Energy Efficiency in the Tourism Sector in Namibia

Renewable Energy & Energy Efficiency Institute

Polytechnic of Namibia

Ministry of Mines & Energy

Royal Danish Ministry of Foreign Affairs

REEECAP Project 1.3 Energy Efficiency in the Tourism Sector

EE Competition 2007

REEECAP is a Renewable Energy and Energy Efficiency Capacity Building Programme funded by DANIDA.

REEEI is the Renewable Energy & Energy Efficiency Institute @ Polytechnic of Namibia.

The objective of this project is to enhance Energy Efficiency (EE) in the Tourism Sector of Namibia.

This project aims at making as many tourism enterprises aware of the opportunities of more EE and to reward those who are already implementing EE measures in their lodges, farms, hotels, pensions and community based camp sites or tented camps.

FENATA

H·A·N Hospitality Association of Namibia

Bed & Breakfast

IRDNC

Energy Efficiency in the Tourism Sector in Namibia

Competition 2007

Renewable
Energy &
Energy
Efficiency
Institute

Contents 2007

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Renewable Energy & Energy Efficiency Institute

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PURPOSE...

of the ""**Energy Efficiency in the Tourism Sector of Namibia Award" (EE in Tourism Award Namibia)**" was to:

a: Recognise, encourage and honour outstanding achievements in implemented Energy Efficiency measures

b: Recognise, encourage and honour outstanding achievements in the fields of implemented Renewable Energy Technology

c: Encourage the promotion of REEE friendly practices to the Namibian public as well as trade and industries

ELIGIBILITY

The awards competition is open to all:

a: Commercial tourism enterprises offering accommodation in an urban environment in Namibia;

b: Commercial tourism enterprises offering accommodation in a rural environment (incl. Joint Ventures with rural communities) in Namibia

c: Community run tourism projects offering accommodation (with support of NGO's or commercial tourism operators, yet without JV's) in Namibia

On suggestion of involved NGO's and institutions the prize money for the category "c." will this year be used to undertake an awareness and education campaign in Renewable Energy and Energy Efficiency measures for such community run accommodation

PROCESS

- Mailing to ~ 800 NTB registered accommodation establishments introducing the competition
- Few basic questions on EE activities to see the level of understanding what the competition is about.
- ~50 replies with the request for detailed questionnaire received
- 2 establishments reacted negatively towards the competition
- 47 returned XLS questionnaires evaluated
- the best 5 in each category were visited to verify their information

The winners in both categories performed best in the combination of implemented EE measures together with high levels of awareness towards guests and staff and additionally outstanding training measures in EE awareness of their staff.

ORGANISERS

The **"Energy Efficiency in the Tourism Sector of Namibia Award" (REEE in Tourism Award Namibia)** was governed and represented by the Renewable Energy & Energy Efficiency Institute (REEEI) at the PolyTechnic of Namibia and organised by nuevas ideas cc.

REEECAP is a Renewable Energy and Energy Efficiency Capacity Building Programme funded by DANIDA.

REEEI is the Renewable Energy & Energy Efficiency Institute @ Polytechnic of Namibia.

nuevas ideas cc is a consulting company focussing on Business Management as well as Environmental Management Systems for the hospitality sector in Namibia.

EE Competition 2007

Sources of pictures and material: REEEI, wikipedia, nuevas ideas, company web sites

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Renewable Energy & Energy Efficiency Institute

REEEI

The **Renewable Energy & Energy Efficiency Institute** represents the **Polytechnic of Namibia's** dedicated commitment to serve as a national information resource base for renewable energy and sustainable energy use and management. The Institute serves as an information dissemination platform and plays a leadership role in the transition from traditional energy sources and usage to a more sustainable energy economy.

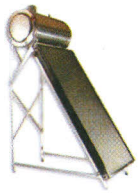
VISION

To be the national centre of excellence in the advancement of Renewable Energy (RE) and Energy Efficiency (EE) and relevant technologies.

MISSION

The Institute aims to be a comprehensive, demand driven, national information hub providing the public and private sectors, academic institutions and the public at large with information, knowledge and expertise with respect to RE & EE.

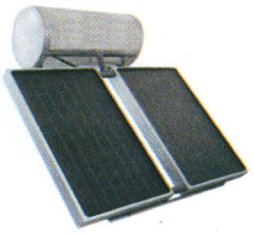




Key Goals & Objectives

- to function as a hub of information on national and international energy issues
- to raise public awareness and facilitate public debates on RE & EE related issues by disseminating information on a regular basis by way of presentations and contacts with media and other stakeholders
- contribute to human resource development through the Polytechnic Schools and departments, and other academic institutions and agencies
- to provide advisory and consultancy services on energy and related matters.

TEAM NAMIBIA



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REEE Institute

Sources of pictures and material: REEEI, wikipedia, nuevas ideas, company web sites

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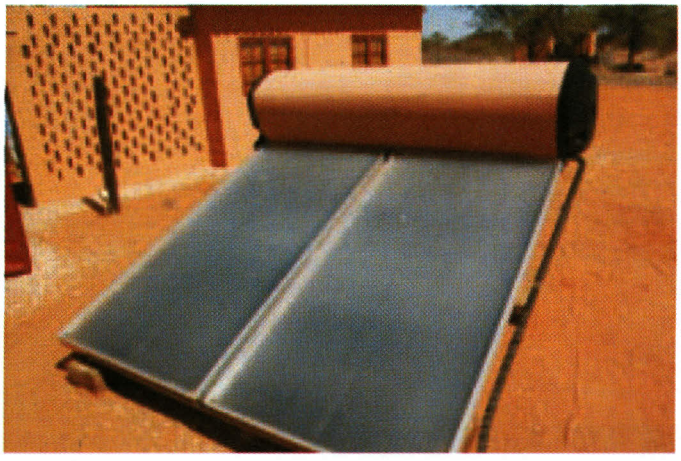

Solar Water Heaters were installed throughout the lodge over 10 years ago. For easy installation and maintenance they were not mounted on the roofs.

Disadvantage:
long pipes to the rooms mean wasted water till the water at the tap turns hot.

Suggestion:
place 5 or 10ltr watering cans in each bathroom for guests to let cold water run in which is used in the garden.

The Ampere meter from "old GenSet" times was retained after the installation of NamPower and helps to identifying energy wasters.

Coolroom has both cold retainer plates and retainer curtains installed!
A better energy saving cooling option than this combination is most probably not possible.

Sources of pictures and material: Harald Schütt, nuevas ideas

Eningu Clay House Lodge

Energy Efficiency in the Tourism Sector in Namibia

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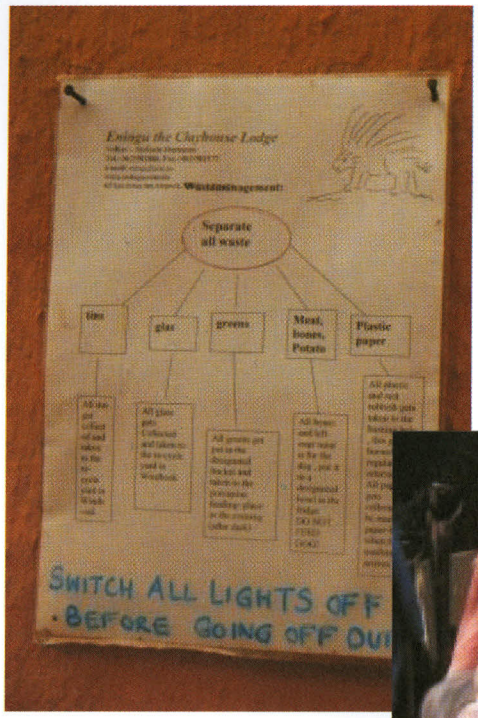
Renewable Energy & Energy Efficiency Institute



Waste Management is spelt in CAPITAL letters at Eningu.
The waste is separated, paper, tins and glass go back to Windhoek, vegetable waste is used to feed the porcupines at night, food remains go to the dog and only a small portion of remaining waste is burned in the dump.

Tins are compressed before going into a separate transport bag

Tins and glass go into large transport bags that have been supplied by Namibian Breweries Limited, before they are taken back to Windhoek.

SCOPE FOR IMPROVEMENT:

- the transport bags are very difficult to handle when full
- use plastic bins similar to the municipality waste bins, they might come at a cost, but due to the lids are a lot less prone to flies etc.
- plastic can be seperated and taken for recycling to Windhoek too!

TIPS :

- MOVE A MESS in Copper St., Prosperita Industrial Area is your ONE STOP address for tins, glass, paper, cardboard and all plastics!
- NAMIBIA POLYMER RECYCLERS, in operation since mid-2007, recycle more than 10 tons of plastic a month!

Eningu Clay House Lodge

Sources of pictures and material: Harald Schütt, nuevas ideas

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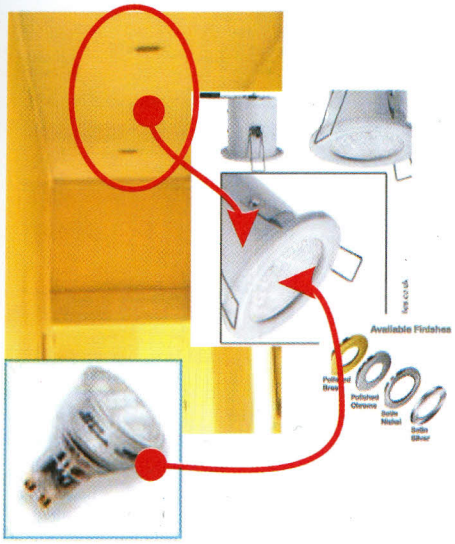


In the Lüderitz Nest Hotel all lighting has been replaced with CFL bulbs.
Even in the public areas the downlighters are fitted with energy saving bulbs.
Additionally all lights in passage-ways and outdoors have daylight switches installed.

LÜDERITZ NEST HOTEL ...for you to enjoy!

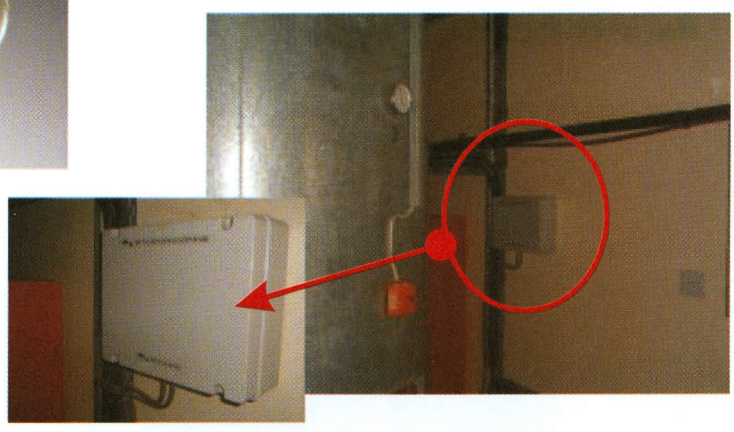
TIP:
CFL replacements are available for every type of lamp on the market.

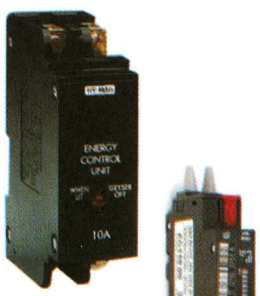
STOP PRESS 2008/02/22:

Motivated through this EE Competition, the Nest Hotel Lüderitz has decided to install a solar preheating system for their warm water boilers. The investments for this project will be in the area of N$100,000.00 to N$150,000.00!

12V LED lamp

IMPROVEMENT:
12V Halogen lamps are NOT energy saving, to the contrary.
The alternative are LED lamps now also available in warm white





Another way to be Energy Efficient is to regulate which high consumption devices may use electricity at which time.
Here for instance a High Demand Regulation Board switches off the boiler when the electricity is needed elsewhere in your house, thus avoiding having to pay peak consumption penalties to Nam Power.

TIP:
Peak demand consumption is expensive and causes the electricity suppliers big headaches. Cheap devices to avoid paying peak penalty fees are energy control units, timers and DB mini kwh meters.

Lüderitz Nest Hotel

Sources of pictures and material: REEEI, wikipedia, nuevas ideas, company web sites

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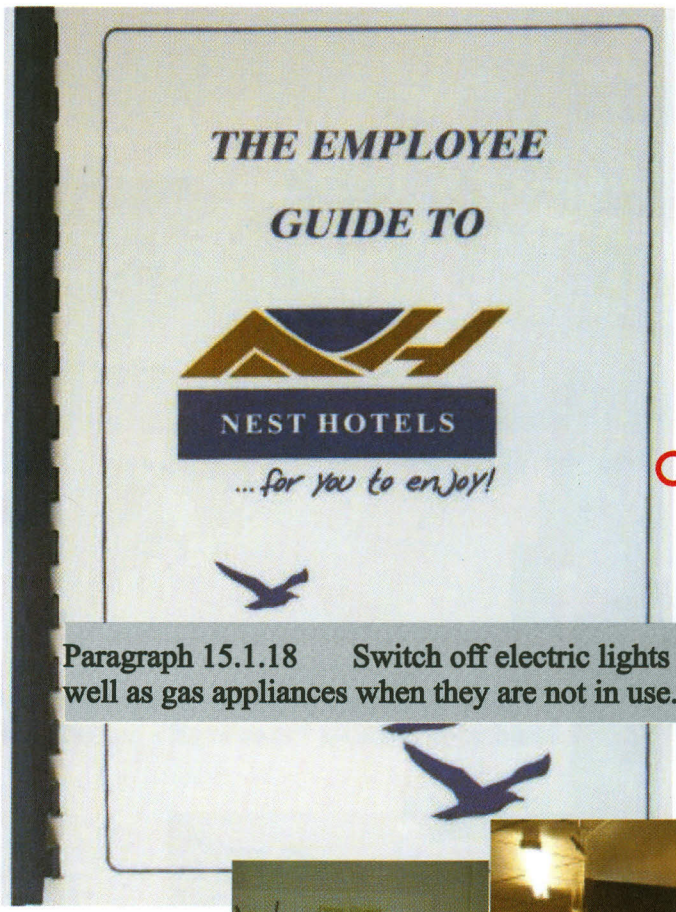
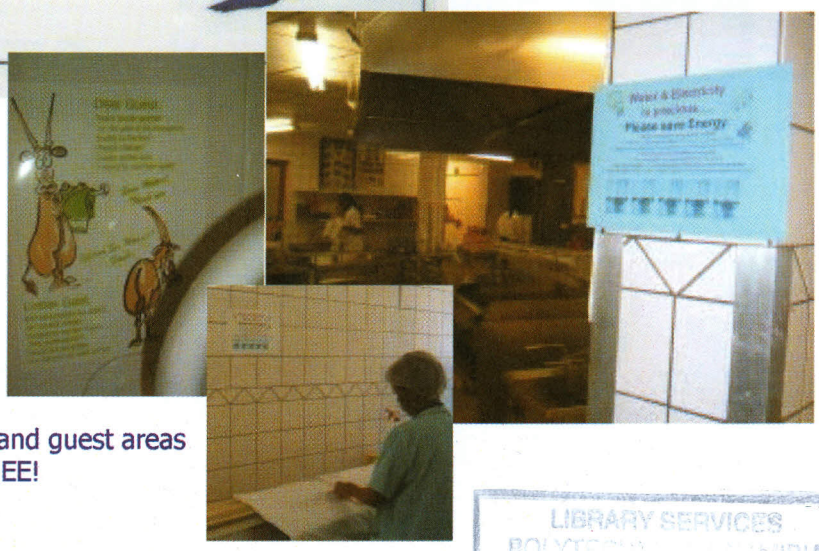
TIP:
the most important factor for success in energy efficiency and environmental best business performance is not to do it, but to ensure that your staff AND your guest know about how to support your efforts in this endeavour!
This is why in this competition a focus lay on the information available to staff and guests.

Lüderitz Nest Hotel ...for you to enjoy!



The Nest Hotel supplies its staff with a guide book and individual training manuals, allowing the staff members to go back and revisit all the subjects they have been trained in!



Reminders in staff and guest areas ensures success in EE!

TIP:
Yes, such training manuals do cost you - but ONCE only - and the gain in productivity will offset these costs in no time!

