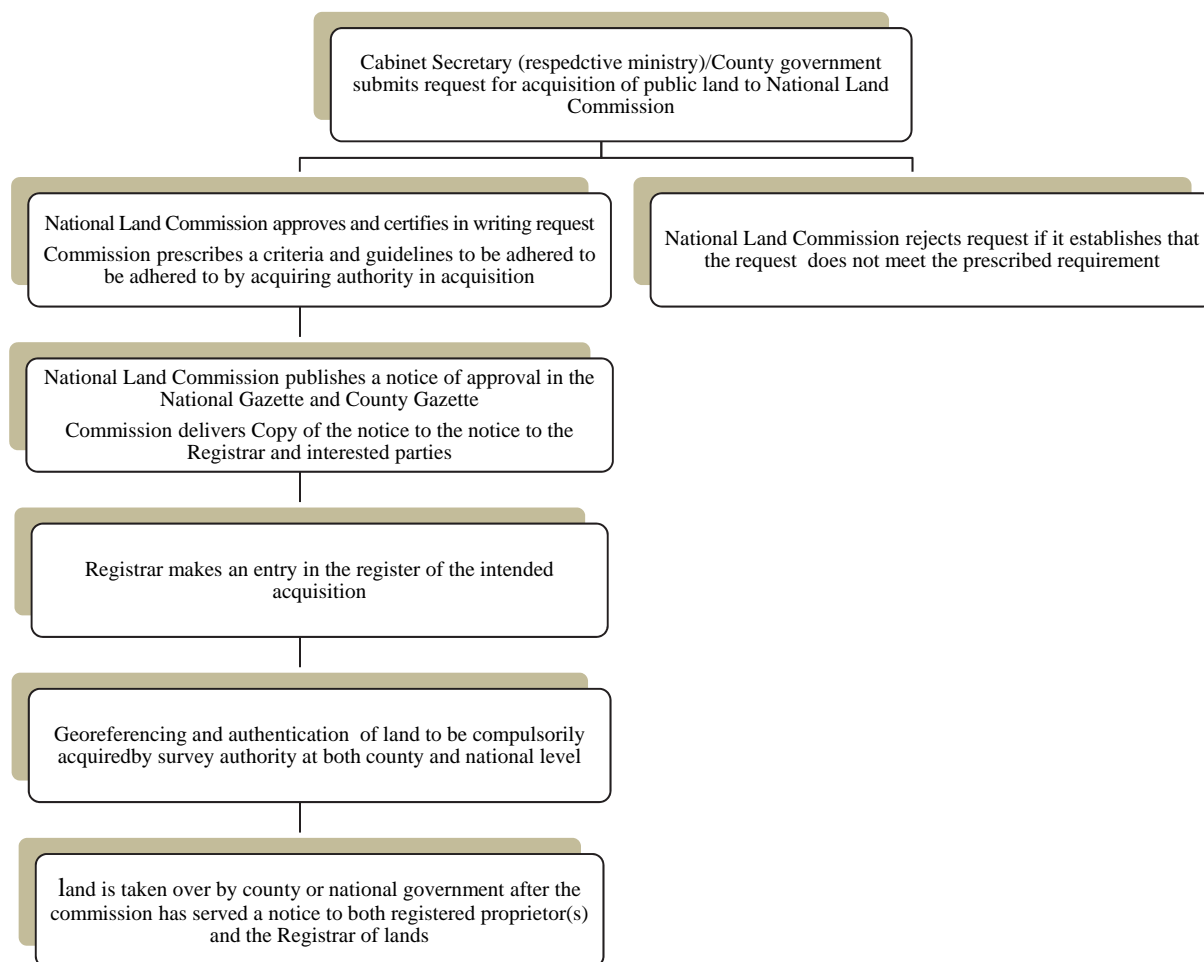
N-4.4 Details of Land Acquisition in Kenya

(1) Land Acquisition for Development Projects

Acquisition of land for development projects is envisaged in the Land Act through compulsory land acquisition. This applies to land acquisition for development projects in the public interest. Here land may be acquired compulsorily in the event that the National Land Commission certifies in writing that the land is necessary for the fulfillment of public purposes for which it is being acquired.

The Land Act 2012 in Section 111(1) prescribes that land acquired under this Act shall be compensated in a just and prompt manner in full to all persons interested in the land in question. The National Land Commission shall make rules to regulate the assessment of just compensation upon making inquiry to ascertain propriety and claims to land for which compensation is to be issued.

Figures below show land acquisition process and the compensation process respectively.

