ENERGY

ASSESSMENT OF THE ENERGY SITUATION AT THE UN COMPOUND IN GIGIRI

Content:

Step-by-Step
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1. Introduction/ Mandate

UNEP GC18/10 inter alia calls on UNEP to "*recommend strategies for the promotion of the best practices in environmental housekeeping for use by UNEP, and advise and encourage the rest of the UNEP system to develop and apply similar strategies for continually improving their own environmental performances and promoting sustainable development, with the aim of (a) reducing waste, (b) recycling, (c) conserving energy, water, paper and other natural resources*".

Subsequently, in 2001 the Board of Auditors to the United Nations General Assembly suggested that UNEP take the initiative in bringing to the attention of the UN system Chief Executives Board (CEB) the possibility of developing a framework to implement this environmental policy in the UN system. This recommendation requests UNEP to develop a policy framework for managing its own operations in an environmentally friendly manner (recycling, reducing energy consumption, considering environmental aspects in procurement, etc.) and to share it with other agencies in the UN system.

It is in this spirit that the "Step-By-Step" (SBS) group was established in 2002 to "green" the United Nations (UN) compound in Gigiri. SBS is composed of Nairobi-based professionals from a variety of UN agencies, and its objective is to improve the corporate environmental performance of the compound. The UNEP Executive Director backed this initiative (Log 860/03) in April 2003 and the Step-by-Step group began undertaking in-depth assessments of the environmental impact of the UN compound, as endorsed by the ED (memo from B. Kante to K. Toepfer of 24 July 2003 on "g*reening the United Nations compound*").

The present report on energy is one of the four elements of SBS's overall assessment of UN compound activities that also focus on waste, water, and transport.

2. Energy assessment

This assessment aims at providing an overall picture of the energy consumption on the compound and presenting a number of preliminary suggestions to improve the current situation.

The overall consumption of electricity from the Kenya Power and Lighting Company (KPLC) at the compound is about 4GWh per year (2003). This is equivalent to 2385 kWh per staff member per year or 9.7 kWh per working day (246 days per year) per staff member (1660 staff members at the compound). The consumption has constantly increased by about 2.6% per year and 8% in the period 2000-2003. (See table 1 on conclusions from the assessment of energy.) The increase is mostly due to increasing number of staff members and the increasing use of electronic equipment.

Taking into account the various sources of electricity in Kenya (hydro 69%, thermal 26%, geothermal 5%) the carbon dioxide emissions related to the energy consumption drawn from KPLC at the UN compound is 268 tonne CO_2 per year or 161 kg CO_2 per person/year. This is equivalent to 0.7 kg CO_2 per staff member per day.

During 2003 there were approximately 200 hours of power failure. There are 6 diesel generators of 250 kW, one 350 kW and one 60 kW. The eight generators produced approximately 332,000 kWh during the power failures. Assuming a production of 3.5 kWh per litre of diesel, the generators would have consumed 94,857 litres of diesel, which is equivalent to 254 tonne of carbon dioxide or 153 kg CO_2 per person/year, 0.6 kg CO_2 per staff member per day. The resulting total emission of CO_2 from KPLC and diesel generator supplied electricity is approximately 1.3 kg per staff member per year.

The cost of electricity has decreased by 25% since the year 2000. This is due to improved agreements with the KPLC in favour of UNON. The total cost for 2003, including the diesel for the generators, was approximately 320,000 USD, which is equivalent to 192 USD per person/year and 0.8 USD per person/day.

Issue		**Unit**				
Baseline		**Year**	**2003**	**UNEP**	**UN-HABITAT**	**UNON**
Staff members		Persons	1,660	354	207	486
Area		Square meters	36,312	9,963	5,265	9,571
Energy		kWh	3,959,680			
	Usage	kWh/person/day	9.7			
	Usage	kWh/person/year	2,385			
	Cost	USD/year	319,132			
	Cost	USD/person/year	192			
	Cost	USD/person/day	0.8			
	Stand by generators	kWh	332,000			
	Carbon Dioxide	kg/year	521,892			
	Carbon Dioxide	kg/person/year	314			
	Carbon Dioxide	kg/agency/year		70,650	41,312	96,994
	Carbon Dioxide	kg/person/day	1.3			

Table 1. Conclusions from the assessment of energy (246 working days per year).

