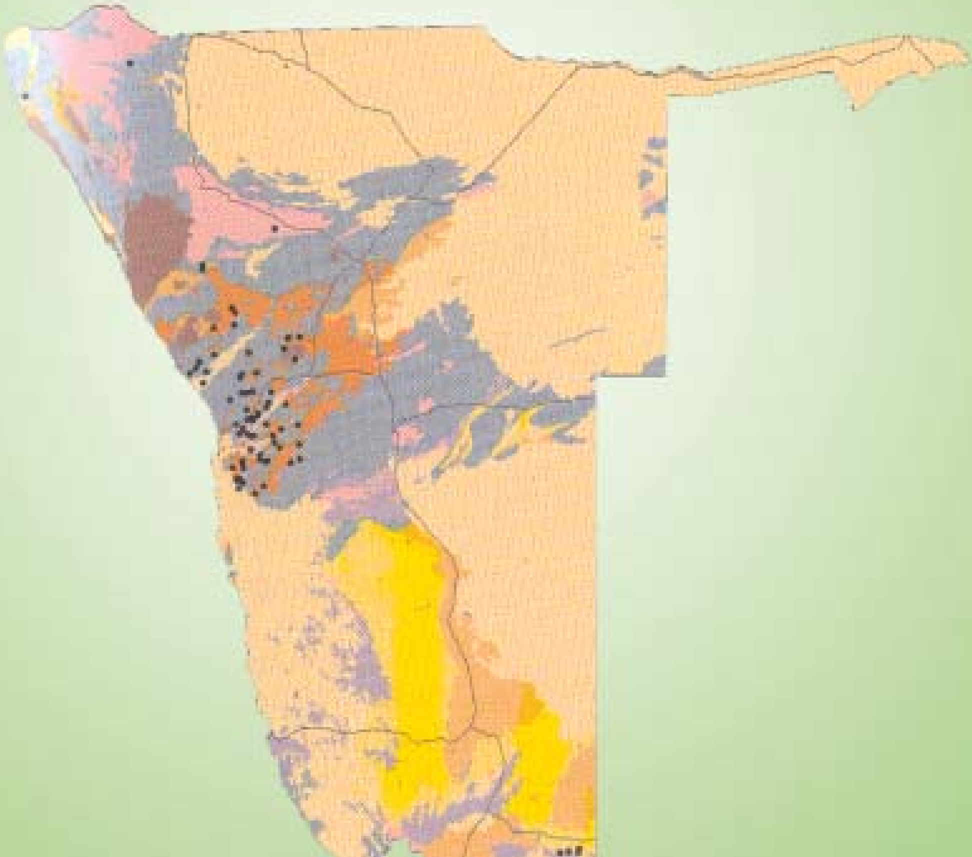
URANIUM – A BLESSING OR A CURSE?

What you need to know about the uranium industry in Namibia



DISTRIBUTION OF URANIUM DEPOSITS

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What you need to know about the uranium industry in Namibia

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Earthlife Namibia is an association of voluntary environmental and social justice activists, a civil society organisation founded as a branch of Earthlife Africa in 1990.

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Acknowledgements

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Introduction

The energy crisis is the topic of the day, and is closely related to the phenomenon of climate change. Namibia, being dependent on electricity imports from South Africa, is facing a serious power crisis. Yet, generating power in a way that does not exacerbate climate change is a matter not only for Namibia, but for the whole world.

22 years after the horrifying nuclear accident in Chernobyl, uranium is again being increasingly mentioned as an alternative source of energy. More than 100 nuclear power plants are panned to be constructed by 2020 in China, India and Russia alone. However, public relation and reality are two different issues. The construction of round about 20 nuclear power stations seems to be more realistic. The Namibian government has also announced its intent to explore nuclear power generation.

The nuclear chain starts with mining of uranium right here in Namibia and does not end with the nuclear power plant. The dismantling of old power plants and storage of nuclear waste create serious problems, with some nuclear waste remaining radioactive for more than 100,000 years.

Namibia has many uranium deposits and has emerged as a new frontier for foreign uranium investors. Presently, two uranium mines are operating in the country (Langer Heinrich Uranium in the protected Namib Naukluft Park and Rössing Uranium in the Erongo region), and more are expected to open soon.

Is uranium a blessing or a curse for Namibia? Through heated debates, concerned people try to find an acceptable answer to this question. Environmentalists and human rights activists see this problem very differently than politicians and developers.

The aim of this booklet is to inform the reader about the nuclear industry and its impacts. The Labour Resource and Research Institute (LaRRI) has conducted research on the situation of uranium mines in Namibia and the conditions for mine workers. Some of LaRRI's research findings are incorporated into this booklet.