Sources of pictures and material: REEEI, wikipedia, nuevas ideas, company web sites

Energy Efficiency in the Tourism Sector in Namibia

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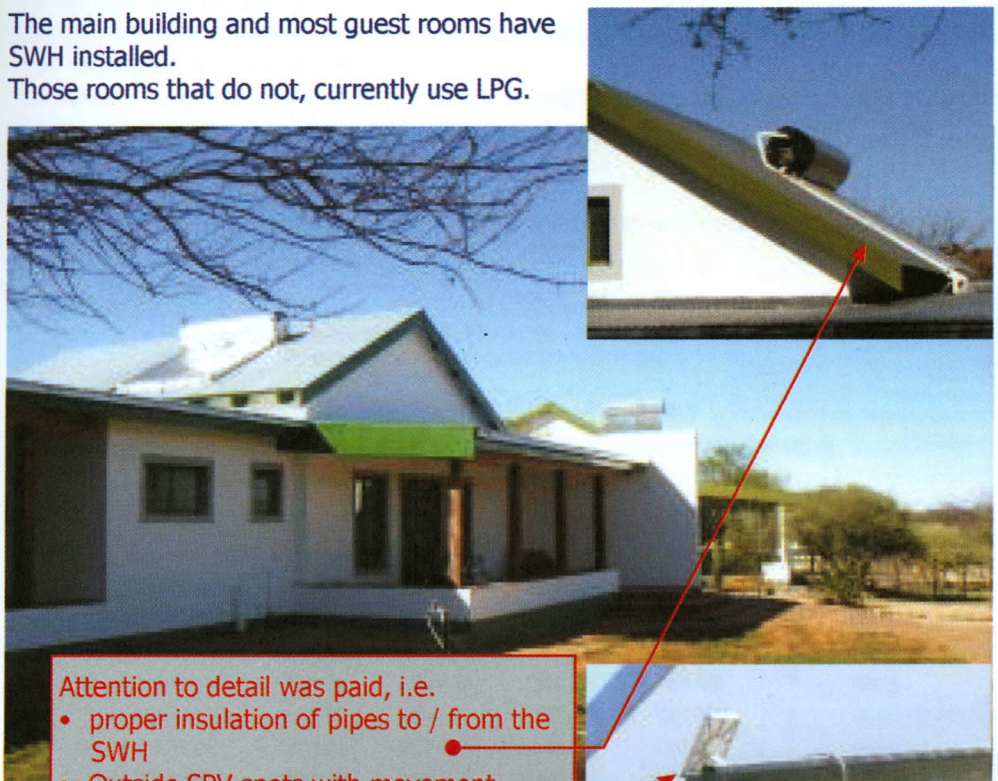
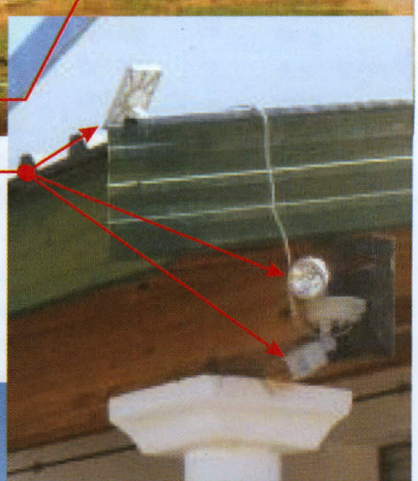
An almost complete change over to Solar Power, both SWH & SPV has been done on Okomitundu Guest Farm.

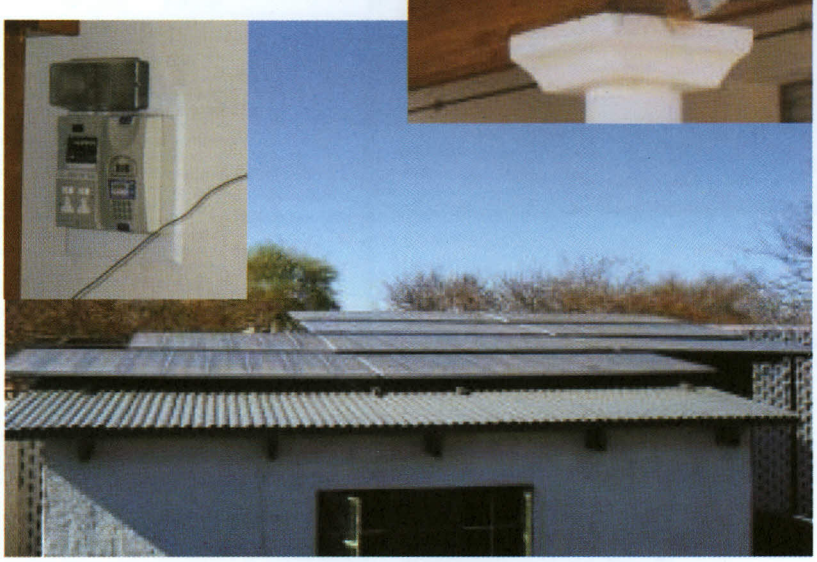
The main building and most guest rooms have SWH installed.
Those rooms that do not, currently use LPG.



Attention to detail was paid, i.e.
- proper insulation of pipes to / from the SWH
- Outside SPV spots with movement detector and CFL bulbs!



A large portion of electricity consumed comes from the sun - NamPower* is on stand-by here!



* NamPower only came to Okomitundu in April 2007. At the time of the competition they had not yet received an invoice, but are closely monitoring consumption of each energy source .
It will be interesting to see the results after 1 year!

Okomitundu Guest Farm

Sources of pictures and material: REEEI, wikipedia, nuevas ideas, company web sites

Energy Efficiency in the Tourism Sector in Namibia

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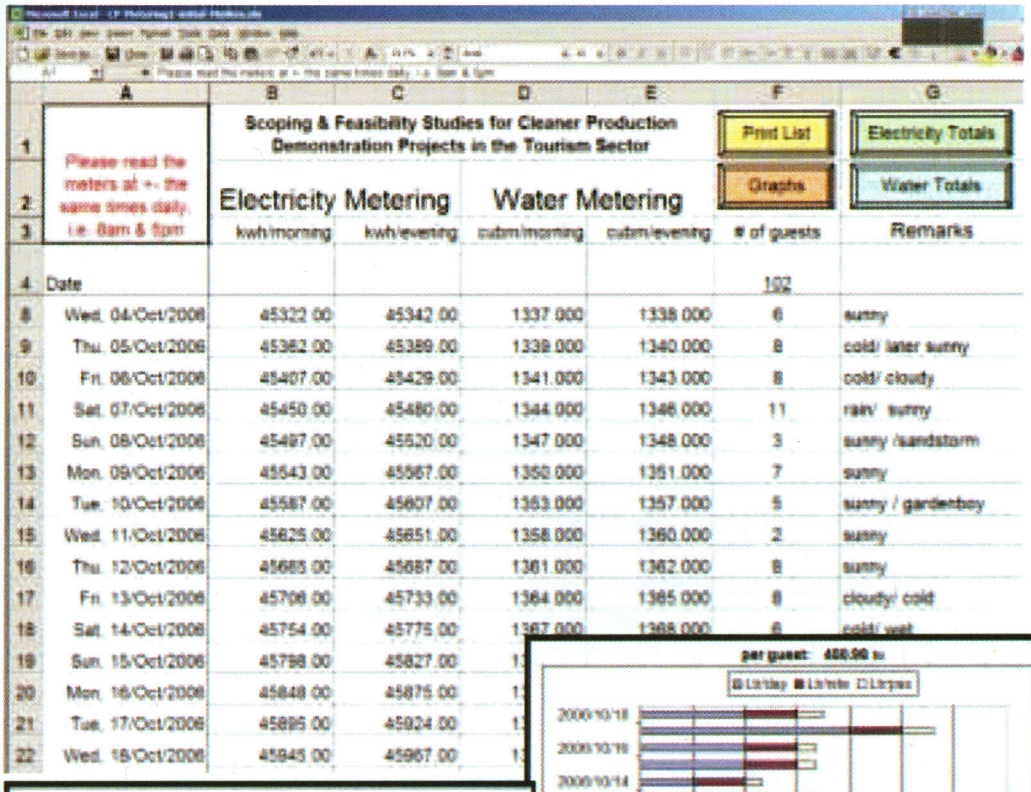
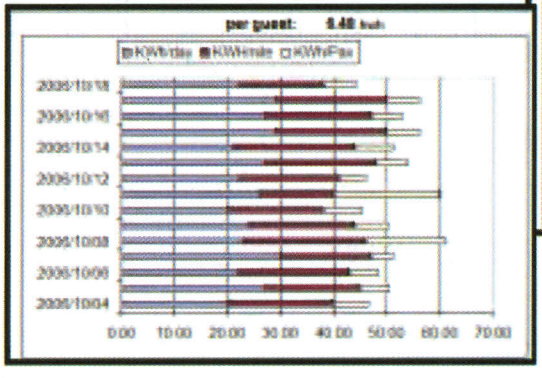
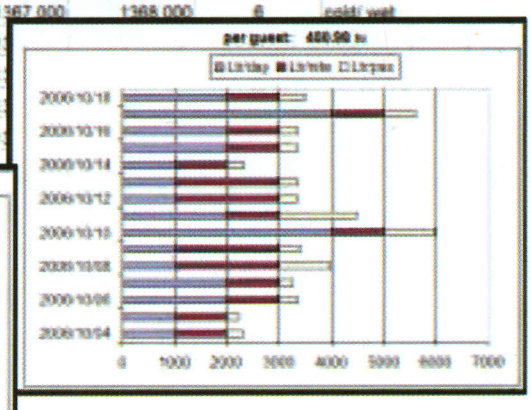
What you don't measure you can't manage

All endeavours of saving the environment by implementing all kinds of measures and devices to save on water and electricity are only done half-heartedly if the results are not measured and monitored.
At Meike's Guest House this minor effort saved them big bucks on several occasions because burst underground water pipes were noticed within a day and reading faults of the municipality could be corrected immediately!



	A	B	C	D	E	F	G
1		Scoping & Feasibility Studies for Cleaner Production Demonstration Projects in the Tourism Sector				Print List	Electricity Totals
2	Please read the meters at +- the same times daily, i.e. 8am & 5pm	Electricity Metering		Water Metering		Graphs	Water Totals
3		kwh/morning	kwh/evening	cubm/morning	cubm/evening	# of guests	Remarks
4	Date					192	
8	Wed. 04/Oct/2006	45322.00	45342.00	1337.000	1338.000	6	sunny
9	Thu. 05/Oct/2006	45362.00	45389.00	1339.000	1340.000	8	cold/ later sunny
10	Fri. 06/Oct/2006	45407.00	45429.00	1341.000	1343.000	8	cold/ cloudy
11	Sat. 07/Oct/2006	45450.00	45480.00	1344.000	1346.000	11	rain/ sunny
12	Sun. 08/Oct/2006	45497.00	45520.00	1347.000	1348.000	3	sunny /sandstorm
13	Mon. 09/Oct/2006	45543.00	45567.00	1350.000	1351.000	7	sunny
14	Tue. 10/Oct/2006	45587.00	45607.00	1353.000	1357.000	5	sunny / gardenboy
15	Wed. 11/Oct/2006	45625.00	45651.00	1358.000	1360.000	2	sunny
16	Thu. 12/Oct/2006	45665.00	45687.00	1361.000	1362.000	8	sunny
17	Fri. 13/Oct/2006	45706.00	45733.00	1364.000	1365.000	8	cloudy/ cold
18	Sat. 14/Oct/2006	45754.00	45775.00	1367.000	1368.000	6	cold/ wet
19	Sun. 15/Oct/2006	45798.00	45827.00	1			
20	Mon. 16/Oct/2006	45848.00	45875.00	1			
21	Tue. 17/Oct/2006	45895.00	45924.00	1			
22	Wed. 18/Oct/2006	45943.00	45967.00	1			





Investing in CFL movement sensitive spots, A++ washing machines or LED bulbs for decorative lamps etc. comes at a cost where you would like to know how soon this extra investment pays off.
This can only be calculated IF consumption is monitored!

NOTE:
an Excel spreadsheet for monitoring and evaluating your water and energy consumption as well as one to calculate your return on investment period can be ordered free of charge from **nuevas-ideas@mweb.com.na**

Meike's Guest House

Sources of pictures and material: REEEI, wikipedia, nuevas ideas, company web sites

Energy Efficiency in the Tourism Sector in Namibia

Competition 2007

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BüllsPort

BüllsPort Guest Farm

Large window glass fronts are usually not seen to be of advantage when it comes to energy efficient building practices.
Yet with the correct orientation, for Namibia North to North East, this is a purposeful way of climatising a room.
This picture, taken around noon in mid-summer, shows that the sun does not shine into the room. Opening the big glass sliding doors guarantees very effective cross ventilation.
In winter the sun will shine into the room to a certain extent and warm up the interior, supported by warmed up slasto floor even after sunset.
Additionally daylight lighting is used to an optimum here.

TIP:
for additional and effective sun shading use dropper from encroachment bush over windows and doors.

Lawn is the biggest waste of water on a typical guest farm or lodge. BüllsPort's garden is proof that a stone garden with desert adapted plants is just as appealing, if not more, as a green lawn and roses!

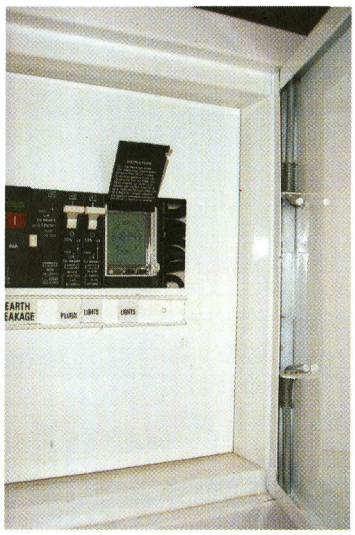
ces of pictures and rial: REEEI, wikipedia, as ideas, company sites

Energy Efficiency in the Tourism Sector in Namibia

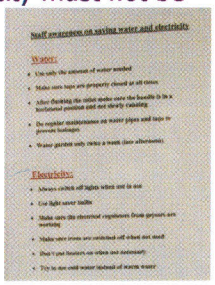
Competition 2007

Renewable Energy & Energy Efficiency Institute

The Stiltz Guest House



The Stiltz Guest House, located in the Swakop River mouth, gives proof that saving electricity must not be expensive.
Simple posters, made on the computer and laminated, remind staff of means of saving in the appropriate area where they are posted.
Cost: less than N$5.00 each.



For the guest simple small stickers above light switches and taps serve their purpose very well too.
Cost: less than N$2.00 each.

AND ...
timers automatically regulate the hours of operation of the electric geysers.
Cost: approximately N$500.00 including installation.
With the prize money from this competition The Stiltz invested in an energy efficient fridge which, even at a cost of close to N$10,000.00, has a payback period of less than 2 years.

NOTE:
Fridges can be, after the electric geyser, the biggest electricity consumer in a house hold.

Located in an environmentally sensitive area in the Swakop River, the Stiltz, as the name suggests, is built on stilts.

In the garden, adapted to the environment it is located in, drip irrigation is put into good use.
To protect them from the harsh sun, most of the flower and vegetable beds are underneath the buildings.

Sources of pictures and material: REEEI, wikipedia, nuevas ideas, company web sites

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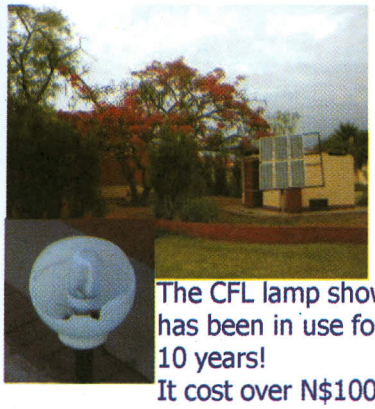
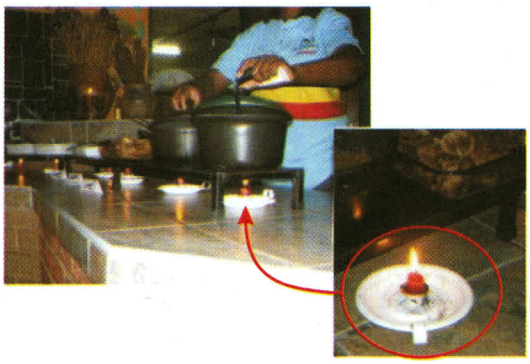


The CFL lamp shown here has been in use for over 10 years!
It cost over N$100.00 when it was bought.

Shown below a unique combination to heat water: if the sun is gone, a donkey takes over the job!

NOTE:
the donkey is vertical = more effective than horizontal!



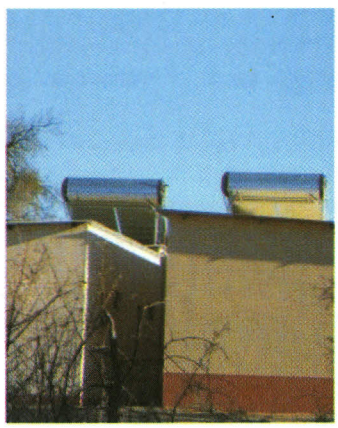
The most ingenious rechaud - why electric if the candles do the job too!
And it gives ambience!

Some ideas from guest farmers that have over the years perfected their ways of saving energy - mostly due to lack of sufficient energy - but kept alive even today as they do work!

Stones of any kind will serve the objective to avoid evaporation around the flower beds - and some even look really decorative too.

Both Hammerstein and Sachsenheim Guest Farms realized the value of SWH's long before it became 'in' in Namibia.

A CFL bulb fits perfectly.



TIP:
spray painting either the bulb or the glass cylinder in sunflower yellow will considerably reduce the amount of insects attracted by the light!