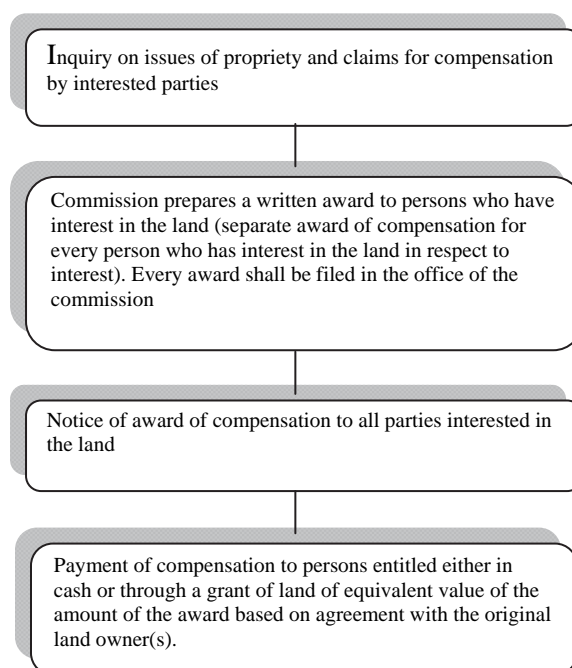


Note:

- The commission may after the expiration of 15 days notice of intention to acquire, the Commission shall proceed to take possession of the land even before award of compensation is given.
- If, after the public purpose or interest for which land has been compulsorily acquired ceases or fails, the Commission may offer the original owners or their successors in the pre-emptive rights to re-acquire the land, upon restitution to the acquiring authority the full amount paid as compensation.

Source: JICA Expert Team referring to the Land Act, 2012

Figure N-4.4.1 Flow Chart for Compulsory Land Acquisition

**Note:**

- Upon taking possession of the land the commission serves a notice to both the registered proprietor and the Registrar of lands that land has been taken and vested in the national or county government
- If the amount of any compensation awarded is not paid, the commission shall on or before possession of the land, open a special account into which the commission shall pay interest on the amount awarded at the rate of prevailing bank rates from the time of taking possession until the time of payment
- If additional compensation is payable, in cases where upon survey of land the area is found to be greater than earlier thought, there shall be added additional amount of compensation plus interest accrued

Source: JICA Expert Team referring to the Land Act, 2012

Figure N-4.4.2 Process of Compensation

N-4.5 Details of Disposal of PV related Equipment and E-waste Management Structure

Used batteries, fluorescent tubes and other used electrical apparatuses/devices can be handled by organizing an e-waste management sub-committee under the Pilot Project management structure to be set up by each community and/or facility as follows.

- ✓ The structure (sub-committee) to be organized for the e-waste management shall be discussed among stakeholders on the initiative of REA.
- ✓ Each community is to be enlightened that even the electrical apparatuses/devices such as PV panels and inverters which have a longer lifespan eventually need replacement.
- ✓ Each community is to also be enlightened that those hazardous elements shown in Table N-4.32 are hazardous to health and environment as well as some hazardous substances like “lead” in batteries and some no-hazardous elements shown in Table N-4.33 can be recycled and reused.

Practically, those e-wastes shall be transported to the licensed E-waste Handlers and/or battery makers in the following idea.

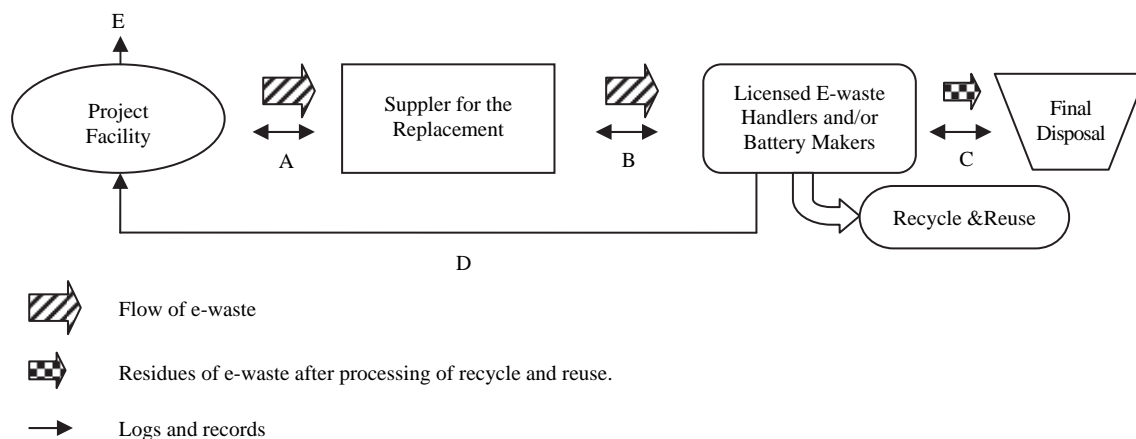
- ✓ Request suppliers to take away used ones from each facility when carrying out replacements (this shall be set as a condition for carrying out replacements).
- ✓ Due to the public property, earning from the selling of used batteries and other used substances of e-waste shall be remitted using the “m-pesa” system by the suppliers when getting selling money from the licensed E-waste Handlers and/or battery makers.
- ✓ The earning money shall be kept in each facility as revenue.