With more uranium mines planned to operate in the near future, Namibians can no longer afford to be un- or misinformed. To help understand this complex issue, uranium mining, along with closely related subjects such as power generation and global warming, are briefly tackled in this booklet. These issues should be of great concern to all residents of Namibia and in fact to everyone on our planet.

The nuclear fuel chain

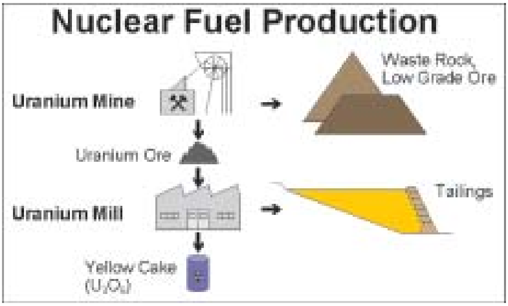
The term nuclear energy is generally linked to nuclear reactors where electricity is produced. However, nuclear reactors are only a small part of the entire nuclear chain. Mining of uranium, enrichment to fissionable uranium (U-235), fuel fabrication, nuclear power generation, storage of used fuel rods, reprocessing of spent fuel rods, waste transportation and storage, dismantling of nuclear power stations are all part of the chain. The different steps are briefly explained here.

Uranium mining

Uranium is one of the very few elements on Earth which is not stable; it decays by itself "naturally", changing into other elements, some of which are very short-lived and others are very long-lived, one of them is gaseous radon, which evaporates into the environment.

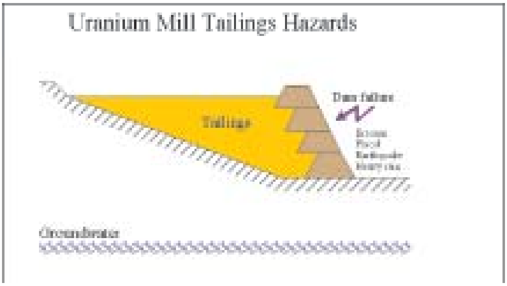
Namibia's uranium resources contain only a fraction of uranium; 1,000 kg of ore leads to only about 500 grams of usable uranium. The mined uranium ore is crushed, piled onto large heaps and irrigated with a chemical solution. This "leaching" dissolves the uranium, which is then separated and precipitated as a concentrate containing 90% or more uranium oxide (U_3O_8). This granular concentrate is generally referred to as yellow cake. The remains, called tailings, are still radioactive and are usually disposed of back into the pits.

The tailings contain about 85% of the original radiation of the uranium ore – due to the decay chain of about 15 elements before uranium turns into stable lead. Some of the elements are very long-lived, thus tailings need to be kept separate from all living beings for thousands of years.



There is the possibility that uranium and chemicals used during the leaching process can be washed into the ground and surface water, contaminating it in such a way that the water can no longer be safely utilised.

In Namibia, uranium deposits are mined in open pits, making it more cost effective than underground mining. This goes hand in hand with massive dust development and leaves huge scars in the landscape.



Enrichment

Uranium in its natural form can not be used in nuclear reactors or in nuclear weapons; both need a certain percentage of fissionable uranium (U-235). Only 0.7% of natural uranium is fissionable. Through an enrichment process the natural uranium is increased to about 3%. As a byproduct, depleted uranium (U-238) is produced and is used in ammunition and tank armor. Highly enriched uranium (over 20% U-235) can be used in nuclear weapons.
Depleted uranium is still highly dangerous to humans through its chemical toxicity. It has been used in several late wars, e.g. in Iraqi, causing horrifying damages to soldiers and civilians.

Fuel fabrication

After enrichment, uranium oxide is squeezed into tablets. The tablets are placed into long pipes called fuel rods. A bundle of these rods form a fuel element.

Nuclear power reactor

In the reactor, the U-235 contained in the fuel rods is fissioned, a controlled chain reaction which releases energy. This heats water (or in some designs gas or molten metal) and by means of a turbine and generator, electricity is produced.

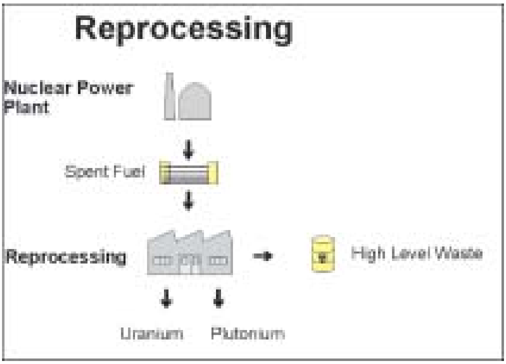
Koeberg nuclear power station near Cape Town

Storage of fuel rods

After being used for two or three years, the fuel rods become extremely radioactive and intensely hot and have to be put into a cooling pool for several years before they can be transported. The fuel rods are considered high-level radioactive waste and are either stored in an interim storage facility or transported to a reprocessing plant.