Sources of pictures and material: REEEI, wikipedia, nuevas ideas, company web sites

SACHSENHEIM JAGD- UND GÄSTEFARM

Hammerstein & Sachsenheim

Hammerstein Lodge & Camp in Southern Africa / Namibia

Energy Efficiency in the Tourism Sector in Namibia

Awareness 2007

Renewable Energy & Energy Efficiency Institute

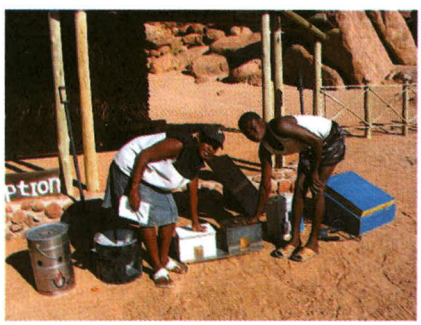
Community Based Tourism EE Awareness Tour

Upon consultation with several specialists in the area of CBNRM (Community Based Natural Resource Management) and CBT (Community Based Tourism) operations it was deciced NOT to include the community run projects in the competition at this stage and rather use the prize money to run an awareness campaign on RE & EE.

The awareness tour was conducted by Mr. Theo Ngaujake, a private consultant in the community based tourism sector who visited the following community campsites: Spitzkoppe Rest Camp, Uis Information Centre, Daureb Craft Centre, Vicky's Coffee Shop (in Uis), Tseiseb Conservancy Office, Otjikakaneno Tourism Project, Granietkop Campsite, Aba Huab Campsite, Khowarib Rest Camp, Ongongo Campsite and Hoada Campsite, Ugab Campsite, Para Campsite, Mbakondja Campsite, and also with some senior members of the #Khoadi //Hoas Conservancy at Grootberg and ordinary farmers at Warmquelle near Sesfontein.
An additional group of of members of CBT camp sites was invited to NaDEET for a three day practical workshop.

The key learning points that came out of the presentations:

- understanding the effective alternative use of energy resources
- impressed by the module on saving energy for cooking
- the methods for burning candles and the use of left-over candle wax
- the water saving tips were particularly useful
- the information on the positioning of the donkey was important as they did not know the effectiveness of vertical positioning on 'donkey' heating.



- the 'Solar Cooker', 'Tso-tso stove and the Vesto stove were very impressive for many who listened
- at a'self-help' women's project selling Herero-dolls next the main road they were impressed mainly with the solar-powered electricity which they said they needed to operate their sewing machines.

Generally, the comments from all the enterprises visited were very similar: people were in agreement about the usefulness of alternative energy use for rural based tourism enterprises. The Tso-tso stove was very popular. People generally expressed interest and willingness to use the energy efficient equipment but were not sure about their availability.

Community Based Tourism

rces of pictures and erial: REEEI, wikipedia, vas ideas, company sites

Energy Efficiency in the Tourism Sector in Namibia

Awareness 2007

Renewable Energy & Energy Efficiency Institute

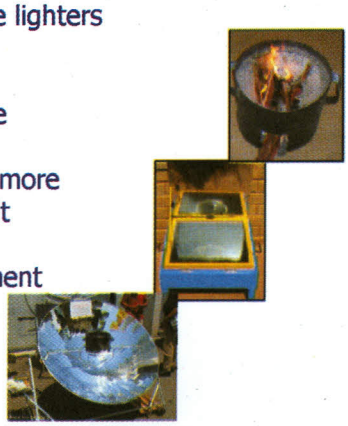
Awareness Tour Training Materials

Energy Measures Lighting

- Store candles in wet sand for longer burning
- Place candle - or a piece of it - in a tin with wet sand to keep it cool while burning
- a candle protected from wind or air movement will burn longer
- use tins as wind shades
- if necessary punch holes in the top part of the tin
- use glass cylinders made from bottles
- if you do not have a glass cutter, use a standard hessian string dipped in petrol, tied around the bottle tightly and then lit
- paint glass cylinders yellow to attract less insects
- use candle wax leftovers & sawdust to make your own fire lighters

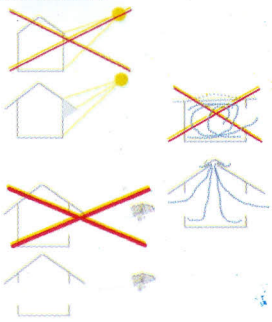
Energy Measures Cooking

- use candle wax leftovers & sawdust to make your own fire lighters
- do not do the cooking right on the ground, the fire burns more effectively and with less wood usage when air can get to it from below
- ensure that the fire is protected from wind and air movement
- Use wood efficient ovens for cooking
- best value for money is the Tso Tso stove
- use solar box ovens for cooking and baking
- for quick boiling use a solar parabolic stove

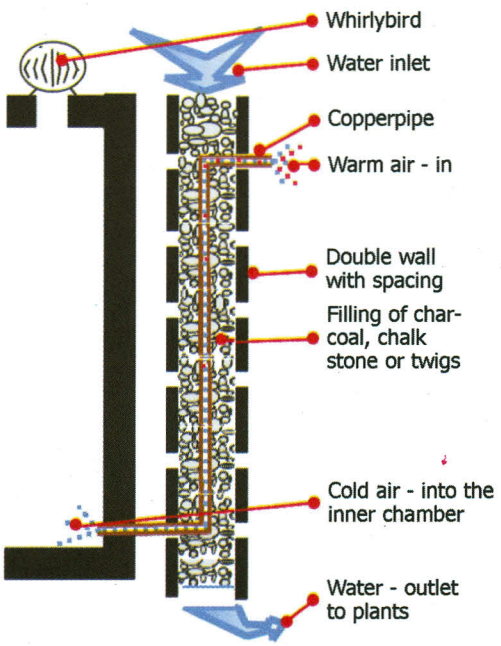


Energy Measures Cooling

- large roof overhangs ensure cooler temperatures inside the hut
- cross ventilation adds to keeping the interior cool
- the steeper the roof the better the ventilation
- adding a vent at the top of the roof improves the ventilation even better
- plant shrubs / bushes close to the windows of the huts as their breathing activity cools the surrounding air



Sources of pictures and material: REEEI, wikipedia, nuevas ideas, company web sites



The Traditional Farm Cooler Principle Revised

- to keep foods cool the old style farm cooler works perfectly
- filling of charcoal can be replaced with porous clay or chalk stones or even twigs
- run off water should be used to water herbs or vegetables

NOTE:

- instead of the broken brick walls with the charcoal in between, it is also possible to use 'boxes' of extended iron sheeting, installing these in between brick pillars or wood poles!
- The inner cubicle can be made of thick plastic insulation plates
- distance between copper pipes ~30cm

CBT Awareness Tour 2007

Energy Efficiency in the Tourism Sector in Namibia

Awareness 2007

Renewable Energy & Energy Efficiency Institute

Awareness Tour Training Materials

Water Consumption

Consumption

- use smaller buckets / tubs for everything
- never wash under running water

Run Off

- avoid open run off (mosquito breading places)
- use 110mm sewage pipes under ground to lead water to plants / trees
- make small holes with a red-hot iron wherever a plant is located

NOTE: use natural detergents / washing powder

Trees / Bushes

- Cover the ground around the stem with grass, creeper plants, mulch or stones to reduce evaporation (and it looks better too)

Water Heating

Heating Water in a Donkey

- make the fire on a grid away from the ground for better heat development
- use a vertical donkey for better effectivity
- consider pre-heating the water in a coil of plastic pipe
- dig in black pipe +- 15cm and cover with platt klippe or compressed clay for protection
- ensures temperature transfer even after sunset and protects from burning hot water
- a smaller donkey is better than a big one as water heats up quicker

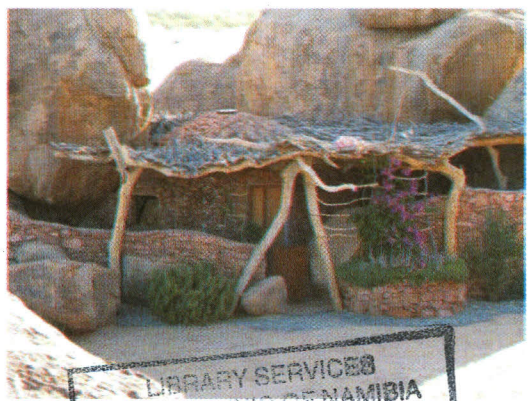
Toilets

Water Toilet

- reduce amount of water flushed by putting 1 or 2 filled plastic bottles in the tank

Dry Toilet

- for information on dry toilet systems contact the Habitat Research & Development Center (HRDC) in Windhoek



toilet sign made of trash

Construction

A sample of appropriate building materials:

- use local materials wherever possible
- use recycled materials wherever possible

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Sources of pictures and material: REEEI, wikipedia, nuevas ideas, company web sites

Energy Efficiency in the Tourism Sector in Namibia

Technology

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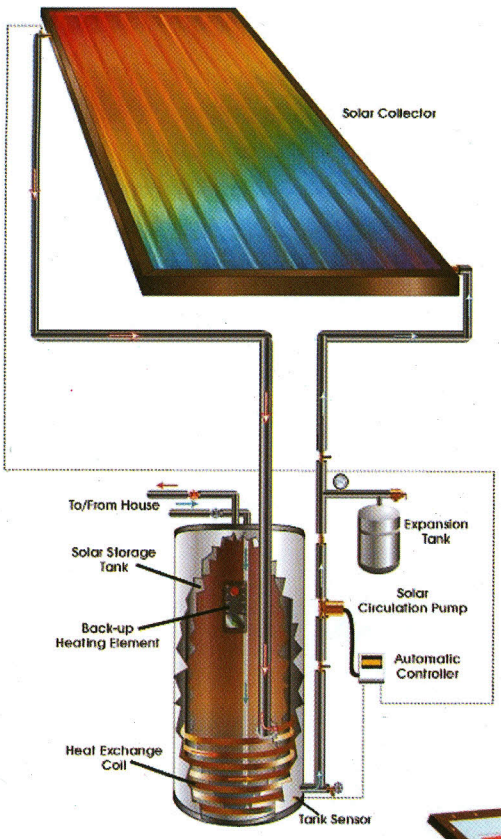
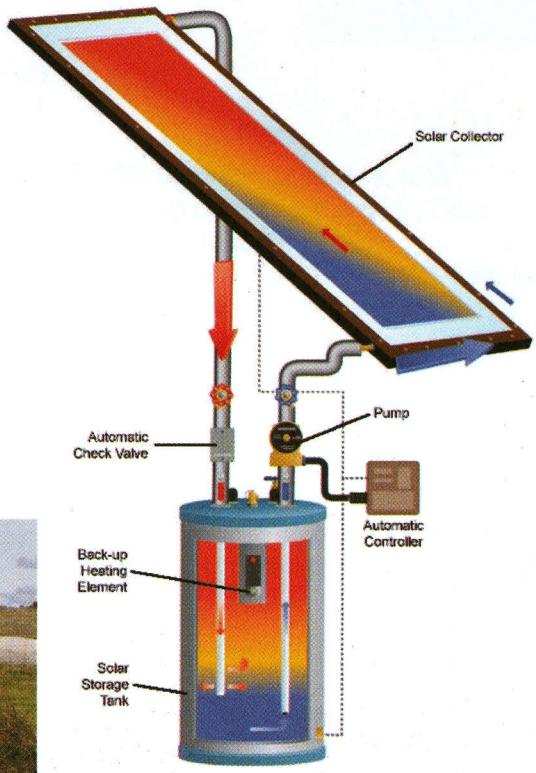
Solar Water Heaters

There are two different systems available:



- Closed Systems:
  The fluid heated in the panel is a medium which runs in its own closed circuit, heating the potable water in the tank through a heat exchanger

Advantage:
Avoids clogging through lime build up in the collector and pipes

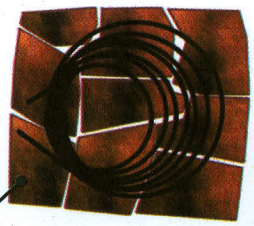


- Open Systems:
  Here the potable water itself is heated directly

Advantage:
Can be used as pre-heater for existing geysers

The CBT "do it yourself" version of an open system:

TIP:
For wood-fired donkeys use a coil of black plastic pipe as pre-heater!
Ideal also as heating for swimming pools installed under a slasto area



Sources of pictures and material: REEEI, wikipedia, nuevas ideas, company web sites

Solar Water Heater

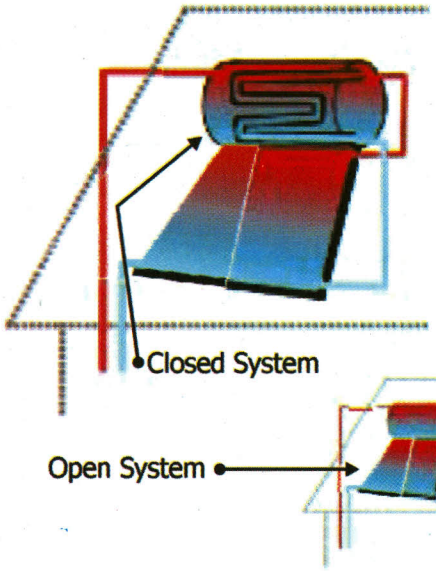
Energy Efficiency in the Tourism Sector in Namibia

Renewable Energy & Energy Efficiency Institute

Technology

The electrical geyser is the biggest consumer of electricity in a household. Together with energy saving bulbs the Solar Water Heater (SWH) is the most popular energy saving measure implemented by many households and public buildings.

Solar Water Heater

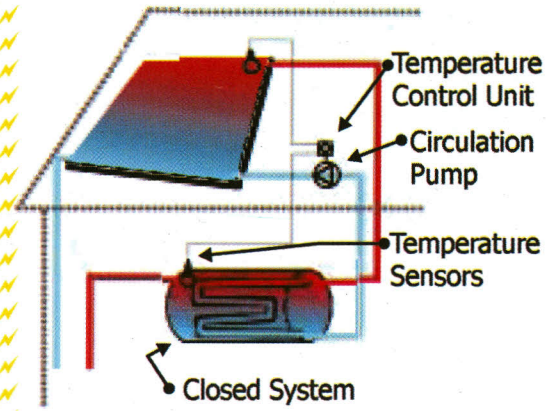


There are two different set-ups available:

- With a roof-mounted tank
  As the fluid heats, it rises to the top of the collector panel and into the tank where it displays cooler fluid, which flows at the bottom of the collector panel where the process is repeated.

Advantage:
No electro-mechanical parts

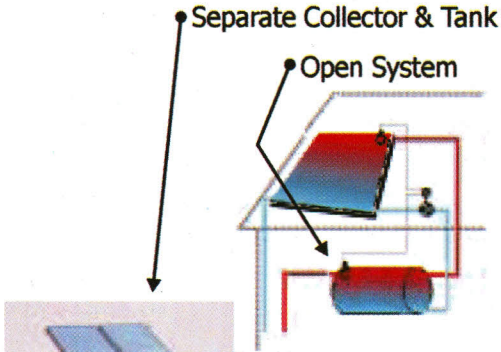
Closed System
Roof Mounted Tank

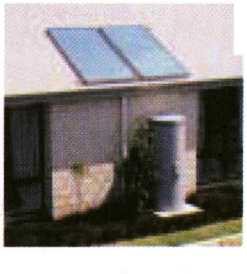


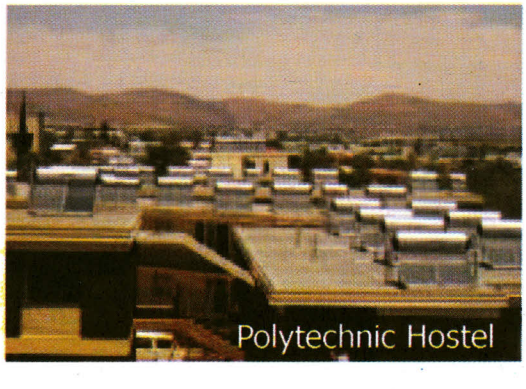
- With separate collector & tank
  A pump circulates the water from collector to tank
  A temperature control system switches the pump off when the water in the collector gets colder than in the tank

Advantage:
Ideal for aesthetical reasons as only the collector is on the roof.

NOTE:
It would be advisable to run the pump and the control unit on solar power!






Polytechnic Hostel

Sources of pictures and material: REEEI, wikipedia, nuevas ideas, company web sites

Energy Efficiency in the Tourism Sector in Namibia

Technology

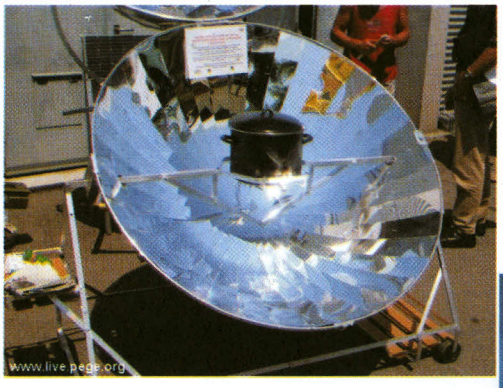
Renewable Energy & Energy Efficiency Institute

Solar Cooking

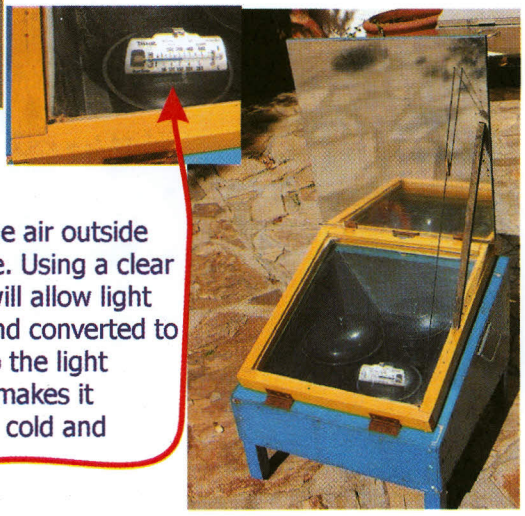
A solar cooker is a device that uses only sunlight to cook and to bake. Because they use no fuel and they cost nothing to run, they help slow deforestation and desertification, caused by the need for firewood.
Solar cookers are also sometimes used in outdoor cooking, especially in situations where minimal fuel consumption or fire risk are considered highly important.