3. Initial suggestions on improvements

It should be noted that before decisions are taken on future improvements, further detailed assessments should to be conducted. An EMS should be put in place to ensure proper decision-making, consultation and evaluation processes are followed. Key priorities should be identified to ensure the best possible positive impacts, considering environmental, financial and practical factors.

The ideas presented below provide recommendations on activities to be undertaken to reduce energy consumption on the UN compound. The set of suggested activities aims at first reducing electricity consumption and subsequently developing sustainable sources of energy on the compound.

Suggested improvements:	Today (2004)	Phase 1 (2006)	Phase 2 (2008)
1. Staff training to reduce kWh consumption	0% (trained staff)	30%	100%
2. Install Energy Star software	0% (installed)	30%	100%
3. Install energy saving bulbs	?% (installed)	25%	75%
4. Turn lights of during daytime	?% (of total)	100%	100%
5. Install motion censors where applicable	0% (installed)	25%	75%
6. Install laptop computers, 90 % less energy	0% (installed)	10%	50%
7. Install flat screen LCDs, 35% less energy	5% (installed)	25%	75%
8. Install additional solar panels (water heating)	150 (no. installed)	200	250
9. Install solar cells (producing electricity)	0 (no. installed)	25	75
10. Install fuel cell stand-by generators	0% (coverage)	5%	30%
11. Install wind power	0 (production)	5000 kWh	10000 kWh
12. Install thin-film solar cells	0 (production)	5000 kWh	10000 kWh

Table 2. Suggested improvements in relation to energy consumption.

The above suggested improvements might reduce the total energy consumption from 4 GWh to 1.5 GWh per annum. This is equivalent to savings of 200,000 USD per year after 2008 when phase 2 is implemented. The fuel cell stand by generators will reduce the cost again by approximately 40,000 USD per year after 2008 with only 30% coverage. Considering the UNON energy budget from 2006 to 2015 1.7 million USD will be reimbursed out of the investment

However, it is of great importance to note that the preliminary cost reduction estimates are very uncertain and thoroughly investigations needs to be undertaken to show the actual cost reductions, if any.

4. Brief project proposals

Based on the suggested improvements mentioned above, the following projects could be implemented by UNON:

1. Undertake staff training on how to reduce energy consumption

Today (2004)	Phase 1 (2006)	Phase 2 (2008)
No staff training on how to reduce energy consumption.	By 2006 30% of all s/m will have undertaken training on how to reduce energy consumption.	By 2008 100% of all s/m will have undertaken training on how to reduce energy consumption.
Cost:	100 USD (Estimated lowest cost)	300 USD (Estimated lowest cost)
Savings:	500 USD per year	1000 USD per year

2. Proper instalment of Energy Star software to reduce energy consumption

Today (2004)	Phase 1 (2006)	Phase 2 (2008)
No proper instalment of Energy Star software to reduce energy consumption.	By 2006 30% of all computers at the compound should have proper instalment of Energy Star software to reduce energy consumption.	By 2008 100% of all computers at the compound should have proper instalment of Energy Star software to reduce energy consumption.
Cost:	0 USD	0 USD
Savings:	500 USD per year	1500 USD per year

3. Install energy saving bulbs

Today (2004)	Phase 1 (2006)	Phase 2 (2008)
Number of functioning energy saving bulbs on the compound unknown. Spot checks indicate very few.	By 2006, at least 25% of all bulbs at the compound should be replaced by energy saving bulbs.	By 2008, at least 75% of all bulbs at the compound should be replaced by energy saving bulbs.
Cost:	1000 USD	2000 USD
Savings:	300 USD per year	900 USD per year

4. Make sure all lights are turned of during daytime to save electricity

Today (2004)	Phase 1 (2006)	Phase 2 (2008)
Lights at the compound are on even during daytime.	By 2006 no lights should be on during daytime. This can be regulated through timers.	By 2008 no lights should be on during daytime. This can be regulated through timers.
Cost:	500 USD	0 USD
Savings:	100 USD per year	100 USD per year

5. Install motion censors where applicable to save electricity

Today (2004)	Phase 1 (2006)	Phase 2 (2008)
No operational motion censors to switch on and off the light at the compound.	By 2006 at least 25% of all manual light switches at the compound should be replaced by motion censors.	By 2008 at least 50% of all manual light switches at the compound should be replaced by motion censors.
Cost:	4000 USD	4000 USD
Savings:	500 USD per year	1000 USD per year