In order to make sure the proper transportation and treatment, an e-waste manifest system shall be introduced in the e-waste disposal system as shown in Figure N-4.10 and Table N-4.36.

* Manifest system: A system to keep all logs from e-waste discharge stage to transportations well as final treatment in order to prevent illegal dispose of e-waste during the transportation as well as to make sure appropriate final treatment of such waste.

**The following web site of USEPA on Hazardous Waste Manifest System can be referred as reference.

<http://www.epa.gov/waste/hazard/transportation/manifest/index.htm>



- A Keep two logs on e-waste between Generator (facility) and Supplier which will transport e-waste to the (2 logs: one is for the generator and one is for the supplier)
- B Keep two logs on the e-waste between the Supplier and Licensed e-waste handler and/or Battery Maker for the treatment of the e-waste (2 logs: one is for the supplier and one is for the Licensed E-waste Handlers and/or Battery Makers)
- C Keep two logs on the residue of the e-waste between the Licensed e-waste handler and/or Battery Maker and a final disposal site (2 logs: one is for the Licensed e-waste handler and/or Battery Maker and one is for the final disposal facility like a landfill)
- D Send two copies of the logs of B and C to Generator (project facility) by which each project facility can identify the proper transportation, treatment and final disposal of the e-wastes by mail.
- E After receiving the copies in D, each facility shall report showing one of the copies to REA, as well as regulatory agency such as the Ministry of Education, Science and Technology (for Primary Schools) or the Ministry of Health (for Dispensaries).

Prepared by JET

Figure N-4.5.1 Conceptual Diagram of E-waste Manifest system



(A battery maker already has a program of buying used batteries at Kenya shillings 40 per kilogram)

Prepared by JET

Figure N-4.5.2 Old Battery Purchasing by a Battery Maker

Table N-4.5.1 Licensed E-waste Handlers in Kenya (As of August 2013)

Handler	Contact	District	Waste Type
EAST AFRICA COMPUTER RECYCLERS LTD	P.O.BOX 49266-00100, NAIROBI Email: eastafrikancomputer@yahoo.com 07215036515 0729308221	MOMBASA	ELECTRONIC RECYCLING
WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT CENTER	P.O.BOX 48584-00100 NAIROBI Email: info@weecenter.com 0733-986-558 202060921	NAIROBI	ELECTRONIC RECYCLING

Source: NEMA (Tabulated by JICA Expert Team)

Table N-4.5.2 Draft E-waste Manifest Log Form

	Date:	No. of Manifest		
1	Facility (Generator)	Name Person –in Charge:	Address/TEL/FAX Contact address/TEL	
	E-waste	name 1:	quantity	mode of packing
		name 2:	quantity	mode of packing
		name 3:	quantity	mode of packing
		name 4:	quantity	mode of packing
		name 5:	quantity	mode of packing
2	Supplier (Transportation)	Name Person –in Charge:	Address/TEL/FAX Contact address/TEL	
	Received the above listed e-waste from the Facility on date _____ and Sign _____			
3	Licensed E-waste Handler and/or Battery Maker	Name Person –in Charge:	Address/TEL/FAX Contact address/TEL	
	Received the above listed e-waste from the Supplier on date _____ and Sign _____			
	Treated appropriately the e-waste on date _____ and Sign _____ in compliance with the relevant laws and regulations in Kenya, especially the followings <ul style="list-style-type: none"> ✓ Environmental Management and Coordination Act of 1999 (EMCA) ✓ Environmental Management and Coordination (Waste Management) Regulations 2006 ✓ Guidelines for E-Waste Management in Kenya 2010 			
4	Final Disposal	Name Person –in Charge:	Address/TEL/FAX Contact address/TEL	
	Received the residues of above listed e-waste from the Licensed E-waste Handler and/or Battery Maker on date _____ and Sign _____			
	Disposed the residues on date _____ and Sign _____ in compliance with the relevant laws and regulations in Kenya, especially the followings <ul style="list-style-type: none"> ✓ Environmental Management and Coordination Act of 1999 (EMCA) ✓ Environmental Management and Coordination (Waste Management) Regulations 2006 ✓ Guidelines for E-Waste Management in Kenya 2010 			

Note: At least eight copies are necessary

Prepared by JET