Source: wikipedia

The basic principles of solar cookers are:



Concentrating sunlight:
Some device, usually a mirror, is used to concentrate light and heat from the sun into a small cooking area, making the energy more concentrated and therefore more potent.

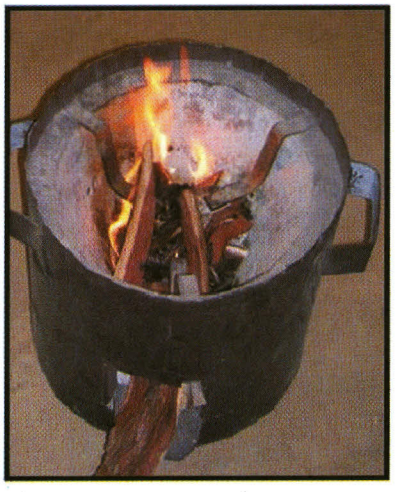


Trapping heat:
Isolating the air inside the cooker from the air outside the cooker makes an important difference. Using a clear solid, like a plastic bag or a glass cover, will allow light to enter, but once the light is absorbed and converted to heat, a plastic bag or glass cover will trap the light inside using the Greenhouse Effect. This makes it possible to reach similar temperatures on cold and windy days as on hot days. (160°C !)

A thick pan that conducts heat slowly (such as Cast Iron) will lose heat at a slower rate, and that combined with the insulation of the oven can be used to keep food warm well into the evening.

Wood efficient stoves:
the Tso Tso wood efficient stove = a true Namibian product!

Developing countries consume little energy compared to developed nations; however, over 50% of the energy that they do use goes into cooking food.
The average rural family spends 20% or more of its income purchasing wood or charcoal for cooking.
Living in the city provides no refuge either as the urban poor frequently spend a significant portion of their income on the purchase of wood or charcoal.



Sources of pictures and material: REEEI, wikipedia, nuevas ideas, company web sites

Solar Cooking

Energy Efficiency in the Tourism Sector in Namibia

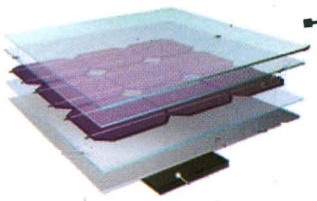
Technology

Renewable Energy & Energy Efficiency Institute

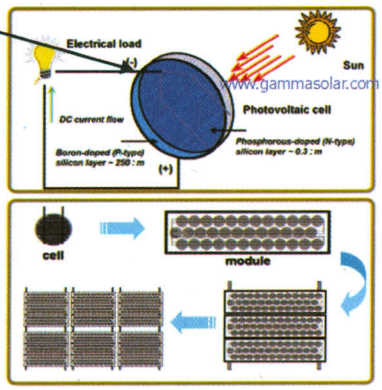
Solar Photovoltaic (PV)

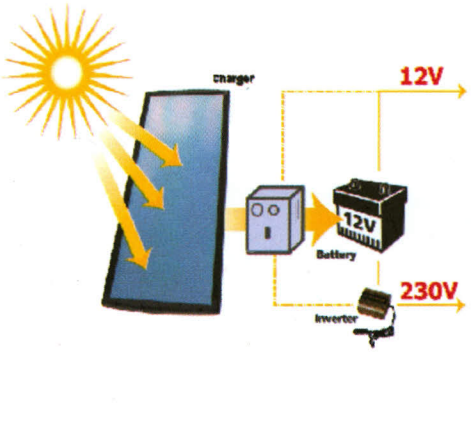
is the name for the technology that converts sunlight into electricity.

Solar power is pollution free during use. The facilities, once set-up, need very little maintenance. This makes PV so useful in remote areas.



A photovoltaic module consists of a number of individual cells, which in themselves are a sandwich of several materials.

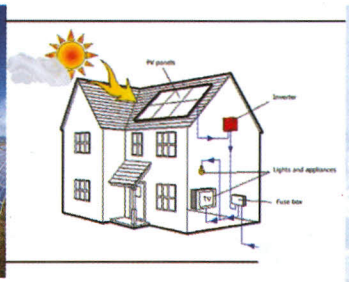




A typical solar power system consists of the following elements:

- PV Modules producing the DC current
- Charge Controller ensuring a constant 12V DC
- Battery (optional) to store the energy
- Inverter transforming the 12V DC into 230V AC

The uses for PV are multifaceted, ranging from big commercial power stations, home systems, water pumps, street lamps, public telephones, hybrid cars to all kinds of small gadgets like portable cellphone chargers.



Solar Photovoltaic

Sources of pictures and material: REEEI, wikipedia, Quevas ideas, company web sites

Energy Efficiency in the Tourism Sector in Namibia

Technology

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Wind Power

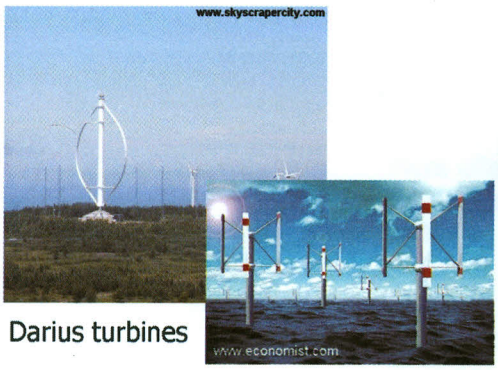
The earliest windmill was used to power an organ in the 1st century AD.
Windmills were used extensively in North-western Europe to grind flour beginning in the 1180s.
The development of the "water-pumping windmill" was the major factor in allowing the farming in remote areas of the world, which were otherwise devoid of readily accessible water.

Source: Wikipedia

A forerunner of modern horizontal-axis wind generators was in service at Yalta, USSR in 1931.

(Source: Wikipedia)

Since the early 1980's the use of the most common horizontal axis, three blade turbine increased substantially.

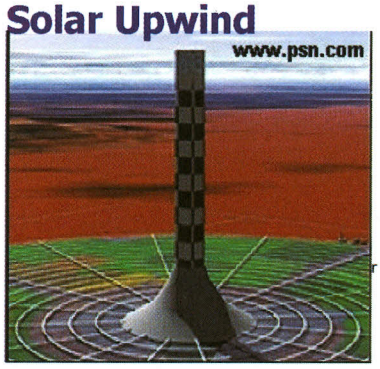


Darius turbines

Savonius turbines

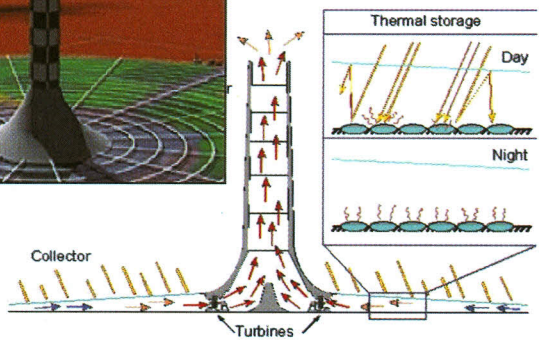
Other technologies in development are the **Darius** turbine, which shows good prospects in electricity generation, and the **Savonius** turbine.

Solar Upwind



The solar upwind or updraft tower is a proposed type of renewable energy power plant. Air is heated in a very large circular greenhouse-like structure, and the resulting convection causes the air to rise and escape through a tall tower. At the foot of the tower a range of wind turbines generate the electricity.

Source: Wikipedia



Micro Turbines

For the off-grid or house use, a range of micro wind turbines are on the market, producing anything form 0.1kw to 2.0kw of power.

"As a commitment to the environment it comes with its own wind turbine."

Wind Power

Sources of pictures and material: REEEI, wikipedia, nuevas ideas, company web sites

Energy Efficiency in the Tourism Sector in Namibia

Technology

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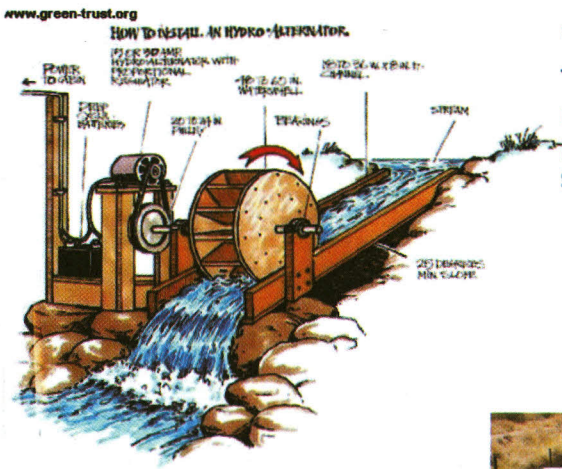
Hydro Power



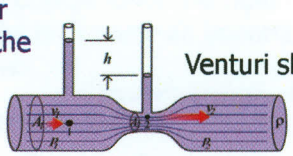
Water Wheel

The water wheel is the oldest and most common means of utilising the power of water for work and small scale electricity generation.

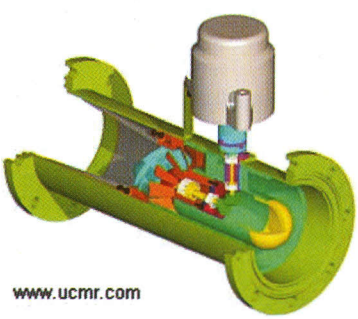
In the Namibian context it is of importance that such a water wheel floats to adjust to the changing water levels of our perennial rivers.

Water Turbines

More effective are water turbines submerged in the river.



Venturi shape



www.ucmr.com

An emerging renewable energy technology is the shrouded tidal turbine enclosed in a Venturi shaped shroud or duct producing a sub atmosphere of low pressure behind the turbine, allowing the turbine to operate at higher efficiency and typically 3 times higher power output than a turbine of the same size in free stream.

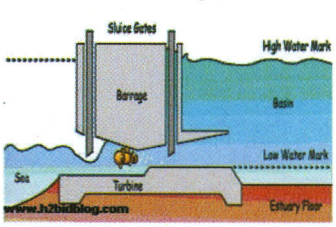
In large scale hydro power generations tidal or current stream systems make use of the kinetic energy from the moving water currents to power turbines, in a similar way to wind mills using moving air. This method is gaining in popularity because of the lower cost and lower ecological impact.

Source: wikipedia

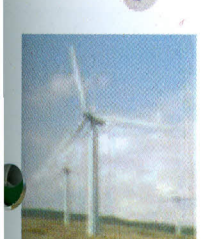
"Artistic view of a twin rotor Seaflow tidal current turbine (Courtesy of MCT Ltd)"

Although not yet widely used, tidal power has potential for future electricity generation and is more predictable than wind energy and solar power.

Source: wikipedia



Tidal power exploits the movement of water caused by tidal currents or the rise and fall in sea levels due to the tides.



Sources of pictures and material: REEEI, wikipedia, nuevas ideas, company web sites

Energy Efficiency in the Tourism Sector in Namibia

Technology

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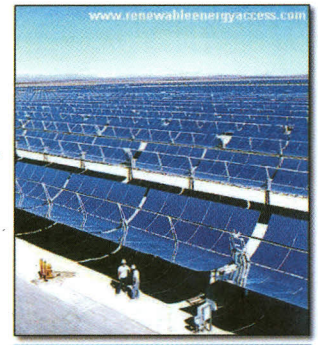
Solar Thermal & Wave Power

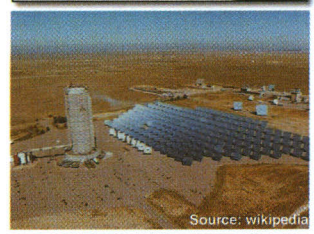
Solar thermal energy is a technology for harnessing solar energy for heat. Water is heated, turns into steam and spins a steam turbine which drives an electrical generator. This is a very different system from solar photovoltaics, which convert solar energy directly into electricity.

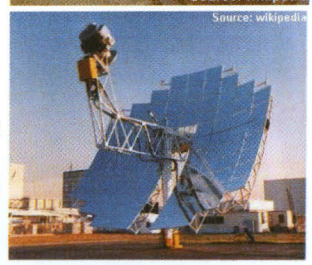


There are 3 basic constructions for solar energy generating systems

- Trough systems convert the heat from the sun into electricity. Because of their parabolical shape, trough collectors can focus the sun at 30-60 times its normal intensity on a receiver pipe located along the focal line of the trough.
- Power towers (also known as 'central tower' power plants or 'heliostat' power plants) use an array of flat, moveable mirrors (called heliostats) to focus the sun's rays upon a collector tower (the receiver).
- A dish system uses a large, reflective, parabolic dish (similar in shape to satellite television dish). It focuses all the sunlight that strikes the dish up onto to a single point above the dish.

Source: wikipedia

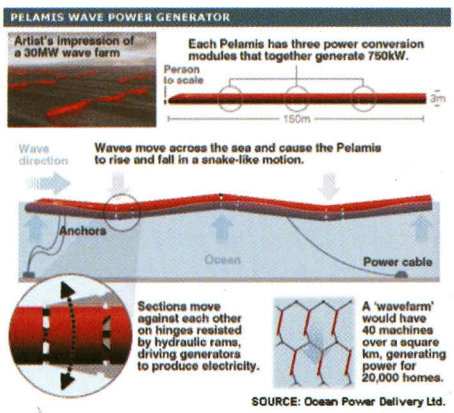




Wave Power: Ocean waves hold a vast amount of energy. Once the right technical solutions are found, wave power has the potential to become an important renewable energy source, comparable in size to hydropower.

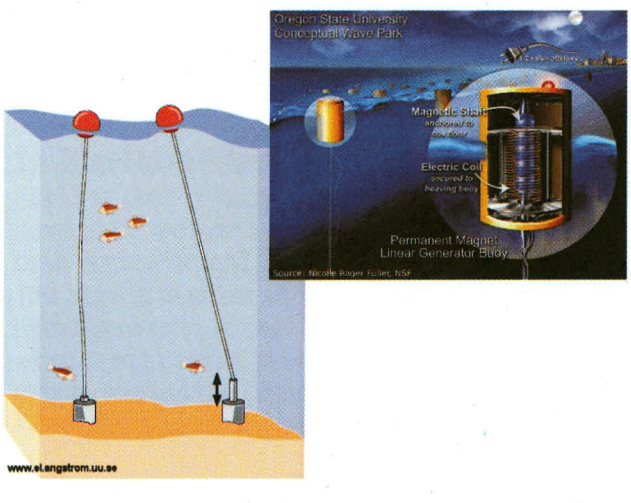
Source: University of Upsala

There are two systems showing the most promising results:



The Pelamis Wave Energy Converter is a semi-submerged, articulated structure composed of cylindrical sections linked by hinged joints. The wave-induced motion of these joints drive hydraulic motors which again drive electrical generators to produce electricity.

Source: Pelamis Corp.



The linear generator buoy

- The version developed in the USA consists of a floating buoy which contains the linear generator. The buoy is anchored to the ocean floor with a rope.
- In the version developed in Sweden, the linear gene4rator is anchored on the ocean floor and connected to the buoy with a rope. In both systems the movement of a magnetic piston in coil windings (stator) generates the electricity.

Sources of pictures and material: REEEI, wikipedia, nuevas ideas, company web sites

Energy Efficiency in the Tourism Sector in Namibia

Technology

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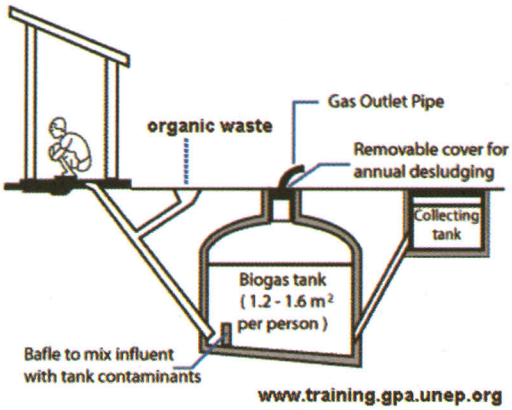
Biogas, -fuel & Wood Gasifier



Biogas typically refers to a gas produced by the biological breakdown of organic matter in the absence of oxygen. Biogas is comprised primarily of methane and carbon dioxide. Biogas originates from biogenic material and is a type of biofuel.

Source: wikipedia

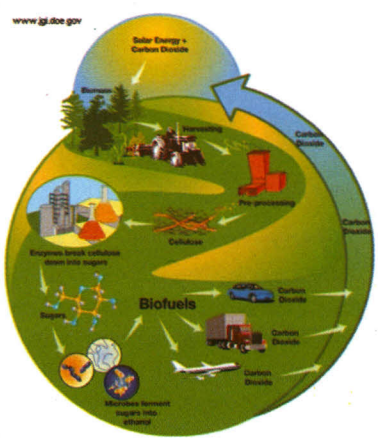
Bladder for storage of biogas.