6. Install laptop computers that use 90 % less energy than normal computers

Today (2004)	Phase 1 (2006)	Phase 2 (2008)
Number of laptop computers replacing desktop computers unknown. Spot checks reveal laptops constitute less than 5% of	By 2006 at least 25% of all computers at the compound should be replaced by energy efficient laptops.	By 2008 at least 50% of all computers at the compound should be replaced by energy efficient laptops.

all computers on the compound.		
Cost:		
Savings:		

7. Install flat screen LCDs that use 35% less energy than normal screens

Today (2004)	Phase 1 (2006)	Phase 2 (2008)
Number of flat screen LCDs operational on the compound unknown. Spot checks reveal LCDs constitute less than 5% of all computer screens on the compound	By 2006 at least 25% of all computer screens at the compound should be replaced by energy efficient flat screen LCDs.	By 2008 at least 50% of all computer screens at the compound should be replaced by energy efficient flat screen LCDs.
Cost:		
Savings:		

8. Install additional solar panels to heat water

Today (2004)	Phase 1 (2006)	Phase 2 (2008)
150 solar panels	200 solar panels	250 solar panels
Approximately 150 solar panels heat water on the compound. The water is mostly used in the restaurants and some of the cafeterias to wash dishes. Some of the hot water is used for showers in the staff's dressing rooms.	In 2006 other cafeterias should get their hot water from solar panels. Another 50 solar panels should be installed.	In 2008 all cafeterias should get their hot water from solar panels. Another 50 solar panels should be installed. All showers available within the compound should get their hot water from solar panels.
Cost:	7500 USD	7500 USD
Savings:	2000 USD per year	4000 USD per year

9. Install solar cells to produce electricity

Today (2004)	Phase 1 (2006)	Phase 2 (2008)
0 solar cell	35 solar cells	70 solar cells
No solar cells exist on the compound. No electricity is being produced within the compound.	In 2006 a solar cell pilot project should be installed with at least 35 solar cells which will produce approximately 1000kWh. The cost will be approximately 8000 USD. The guarantee will last for 25 years. Additional equipment such as Balance of System (BOS) components (including batteries, inverters, regulators, wires, and control panel) will cost approximately additional 2000 USD.	By 2008 additional 35 solar cells should be installed. The electricity production will then be 2000kWh per year.
Cost:	10000 USD	10000 USD
Savings:	1000 USD per year	2000 USD per year

10. Install fuel cell stand-by generators that are carbon dioxide neutral and quiet

Today (2004)	Phase 1 (2006)	Phase 2 (2008)
No fuel cell stand-by generators operating on the compound. Instead there are eight very noisy and diesel consuming generators operating approximately 1 hour each working day.	By 2006 at least 5% of the electricity generated within the compound should be produced from fuel cell generators. The hydrogen should be produced, compressed and stored locally from the electricity generated from our solar cells.	By 2008 at least 30% of the electricity generated within the compound should be produced from fuel cell generators. The hydrogen should be produced, compressed and stored locally from the electricity generated from our solar cells. The Shell gas station could be interested in a similar pilot. The buses for S/M should be converted to run on hydrogen.
Cost:	25000 USD	75000 USD
Savings:	15000 USD per year	90000 USD per year

11. Install wind power to produce electricity

Today (2004)	Phase 1 (2006)	Phase 2 (2008)
No wind power generators operating on the compound.	By 2006 there should be 5000 kWh produced by wind power generators at the compound.	By 2008 there should be 10000 kWh produced by wind power generators at the compound.
Cost:	15000 USD	15000 USD
Savings:	400 USD per year	800 USD per year

12. Install thin-film solar cells

Today (2004)	Phase 1 (2006)	Phase 2 (2008)
No thin-film solar cells exist on the compound.	By 2006 there should be 5000 kWh produced by thin-film solar cells at the compound. The films should be placed on windows with optimal solar exposure.	By 2008 there should be 10000 kWh produced by thin-film solar cells at the compound. The films should be placed on windows with much optimal exposure.
Cost:	15000 USD	15000 USD
Savings:	400 USD per year	800 USD per year

5. Conclusion

With wind, solar and fuel cell alternatives, or at minimum, pilot projects installed, the UN compound will not only benefit from decreased energy consumption and energy being drawn from more sustainable sources, but will also serve as an example of actions that would be replicable elsewhere in Kenya, within the UN system and among all large international organizations. Local NGOs such as Energy Alternatives Africa (EAA) would be able to provide technical assistance and advice on feasibility, cost and availability of alternatives.

Annex 1 – Energy contact list

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