Biogas (anaerobic) digesters, fed with energy crops such as maize silage or biodegradable wastes including sewage sludge and food waste, produce a low-cost fuel for cooking and thus combatting deforestation. The remaining sludge that has to be removed at intervals, is a highly effective fertilizer.

Source: wikipedia

Biofuel (also called agrofuel) can be broadly defined as solid, liquid, or gas fuel consisting of, or derived from biomass.

Biofuel is considered by some as a means of reducing greenhouse gas emissions and increasing energy security by providing an alternative to fossil fuels.



The "food vs. fuel" Debate

This topic is internationally controversial, with good-and-valid arguments on both sides of the ongoing debate.

Due to government subsidies and rising demand for biofuels, farmers worldwide have an increased economic incentive to grow crops for biofuel production instead of food production. Without political intervention, this could lead to reduced food production and increasing food prices and inflation. The impacts of this would be greatest on poorer countries.

Source: wikipedia

The **wood gas generator** is a wood-fuelled gasification reactor mounted on an internal combustion engine to provide a wood gas, a form of syngas. These plants come from mobile to industrial sizes.

Source: wikipedia

In the Namibian context:

REEEI at the Polytechnic has obtained a mobile demo plant to be fed with wood from projects combatting bush encroachment.

The plant is in effect very much like a diesel generator, except that the fuel is wood being gasified with this wood gas in turn running the engine that again drives the generator producing 230V AC.

Sources of pictures and material: REEEI, wikipedia, nuevas ideas, company web sites

Energy Efficiency in the Tourism Sector in Namibia

Contacts 2007

Renewable Energy & Energy Efficiency Institute

Sources of pictures and material: REEEI, wikipedia, nuevas ideas, company web sites

Associations & Organisations

Hospitality Association of Namibia

H·A·N has since its inception in 1987 grown to a total of over 400 members, representing the full spectrum of the hospitality industry.
H·A·N promotes sustainable environmental business practices towards its members.

Bed & Breakfast Association of Namibia

B&BAN is the leading Association in Namibia for the B&B/Guesthouse and Self Catering sector of the Tourism Industry in Namibia.

Federation of Namibian Tourism Associations

FENATA is the umbrella organization for the private sector tourism industry.
The professional associations play a vital role in tourism development and economic stability in Namibia.

Namibia Community Based Tourism Assistance Trust

NACOBTA is a non-profit membership organisation which supports communities in their efforts to develop and operate tourism enterprises profitably as well as sustainably

Integrated Rural Development & Nature Conservation

Doing African conservation the sustainable way...
IRDNC's long-term southern African program pioneered linking wildlife conservation to rural development and to democracy.

Namib Desert Environmental Education Trust

NaDEET believes environmental education must not only increase awareness and knowledge but also eco-friendly attitudes and skills in Namibia's youth and educators to promote participation.

Desert Research Foundation of Namibia

The DRFN is a Namibian non-governmental sustainability organisation aiming to enhance decision-making for sustainable development through research, training and consultancy in the country's land, water and energy sectors.

We thank the Desert Research Foundation of Namibia for supplying us with all the demonstration objects for the CBT

Energy Efficiency in the Tourism Sector in Namibia

Contacts 2007

Renewable Energy & Energy Efficiency Institute

Suppliers & Technicians

SUPPLIERS

SWH = SOLAR WATER HEATER
SHS = SOLAR HOME SYSTEM
PVP = PHOTOVOLTAIC PUMPING

AE Services
081 124 8924, 063 270634(f)
P.O.Box 273, Karasburg
PVP

Alternative Energy Systems cc (ALENSY)
081 149 2969, 061 301677(t), 061 301668(f)
P.O.Box 86579, 13 Parsival Str. WHK
SHS,SWH & PVP

Conserv
081 127 1666, 061 236336(t), 061 256726(f)
P.O.Box 6422, Windhoek
SHS,SWH & PVP

Electro Amwele
065 240414(t), 065 241777(f)
P.O.Box 401, Ondangwa
SHS

Excel Construction & Services cc
064 572800(t), 064 572801(f)
P.O.Box 40, Omaruru
SWH,PVP & SHS

Johnny's Auto Electric
063 222442/222359(t), 063 223897(f)
P.O.Box 4, Keetmanshoop
SHS & PVP

Kuhler Kutz
081 128 7778, 061 235605/6(tel/fax)
P.O.Box 55, Windhoek
SWH

LIC Pool Centre cc
061 232839/235879(t), 061 238602(f)
P.O.Box 5940, MacadamStr. WHK
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061 236720(t), 061 232673(f)
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SHS, SWH & PVP

Orujaveze Solar cc
081 127 5409, 061 260338(tel/fax)
P.O.Box 2409, Bach Str. No.9, WHK
SHS, SWH & PVP

Pupkewitz Megatech
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P.O.Box 40726, Ausspannplatz, WHK
SWH

RES
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P.O.Box 80262, Olympia, WHK
SHS, SWH & PVP

SK Holdings
061 230459(t), 061 230907(f)
P.O.Box 24801, Windhoek
SHS

Solar Age Namibia
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P.O.Box 9987, Windhoek
SHS, SWH & PVP

Soltec cc
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SHS, SWH & PVP

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SWH

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PVP & SWH

Sources of pictures and material: REEEI, wikipedia, nuevas ideas, company web sites

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Tomas Shigwedha, DRWS
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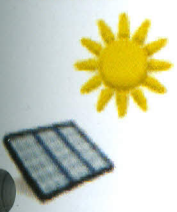
Energy Efficiency in the Tourism Sector in Namibia

Acknowledgements 2007

Renewable Energy & Energy Efficiency Institute



Sources of pictures and material: REEEI, wikipedia, nuevas ideas, company web sites

A Thank You to:

The consultants would like to thank the following for their support and source of valuable input:

Andreas Wienecke of the Habitat Research and Development Centre in Windhoek for his input on water, dry toilet systems and many other

Gitta Paetzold of H•A•N, the Hospitality Association of Namibia, for her support in conveying the 'eco' message to all the members of the association and for ensuring that 'environmentally sustainable business practices' is the focus theme for the association in 2008

Harald Schuett & Kudakwashe Ndhlukula of the Renewable Energy & Energy Efficiency Institute @ the Polytechnic of Namibia for all their support

Nina Maritz of Nina Maritz Architects for all the information concerning environmentally friendly building practices; thanks as well for a range of pictures used in this documentation

Robert Schulz of the Energy Desk at the Desert Research Foundation of Namibia for all the energy he put into showing me how to save energy

Whilst the winners of this competition received their exposure in the front part of this documentation, we do not want to miss mentioning two more runners up, both in the urban category:

Terra Africa Guest House & **Hotel Pension Casa Piccolo,** both in Windhoek

Even the next 16 were so close to the top in their results that we believe they warrant to be mentioned (in no specific order):

Brandberg Lodge, Brandberg
Chameleon Back Packers, Windhoek
Okowiruru Holiday Farm, Hochfeld
Villa Schmoe, Swakopmund
Hotel Pension Uhland, Windhoek
Hakos Guest Farm, Gamsberg Pass
Onguma Game Lodge near Namutoni
Schönfeld Guest Farm, Omaruru
Buschberg Guest Farm near Okaukuejo
Langholm Hotel, Walvis Bay
Düsternbrook Guest Farm, near Windhoek
Cape Cross Lodge @ Cape Cross
Harmony Seminar Centre, near Windhoek
Mowani Lodge near Twyfelfontein
Rostock Ritz, Namib Desert
Albrechtshöhe Guest Farm near Karibib

Watch out for all of these in the next RE & EE Competition!

eco awards Namibia Alliance

eco award Namibia

Finally we want to point out a programme that has been running for over 3 years now - the **eco awards Namibia.**

The eco awards Namibia are a mark of distinction for accommodation establishments which are planned and managed according to eco-friendly principles.

To be a recipient of the eco award Namibia an establishment is assessed against strict sets of criteria in conservation, water management, waste management & sewerage disposal, energy management, suitable & appropriate construction & landscaping, guiding, staff development, social responsibility & human welfare.

This folder* was conceptualized, researched, developed and produced by

nuevas ideas

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* with the exception of the Fact Sheets

Renewable Energy & Energy Efficiency Institute

Royal Danish Ministry of Foreign Affairs
Danida

Fact Sheet

REEECAP REEEFocus

Objective

To summarise the significant REEECAP projects and present the information obtained to the interested public.

Background

After having collected information on various topics related to energy efficiency and renewable energy under REEECAP for over a year, the team wanted to summarize the most significant aspects and share the findings with interested members of the public.

Ministry of Mines and Energy:

Energy in Namibia over the next 5-years

- Namibia's electricity imports will reduce dramatically causing local shortage of supply
- Electricity prices will increase in order to curb electricity wastage and accumulate funds for new local generation
- Liquid petroleum fuel prices will remain volatile and prices will increase
- Coal transportation accounts for about 50% of cost of coal delivered to Van Eck Power Station
- Solar water heating and compact fluorescent lights will be vital measures to reduce household electricity consumption
- Solar water pumping will be a vital measure to maintain agricultural livestock production

Keeping the lights on during the power crisis

In order to maintain essential services

- You could run
  - A diesel/petrol generator
  - A battery based back up system
  - A combination of the two
- Approximate average power brackets are:
  - Home: 1kVA to 5kVA
  - Small office/shop: 1kVA to 20KVA
  - Commercial entity: 20kVA to 250kVA
  - Industrial entity: 200kVA plus

VISION:

To be the national centre of excellence in the advancement of renewable energy (RE) and energy efficiency (EE) and relevant technologies

REEEI PROFILE

MISSION

REEEI aims to be a comprehensive, demand driven, national information and networking hub providing the public and private sectors, academic institutions and the public at large with information, knowledge and expertise with respect to Renewable Energy & Energy Efficiency

Project Outputs

12 presentations, fruitful discussions, public awareness and interesting exhibitions.

The Renewable Energy and Energy Efficiency Capacity Building Project (REEECAP) is funded by Danida, executed by the Ministry of Mines and Energy and jointly implemented by the Renewable Energy and Energy Efficiency Institute at the Polytechnic of Namibia, the Habitat Research and Development Centre and the Desert Research Foundation of Namibia.

THE IDEAL NAMIBIAN ENERGY EFFICIENT HOME

is energy efficient:
not just to save money,
but uses minimal energy
to benefit the environment.

By Nina Maritz

Energy Efficiency for Institutions

By Glenn Howard

Emcon Consulting Group

Energy Efficiency & Renewable Energy Baseline Surveys

REEEFocus

28 March 2008
Presented by Danie Nel, on behalf of CSA

Data generated by Consulting Services Africa and the Desert Research Foundation of Namibia

Solar Cities: A Concept for Namibia's Local Authorities?

REEEFocus – 28 March 2008
Detlof von Oertzen

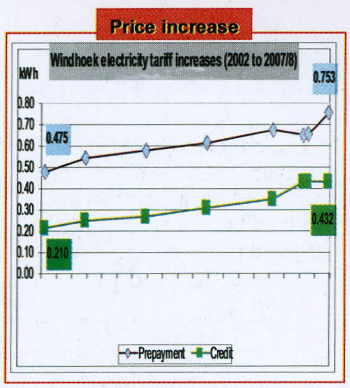
Electricity Supply and demand in Namibia

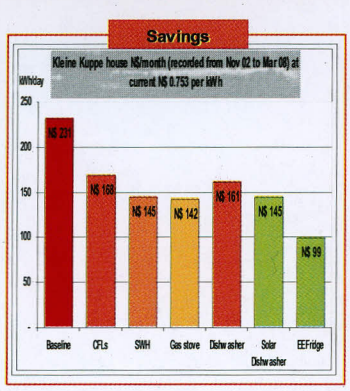
Uli von Seydlitz
EMCON Consulting Group
28 March 2008

7 Steps to Household Energy Autonomy by Robert Schultz

Can Namibia meet its demand ?

- Building no new power stations in Namibia is the worst we can do.
- Demand side management is economically efficient and should be implemented as a matter of urgency.
- We could meet demand if the right decisions are taken fast.
- The crisis is an opportunity to break away from traditional generation portfolio thinking and to become efficient!





Household energy autonomy:

- **Can be achieved step by step**
- **Systems are modular and easily expandable**
- **Can be financed through existing home bonds**
- **Can be financed through reduced interest rates**
- **Is to 90% resistant to external factors such as fuel increases and foreign exchange fluctuations**
- **Is a long-term investment that can be handed-over**

REEECAP Fact Sheets are available from:

REEEI @ Polytechnic of Namibia, Engineering Campus, Auditorium Building, office A4. reeei@polytechnic.edu.na Tel 061- 207-2154.

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DRFN, 7 Rossini Street, Windhoek. drfn@drfn.org.na Tel 061-377-500

Renewable Energy & Energy Efficiency Institute

Royal Danish Ministry of Foreign Affairs
Danida

Fact Sheet

REEECAP 1.1 : Energy efficiency baseline survey for rural, peri-urban and urban households

Objective

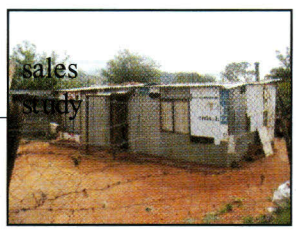
The aim of the study was to set a baseline – for future reference and comparison – for the use and adoption of energy efficiency measures in the residential sector of Namibia.

Background

The study consisted of a field study performed in rural and peri-urban areas and a desktop study for urban areas.

Energy efficiency can be easily achieved, but is rarely employed

The urban component included a survey of energy efficiency practices and technologies. A total of 38 suppliers, manufacturers, distributors and consultants were surveyed for sales and installation figures. The study also reviewed current policies and programmes regarding energy efficiency.



Energy efficient lamps use one fifth of the electricity that incandescent bulbs use.

Project Outputs

The survey showed that energy efficiency awareness, acceptance and implementation appear to be at low levels throughout all levels of society in Namibia. We suggest some actions that could be taken by stakeholders to improve this situation:

Short Term Goals

A Regulatory Framework for Renewable Energy and Energy Efficiency within the Electricity Sector exists (MME, 2007)

Revise & implement it, urgently!

Long Term Goals

Encourage and enforce greater energy efficiency through legislation and demonstrations by institutions such as REEEI

"*... the single most important issue to be addressed is* ***education***"

Provide retailers with non-biased, easy-to-read technical information

Retailers can educate consumers

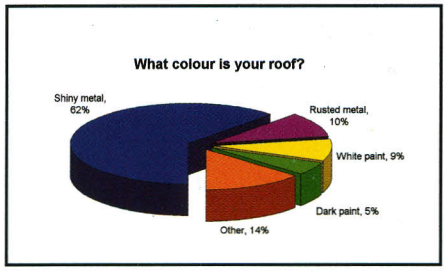
Inform, persuade, educate people about the benefits of renewable energies!

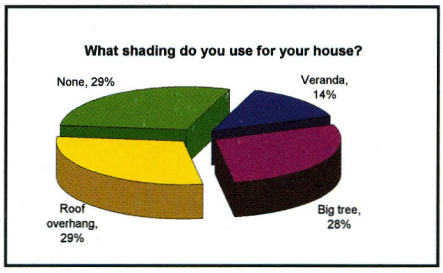
The Renewable Energy and Energy Efficiency Capacity Building Project (REEECAP) is funded by Danida, executed by the Ministry of Mines and Energy and jointly implemented by the Renewable Energy and Energy Efficiency Institute at the Polytechnic of Namibia, the Habitat Research and Development Centre and the Desert Research Foundation of Namibia.

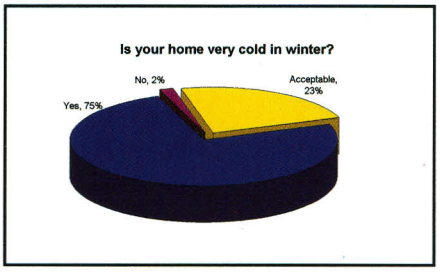
Project Results and Highlights

Rural and Peri-Urban Trends:

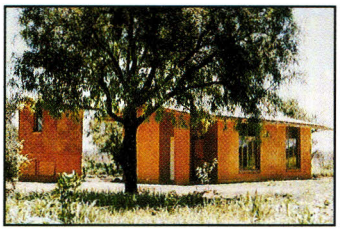
The use of energy efficiency measures to improve the indoor climate of low-income houses in Namibia is very low. There is little indication of a desire to apply such measures.



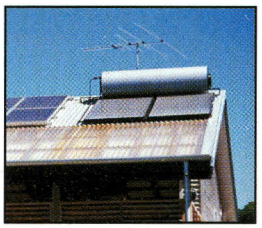




Painting building roofs white is a quick, cheap intervention for efficiency and comfort

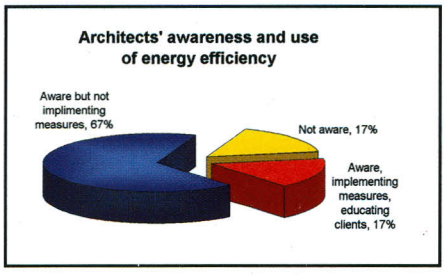


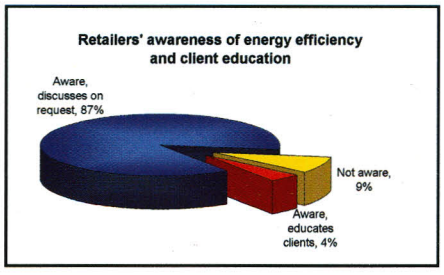
Natural shade increases building comfort and beautifies the surrounding environment

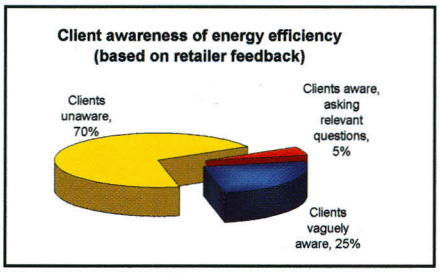


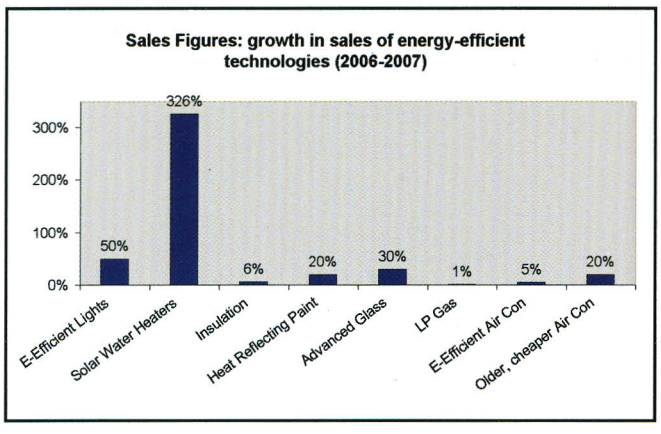
Replacing electric geysers with solar water heaters is an effective energy efficiency intervention

Urban Trends:









The study of trends in urban areas concluded that energy efficiency is largely misunderstood, unknown or ignored (see graphs above).

The building industry especially could benefit from clear and concise information regarding energy efficiency. This could outline:

- availability of relevant technologies;
- costs and benefits;
- life cycle costs and payback periods.

Policies & Programmes:

Government's involvement in energy efficiency activities are not specifically defined in the Constitution, but only hinted at in terms of sustainable natural resource use (Article 95(l)). Additionally, energy efficiency issues are conspicuously absent from Namibia's long-term development plan, Vision 2030. The Ministry of Mines and Energy is, however, discussing the possibility of a major energy efficiency programme to begin in the 2008/09 financial year.

REEECAP Fact Sheets are available from:
REEEI @ Polytechnic of Namibia, Engineering Campus, Auditorium Building, office A4. reeei@polytechnic.edu.na Tel 061- 207-2154.
and
DRFN, 7 Rossini Street, Windhoek. drfn@drfn.org.na Tel 061-377-500

Renewable Energy & Energy Efficiency Institute

Royal Danish Ministry of Foreign Affairs
Danida

Fact Sheet

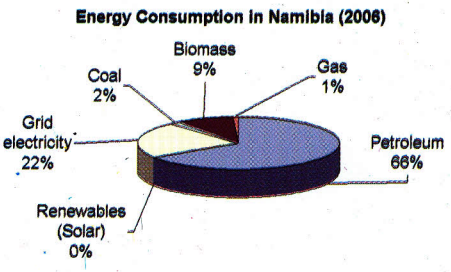
REEECAP 1.2 : Energy Efficiency Strategic Action Plan

Objectives

1) Broaden awareness of Energy Efficiency (EE) issues & enhance EE capacity in institutions and industry.
2) Promote EE practise in households, industry and commerce, and in the building and transport sectors.
3) Promote investment in EE practises.
4) Promote energy reforms and implementation of Demand-Side Management measures.

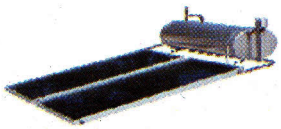
Background

This plan is a road map to implement energy efficiency initiatives for sustainable development in Namibia, as set out in the White Paper on Energy Policy (1998). Five sectors were identified as being critical for implementing the action plan: Residential, Built Environment, Transport and Agriculture, Trade & Industry and Energy Supply Services.



Project Outputs

RESIDENTIAL



Residential consumption accounts for at least 50% of electricity demand.

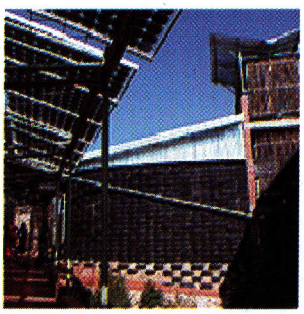
Measures for implementation: Promote CFLs, energy-efficient stoves and solar water heaters,use more appliance labelling and review building codes.

Compact fluorescent lamps (CFLs) use very little energy.

BUILT ENVIRONMENT

A large proportion of energy used in buildings is for heating, ventilation and air conditioning.

Measures for implementation: Promote the concept of life cycle costing of buildings, do energy audits to identify where energy is wasted, introduce performance contracting.



Locally available materials can be used to construct energy efficient houses.

TRANSPORT AND AGRICULTURE

Transport accounts for two thirds of the total demand for refined petroleum products. The agricultural sector takes about 20%.

Measures for implementation: Develop EE labels for vehicles, encourage research on use of natural gas and fuel cells, upgrade infrastructure, promote increased use of railway transport.

The Renewable Energy and Energy Efficiency Capacity Building Project (REEECAP) is funded by Danida, executed by the Ministry of Mines and Energy and jointly implemented by the Renewable Energy and Energy Efficiency Institute at the Polytechnic of Namibia, the Habitat Research and Development Centre and the Desert Research Foundation of Namibia.

TRADE AND INDUSTRY

This sector takes 29% of Namibia's total electricity demand.

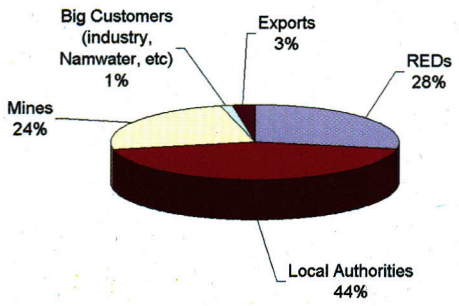
Measures for implementation: Enforce regular energy audits, endorsement of energy service companies, and use more efficient heating and cooling mechanisms.

ENERGY SUPPLY SERVICE

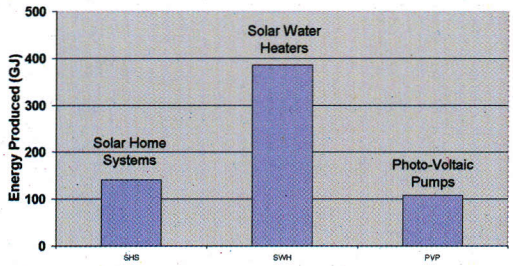
Energy losses from transformers and long-distance cables account for 8% of Namibia 's energy demand.

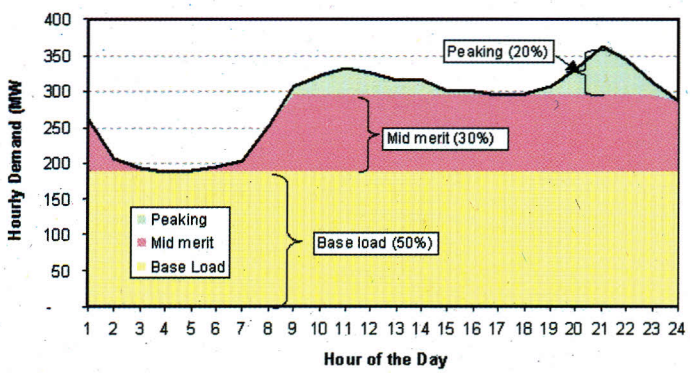
Measures for implementation: Encourage co-generation in utilities, and set higher energy efficiency targets for reducing transmission losses.

National Electricity Consumption (NamPower 2007)



Energy produced from renewables (2006)





Project Results and Highlights

Energy intensive industries and the use of energy inefficient machinery and methods contribute greatly to the high demand for energy.

Solar water heaters constitute the highest proportion of electricity generated from renewables. Their use will continue to rise, especially with the recent Cabinet directive to use SWHs on all government and parastatal buildings. Solar home systems and photovoltaic pumping technologies are still very under-utilised, probably due to the high initial cost of the equipment.

Electricity demand in summer is high during the day, mostly due to air conditioning. During winter it is high in the evening from the use of heaters. Both of these peaks could be reduced through more energy-efficient building designs. To improve energy efficiency overall, it is important to keep the peak and mid–merit as low as possible and have most consumption in the base load, as that will make energy generation most cost effective.

All sectors can implement energy-saving measures.
We should all strive towards energy efficiency in order to save the environment, improve health and save money!

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REEECAP 1.4, 1.5, 1.8 & 1.9 : Energy efficiency in buildings

Objective

The aim of these studies was to evaluate energy efficiency (EE) implementation in building structures.

- Reviews were made of building codes and regulations
- Low cost building plans were appraised and updated (also for owner-built implementation)
- A competition was held for the best energy efficient low cost house.

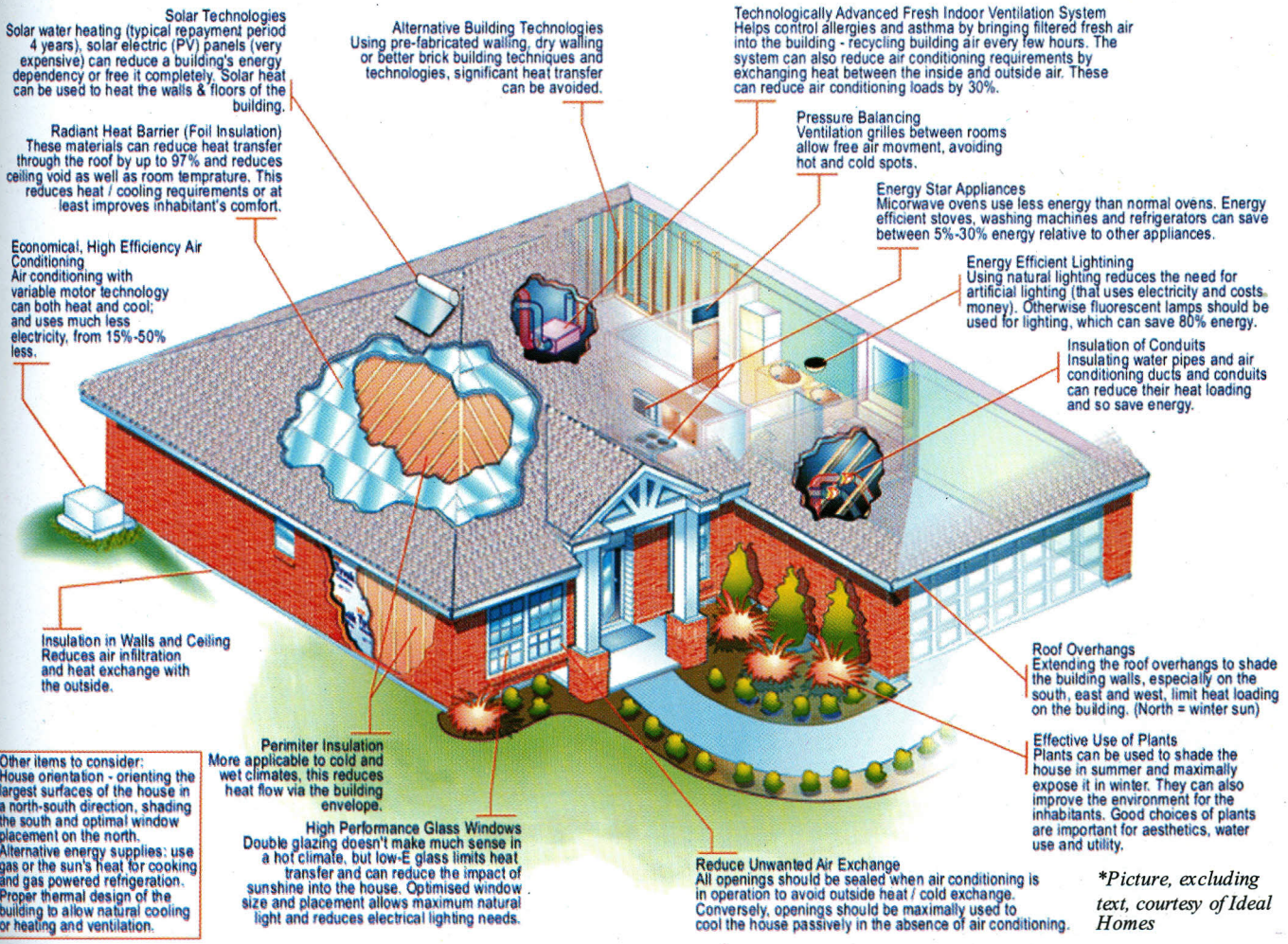
Environmentally friendly clay structure at Eningu, Namibia

Background

Energy efficiency and the incorporation of renewable energy technologies in Namibian buildings have been mostly neglected in the past. However, shortages of Eskom supply capacities as of 2007 have highlighted the necessity of such practices in preserving limited resources and reducing carbon emissions.

Fired clay brick (an energy intensive resource) building under construction

Overview of Projects



**Picture, excluding text, courtesy of Ideal Homes*

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Overview of Projects

Harsh Reality

The projects identified that the income levels of low-income housing inhabitants would not allow them to operate on a level of energy use that would rationalise most large capital investments to improve energy efficiency (i.e. to reduce **electricity** use). For example, most low-cost housing designs do not allow for an [electrical] water heater at all, making it futile to specify a technology such as Solar Water Heating (SWH).

The Good News

There are many other technologies that can offer good financial savings through low life-cycle costs and quick payback periods, improve comfort and reduce energy requirements (see below).

Low Cost Home Construction

Resources are available from Habitat Research and Development Centre to assist owner-builders in energy efficient, effective and safe construction.

Affluent Housing, Commercial Buildings

Architects and other consultants should be required to educate their clients regarding energy efficiency and renewable energy. In the absence of regulation, the choice remains the client's, but at least it can be an educated one!

Building Codes and Regulations

- Namibia currently uses South African building standards, with no energy efficiency requirements.
- Namibians should voluntarily implement energy efficiency and renewable energy measures to reduce their power requirements and save some money too!

Available Technologies

Cost saving!

- Alternative building materials:
  - Adobe / cob / sun baked clay bricks : very cheap and accessible, have low embodied energy, relatively durable and attractive. They have good insulation and thermal mass properties.
  - Compressed earth bricks: can be very strong and durable, with low embodied energy. They have good insulation and thermal mass properties.
  - Fired clay bricks: very high embodied energy, but can be extremely strong and durable.
- Many alternative, efficient technologies offer lower life-cycle costs.

Lower costs!

Terms

- **Life-cycle costing**: the evaluation of the total cost of an item over it's lifetime, as opposed to just its purchase cost. Calculate a life cycle cost by summing all purchase, maintenance, depreciation, replacement costs and subtract benefits, such as income generation, of a technology. Compare this totals with alternative technologies.
- **Payback period**: the time it takes an efficient device to pay for its initial price difference, with a non-efficient device, by its savings. Simple payback calculations use the cost difference between two alternatives divided by the expected savings from using the more expensive technology.
- Insulation: action or capacity to resist the transfer of thermal energy (heat or cold)
- Thermal mass: the ability to absorb, store and then release thermal energy
- Embodied energy: electrical or heat energy required to create a certain material or object

Namibia should subscribe to rating systems such as:

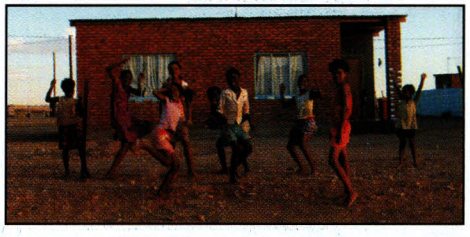
Good payback!

Fewer imports!

energy
Money Isn't All You're Saving

Energy Star, which rates electric and electronic devices that consume less energy often pay for their extra costs over some time.

Natural building techniques and local materials, such as cement, can make Namibia independent of expensive imports



It should not be forgotten that houses house people...

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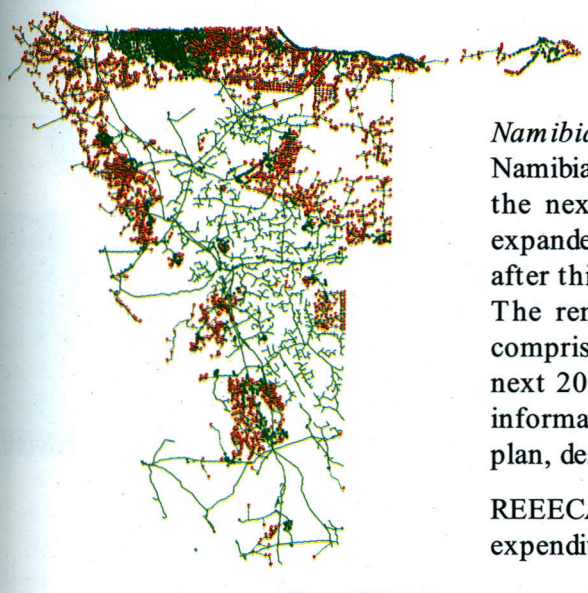
REEECAP 2.1 - Renewable Energy Baseline Survey

Objective

To conduct energy needs assessments at off-grid sites across Namibia, in order to understand patterns of current energy usage, technologies and habits. This information can be used to assess which combination of renewable energy and energy efficiency measures will offer reliable and high quality energy services to off-grid areas.



Background

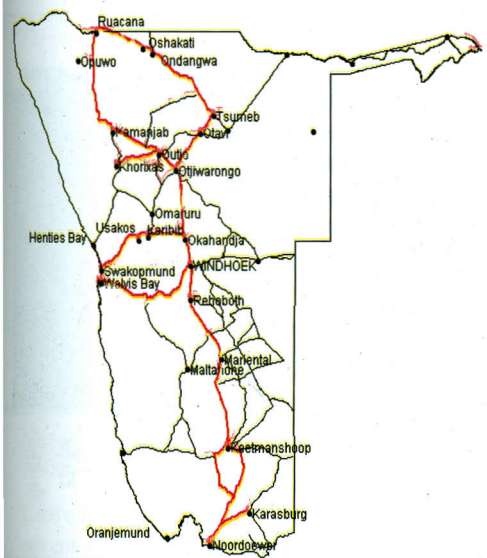
Namibia's *Rural Electricity Distribution Master Plan for Namibia* has identified a total of 5,858 unelectrified rural settlements in Namibia. Of these, only 1,543 are scheduled for electrification within the next 20 years. **Green** lines and dots on the map (*left*) show the expanded grid electricity network and the electrified rural settlements after this 20 year period.

The remaining 3,886 unelectrified rural settlements (**red** dots), which comprise over 106,000 households, will not be electrified within the next 20 years and have been designated as "off-grid areas". Unelectrified informal settlements around urban areas were not included in the master plan, despite being areas of great population growth.

REEECAP 2.1 investigated energy sources, consumption and expenditure in a number of unelectrified rural and peri-urban areas.

Parts of Windhoek's sprawling unelectrified informal settlement area.

Project Outputs



Field Facilitators and Survey

Six field facilitators were trained in field surveying techniques and analysis of data, and were provided with background information about aspects of energy in general and renewable energy and energy efficiency in particular. They conducted surveys during June and July 2007. A total of 21 localities were surveyed in areas with different climatic conditions (which impact on energy consumption). The map shows the routes they covered.

RE Baseline Analysis

A total of 348 questionnaires were analyzed, both in terms of individual localities as well as by lumping them together in an aggregated analysis. The analysis offered insight into monthly household energy source expenditure, transportation expenses, types of appliances used and various services procured on a regular basis.

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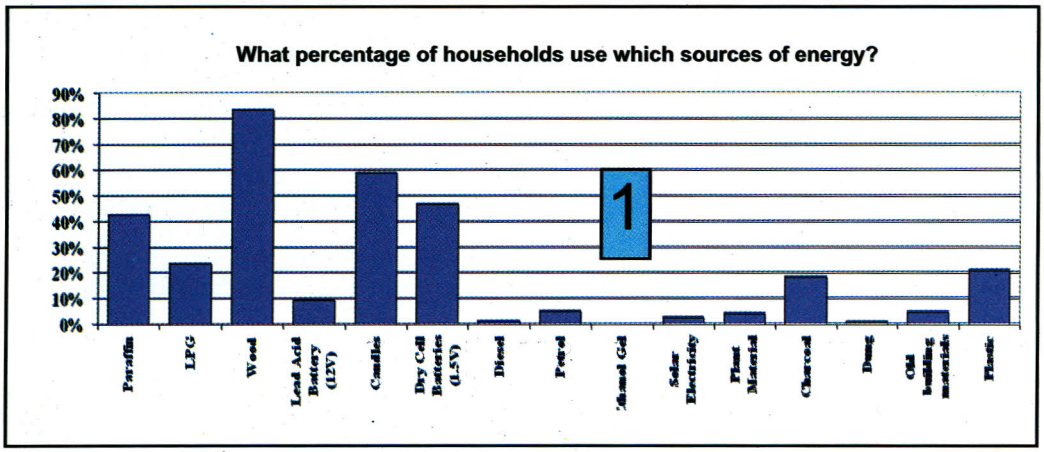
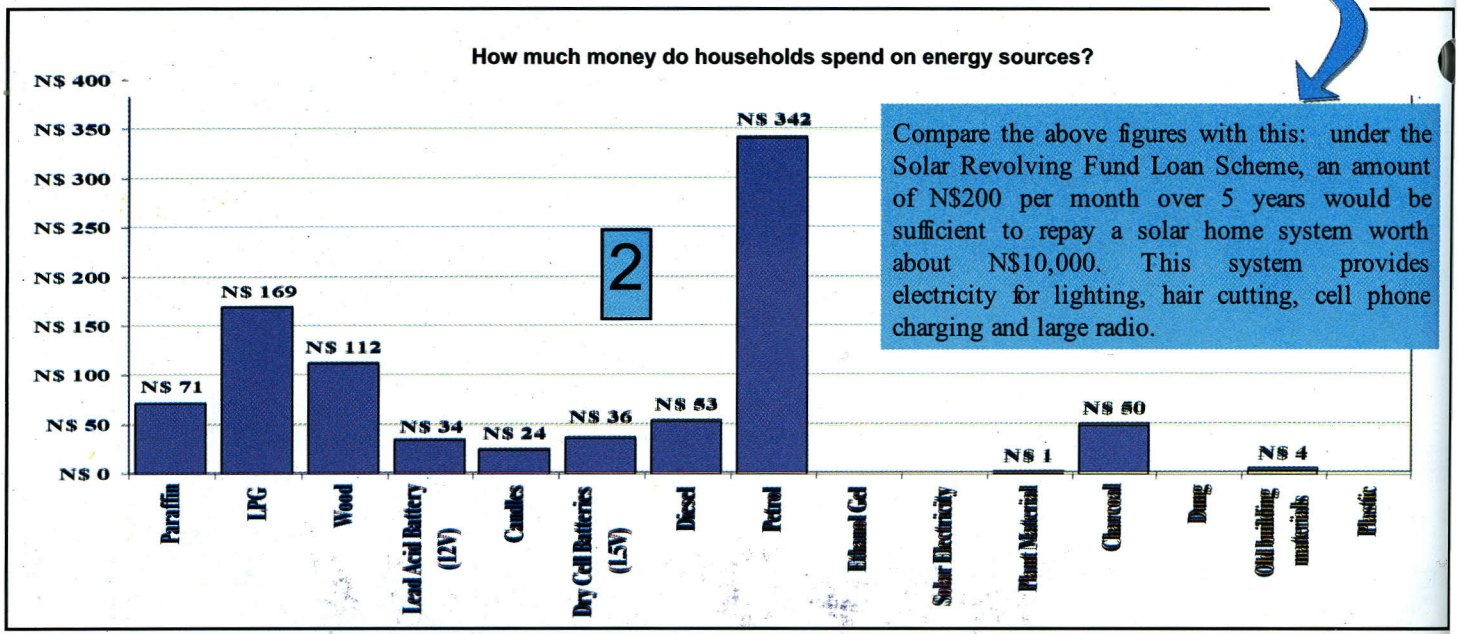
Baseline Survey Results

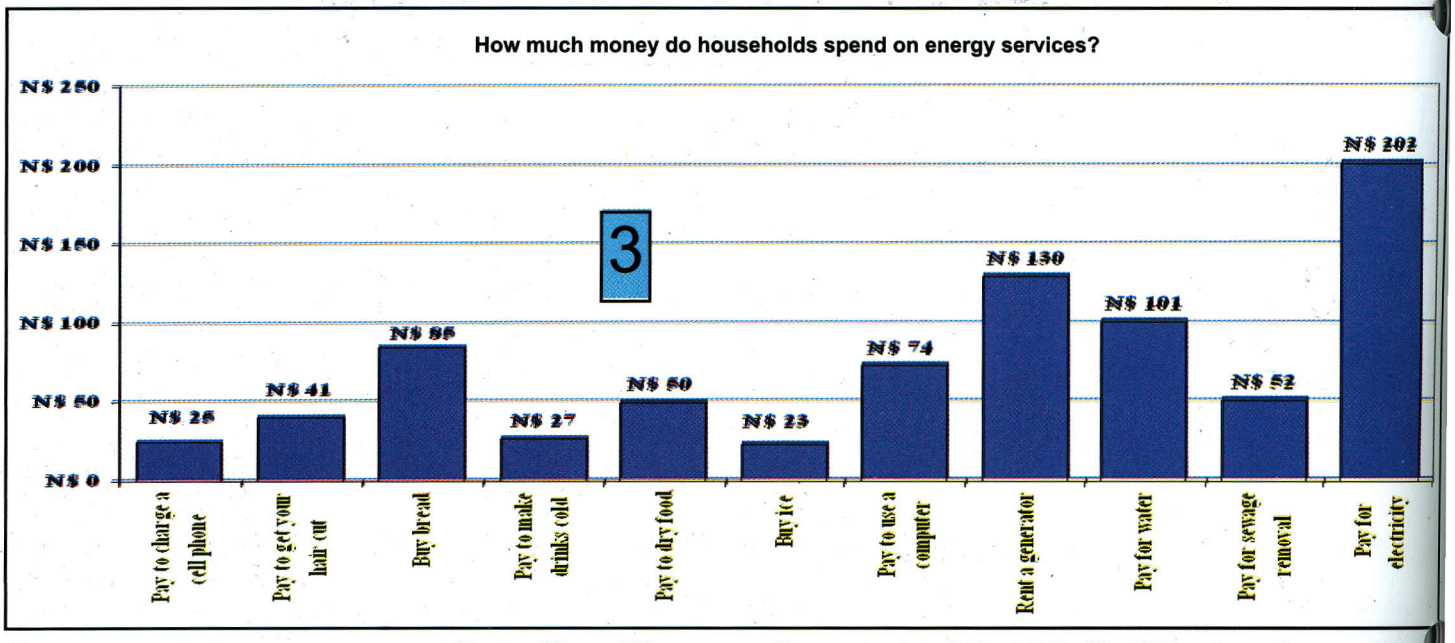
The graphs show the aggregated results for all 21 locations surveyed. The sample comprised 348 low-income households, predominantly in unelectrified rural and peri-urban areas, as well as in some newly electrified households in these areas. Given the limited sample size, the statistics should not be construed to be representative of Namibia as a whole.



The graphs show the prevalence of energy sources used by surveyed households (**1**) and the average amounts spent on these sources per month (**2**). In addition to purchasing energy sources, households also spend money (**3**) on various services, such as charging their cell phones. The average monthly household expenditure for energy is N$201 plus N$223 for services.



Compare the above figures with this: under the Solar Revolving Fund Loan Scheme, an amount of N$200 per month over 5 years would be sufficient to repay a solar home system worth about N$10,000. This system provides electricity for lighting, hair cutting, cell phone charging and large radio.



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REEECAP 2.5 : Community Development and Training for Renewable Energy and Energy Efficiency

Objective

The objective was to develop skills in renewable energies (RE) and energy efficiency (EE) in selected communities. To achieve this the following objectives were defined:

- To develop training materials on the subject of RE and EE technologies and practices,
- To train field facilitators to carry out demonstrations to communities, and
- To develop selected communities' skills in applying RE and EE technologies and practices.

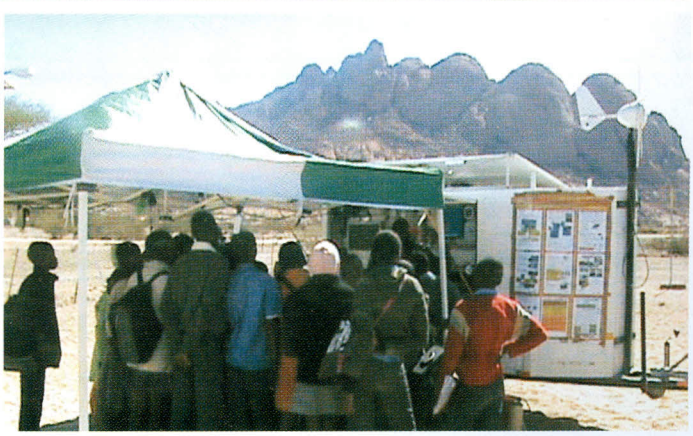
Background

To bring all necessary demonstration materials to the communities, it was decided that "energy information platforms" would be used, allowing community members to get hands-on experience of RE and EE technologies. These energy information platforms are mobile trailers equipped with a range of RE and EE technologies. They can be towed to remote areas, allowing community members to see and experience the various technologies first-hand. We visited selected communities in northern, western and southern Namibia demonstrating RE and EE.

Project Outputs

- Training materials
- Training of field facilitators and their assistants, enabling them to carry out demonstrations
- Training provided to selected communities, giving participants improved skills in applying RE and EE technologies and practices.

Close inspection of the facts and apparatus on an information platform in Uis.



The energy information platforms attracted great interest from community members in remote areas.

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Project Highlights

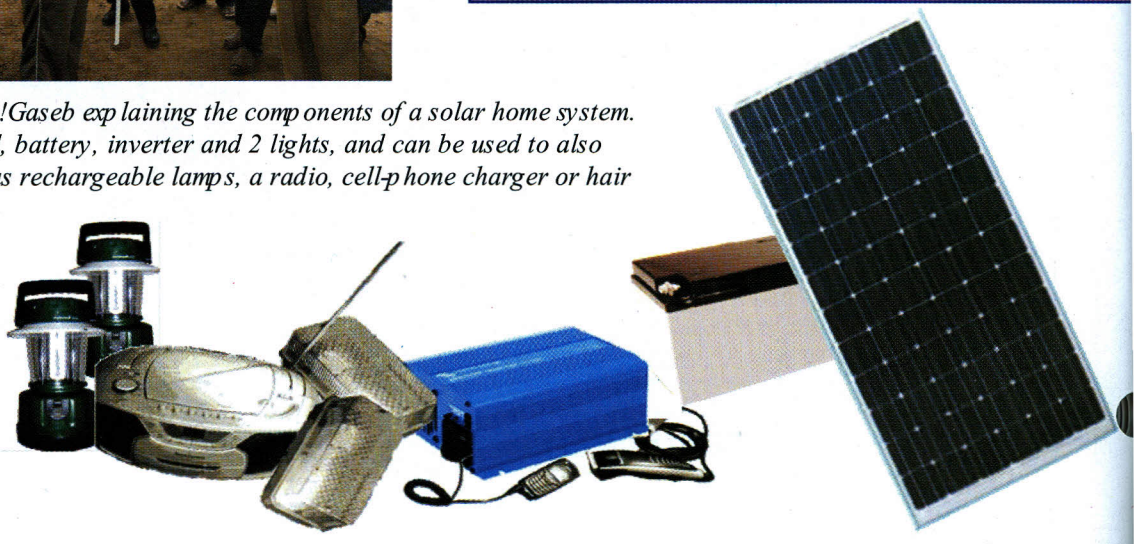
During the field work, rural and urban communities were given demonstrations on various technologies such as solar water heating, fuel efficient stoves, solar cookers, solar-powered submersible water pumps and energy efficient lights. In addition, several videos about RE and EE were screened using a solar powered computer system fitted to the energy information platforms.

A total of 36 settlements were visited, and several demonstrations were given at each settlement. Over 450 participants completed questionnaires about renewable energy and energy efficiency. It was estimated that the total number of individuals exposed to the demonstrations of RE and EE technologies during the tours exceeded 4,500.

Beneficiaries of the demonstrations ranged from learners in primary and secondary schools, their teachers, traditional authorities and local decision-makers. Many of the participants in rural areas were communal farmers and pastoralists. In villages and towns, audiences included unemployed people living in informal settlements, representatives from the business community, politicians and other decision-makers.

The interest generated from the public is illustrated by the 276 requests for more information about RE and EE received from the participants. The most popular technologies, both in rural and urban areas, were solar home systems and fuel efficient stoves.

Field facilitator Arnold !Gaseb explaining the components of a solar home system. It includes a solar panel, battery, inverter and 2 lights, and can be used to also power appliances such as rechargeable lamps, a radio, cell-phone charger or hair cutter.



A central lesson from this project is that even though people have been made aware of RE and EE, and would like to make use of these technologies, they commonly do not have the means to do so.

To improve this, current Solar Revolving Fund loan facilities should be extended to allow more people to take loans and purchase and operate such technologies. This requires greater commitment from government, donors, the private sector and other funding agencies

Energy shops, i.e. small enterprises providing RE and EE to off-grid sites, could also contribute to increased use of the relatively cheaper technologies such as fuel-efficient stoves.

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REEECAP 2.7: Biomass energy 'Workshop on Wheels'

Biomass energy refers to energy from biological material such as firewood, charcoal, biogas and biofuels.

Objective

To bring together stakeholders interested in sustainable use of woodfuel and to link it with achieving greater commitment and action towards Namibia's biomass conservation strategy.

A wood-seller in Katutura explains that demand for firewood is high, and wood is no longer easily available around Windhoek. He travels as far as the Gobabis area to harvest wood for sale.

Background

Wood is used for cooking by about 213,000 households (62% of all households) in Namibia. Working on an average daily consumption of 5kg of wood, these homes consume 1,100 tons of firewood, which is equivalent to about 3,000 medium-sized Acacia trees every day! Over three quarters of the 213,000 households that use wood for cooking are in the seven northern regions of the country, where deforestation is now severe.

Woodfuel is therefore becoming scarcer and more expensive, yet biomass energy conservation practices are slow in being implemented. There is a gap between what people want or need for their cooking, and the corresponding use of fuel-efficient technologies. The 'Workshop on Wheels' brought stakeholders, entrepreneurs and communities in central and northern Namibia together to try to bridge that gap. The overall theme was to demonstrate the opportunities that lie in enterprises based on efficiency in household energy technologies.

Participants visiting the solar stove manufacturing plant in Ongwediva.

Project Results and Highlights

From 29 July to 2 August 2007, the workshop visited
- wood sellers in Katutura,
- a small stove-manufacturing community programme in Ovitoto,
- a charcoal producer near Grootfontein,
- a solar stove manufacturer in Ongwediva
- a tsotso stove manufacturer in Oshakati,
- a biogas installation at Oshiko,
- the 'Bushblok' factory in Otjiwarongo.

An invigorating and dynamic mix of participants was achieved, and the five days of traveling and interaction were stimulating and interesting. Participants included technicians and engineers in renewable energy enterprises, representatives of the Shack Dwellers Federation, an entrepreneur looking for business opportunities, fuel-efficient stove manufacturers, government officials and private sector people.

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Fuel-efficient stoves

Tsotso stoves are manufactured in various small urban and rural enterprises but the businesses tend to loose momentum and fail because of difficulties with marketing and lack of business skills. A successful tsotso stove manufacturer in Oshakati pays much attention to marketing and his business is successful and growing. Cost: N$250-450, available from Habitat Research and Development Centre, Windhoek; and other local manufacturers. With the saving in wood costs, a stove pays for itself in about 5-10 months.

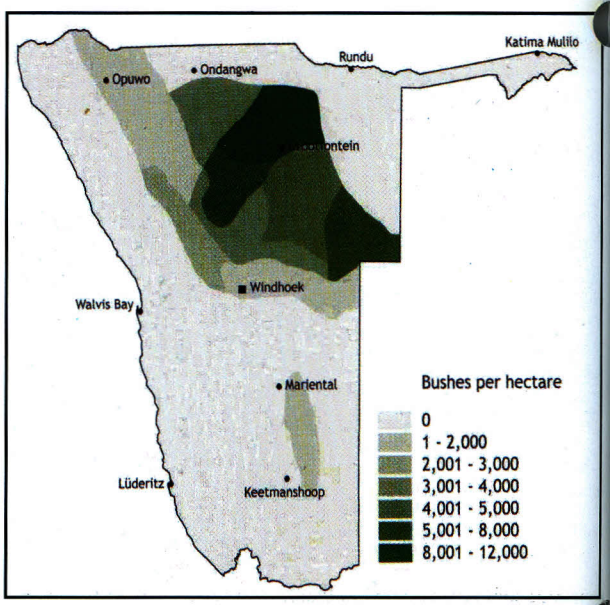
A tsotso stove uses less than half the wood of a conventional cooking fire and can also cook effectively with twigs and even scrap paper. The product is easy to manufacture and offers great potential for a small business.

Solar cookers require no wood at all, only sunlight. They are manufactured at Valombola VTC (Ongwediva) but sales are generally quite low because people are not familiar with the technology and marketing is not actively pursued.
Cost: N$600 for a single cooker (left), N$1000 for a double, available from Solar Stove Project, Tel 065 231-463.

A solar box cooker can cook a typical meal of pap and meat in about 3 hours on a sunny morning.

Charcoal production

Namibia has the ironic situation of over-exploitation of wood in many urban and rural areas, yet over-abundance of 'problem' wood by bush encroachment in much of the country. Bush encroachment on 26 million hectares on land in Namibia has decreased the livestock carrying capacity by 50-60%, and reduced the income from ecotourism and livestock farming by at least N$700 million per year.



Encroacher bush actually presents a great opportunity for income generation through manufacture of charcoal. Thinning of bush for charcoal production can potentially add 44,000 jobs to the Namibian economy, with obvious benefits for poverty reduction. The removal of bush increases the carrying capacity for livestock, so cattle-farming land is restored to higher productivity. Emerging commercial farmers could service their debts with the extra income from charcoal. With these benefits, encroacher bush can be viewed as a sustainable resource rather than a problem.

Conclusions of the Biomass Energy Workshop on Wheels

There are many ways to reduce wasteful firewood consumption in Namibia without compromising people's livelihoods. Innovative schemes, such as municipalities that purchase wood-efficient and solar stoves in bulk and hand them to all new erf-owners (with the small price of a stove included in the price of the property), could give a boost to local small-scale stove producers and simultaneously help with wood conservation. In the same vein, Namibia's 'problem wood' can be seen as a valuable resource, and also holds great potential for income generation.

Projects in the biomass sector that are most successful are entirely commercially driven, notably charcoal production and the tsotso stove manufacturer in Oshakati. These enterprises are characterised by having either strong markets or paying much attention to the marketing process. Lessons from these enterprises would be valuable in the whole sector.

The traveling workshop brought people from different backgrounds into close contact, so that participants developed an understanding of the issues and the situations on the ground, and of each other. Such an approach has a more lasting impact than conventional static workshops in air-conditioned conference centres.

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REEECAP 3.3 : Energy-related Impacts of Climate Change in Rural Namibian Households

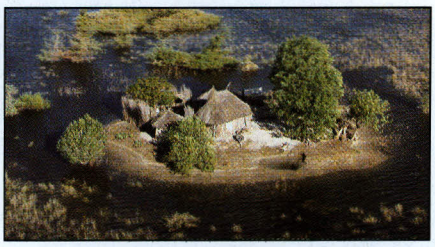
Objective

1. Identify the most likely energy-related impacts of climate change on rural Namibian households
2. Suggest energy-related adaptation measures that rural households can undertake to minimize the negative impacts of climate change

Background

Global climate change and its *impacts* are projected to vary greatly on international and local scales. Similarly, *resilience* and *vulnerability* to the impacts of climate change vary greatly across regions, cultures and communities, depending on their capacity to cope with the negative impacts associated with climate change.

Climate change *adaptation* moderates harmful impacts and exploits beneficial opportunities through planned adjustment to actual or expected climate conditions.



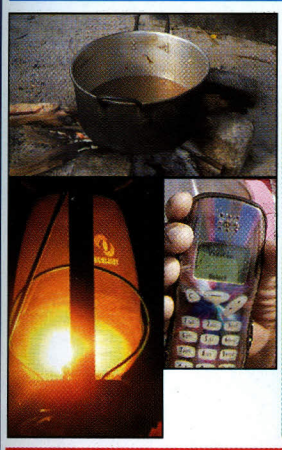
A Caprivian house exposed to Namibia's variable climate

Project Findings

Climate Change Projections in Namibia

The following changes in climate conditions are expected to be observed in Namibia:

- Rise of average and maximum temperatures
- Increases in evapo-transpiration rates
- Increases in climate variability, and extension of the duration of dry season
- Decreases in ecosystem production in some regions
- More variable rainfall, with impacts on groundwater recharge
- Increase cost of fuel and most commodities



Energy-related Household Vulnerabilities to Climate Change

Rural Namibian households have a range of energy-related, climate sensitive vulnerabilities, including:

- High dependence on firewood for cooking, and water and space heating
- Vulnerability of inside temperatures and conditions to outside climate
- High dependence on internationally-sourced lighting fuel, such as candles and paraffin
- Remote location and dependence on transport for access to goods and services to and from urban centres
- High dependence on communal taps, boreholes and open water sources for household uses

Impacts of Climate Change on Rural Households

Climate change is expected to:

- Decrease the accessibility, availability and affordability of:
  - —Firewood for cooking, water heating and space heating
  - —Lighting and transport fuel
- Exacerbate extreme temperatures in energy inefficient households

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Project Highlights

Energy-related Adaptation in Households

To minimize the negative impacts of climate change on energy use and services, priority energy-related adaptation in households should address the high dependence on wood fuel, enhance the stability of the house's inside climate, promote secure water access, strive for small-scale energy generation, and reduce the dependence on transport fuels.

The image below illustrates and highlights the scope of implementable household energy-related adaptation measures in rural Namibia.

Use solar water heaters to eliminate need for water heating fuel

Install solar home systems to generate electricity for domestic uses

Install and use locally, independently produced renewable energy

Use solar water pumps to secure water access

Use energy efficient building design and materials to buffer inside environment from variable, extreme external climatic conditions

Establish low-cost, water-efficient household garden systems to enhance self-sufficiency and food security

Build erosion prevention structures and plant trees to minimize runoff & increase soil infiltration

Use fuel-efficient stoves and solar cookers to relieve dependence on fuel sources

Climate Change Adaptation and Development

Given Namibia's highly variable climate, focusing on household adaptation to the effects of climate change actually promotes and reinforces sustainable development and poverty alleviation. Despite the long-term nature of climate change projections, understanding the impacts of climate change and addressing them through adaptation measures and strategies can and should be prioritized; climate change adaptation reinforces disaster preparedness, risk reduction and sustainable development.

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REEECAP: Energy Efficiency in Namibian Schools

Objective

- To identify the main opportunities for energy-efficiency in Namibian schools,
- To develop a set of useful and cost-effective recommendations for secondary schools, and
- To design, develop, and test awareness-raising materials and strategies for energy efficiency in schools.

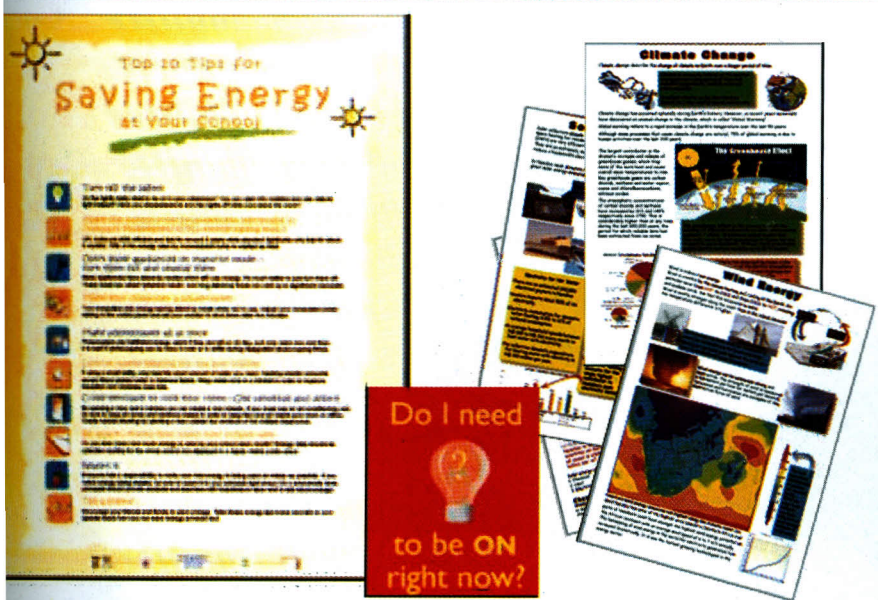
Background

There has never been a more appropriate or relevant time for Namibia's schools to strive for energy efficiency. Namibia's electricity crisis is being widely discussed at home, in classrooms, and on the front pages of Namibia's newspapers, and even young students are expressing interest in learning more. By introducing energy efficiency concepts and practices into the daily life of Namibian schools, students and staff will acquire skills and knowledge which enable them to use energy conscientiously and efficiently at school and at home and in the future. Currently, Namibian schools spend hundreds of thousands of N$ per year on electricity which is being wasted through poor practices and an over-reliance on outdated and inefficient technology.

A learner points out that lights have been left on overnight

Project Outputs and Results

The EE in Namibian schools project conducted baseline studies at five secondary schools—two public schools, two private schools, and one public technical high school. Through surveys, interviews, and guided tours of the schools, the DRFN team could identify the most common and pressing energy-related needs at schools. The project discovered that schools have a limited understanding of how their electricity is being used, and are therefore unlikely to know how and where to save energy. To enable schools to better monitor their consumption and to implement the project's recommendations, an "Energy Efficiency Toolkit" was developed that includes: an energy saving tips poster, reminder stickers, an energy saving in action mural, an energy auditing software tool, electricity consumption loggers, and various information resources such as DRFN Energy Desk fact sheets.



From left to right: Top 10 Tips Poster, colorful reminder stickers, energy-related information sheets, and Mr. Fillipus Sheehama working on the Energy Saving in Action mural.

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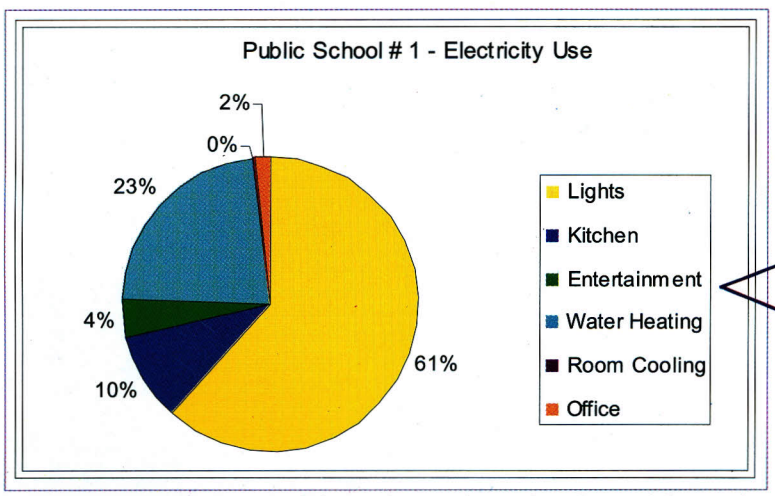
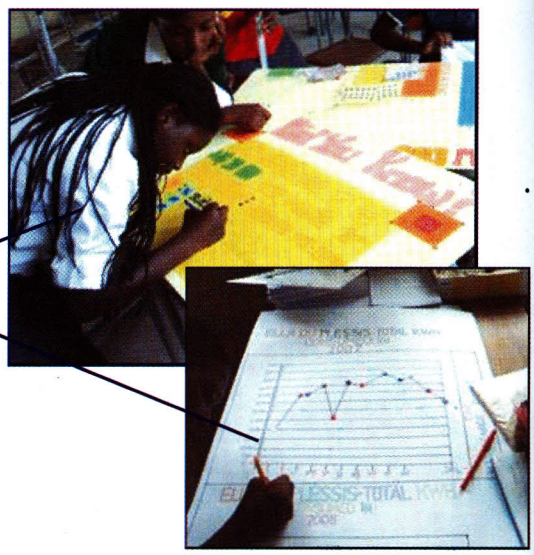
Project Highlights—Working with Bright Students to Find Smart Solutions

The EE in Schools project team worked with student based energy clubs at three different schools. In order to enable these student groups to identify electricity waste and opportunities for savings at their school, the DRFN assisted them with performing basic energy audits. The learners worked together to count all appliances and to record their power wattages and hours of use, and were able to identify the biggest electricity users at their school—by far, lights and room cooling. At one public school, where air conditioning units and fans are not used, approximately 60% of their monthly consumption is used for lighting alone.



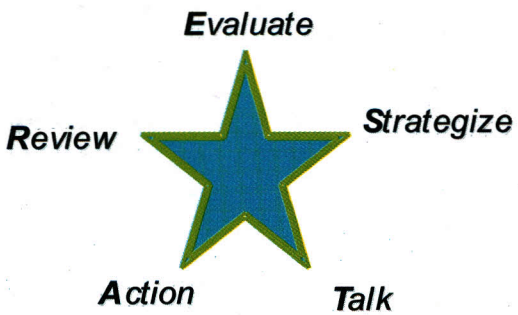


Students making posters of the audit results and a chart of their school's monthly electricity consumption in preparation for a school wide assembly.

Implementing Change—Follow the *E-STAR* Method!

Effective implementation of an awareness raising and behavioural change campaign requires careful planning, the involvement of both staff and students, and the monitoring of the project's results. In order to help schools remember the most important phases of an energy-saving project, the DRFN recommends following five basic steps, summarized by the E-STAR diagram below. Energy-saving projects are a chance for the entire school community to learn and take action together. Many simple behaviour changes can be implemented at no cost— all it takes is a collective effort and commitment from a school that energy efficiency is a priority.

A successful project begins with ***evaluating*** the school's current consumption, ***strategizing*** which energy-saving measures and activities are feasible, ***talking*** about energy-saving tips and concepts with the rest of the school community, taking ***action*** to implement changes, and continually monitoring and ***reviewing*** electricity use.



Top 10 Tips for Saving Energy at School:

1. Turn off the lights
2. Change to energy saving CFL light bulbs
3. Don't leave appliances on stand-by mode
4. Make your computer a power-saver
5. Make photocopies all at once and then turn it off
6. Save on water heating for tea & coffee
7. Use windows and doors to cool a room
8. Regularly monitor your school's consumption
9. Report waste and do something to stop it
10. Tell a friend about the importance of saving

REEECAP Fact Sheets are available from:

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