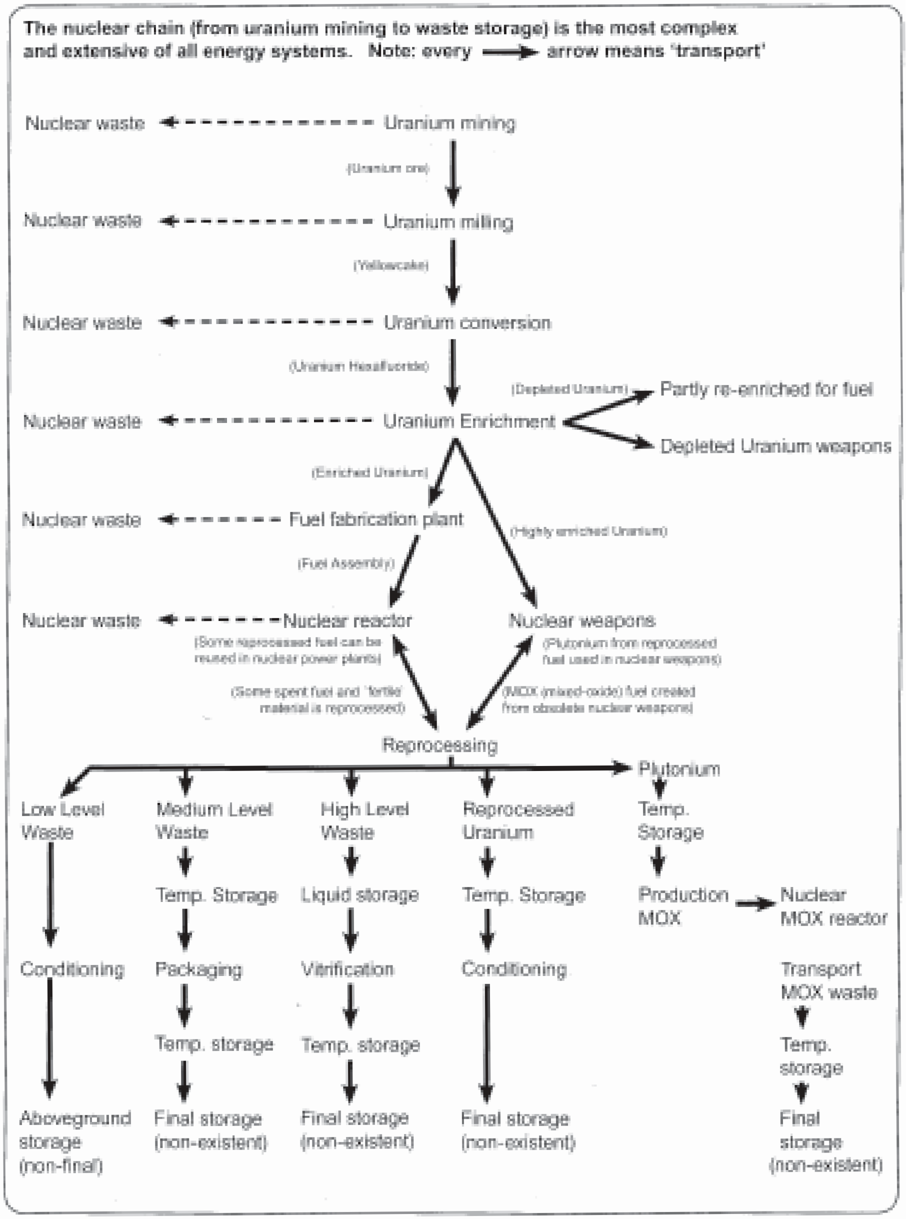
Reprocessing

Spent fuel rods still contain U-235 as well as plutonium, which are bred from another uranium isotope, U-238. The remaining uranium and the plutonium are chemically separated from the fission products for re-use. It has to be re-enriched to 3% U-235. Reprocessed uranium contains remnants of plutonium and other byproducts of fission. As a result, reprocessed uranium is more radioactive than normal uranium. Reprocessing results in large quantities of solid waste and releases radioactivity into water and air.



Source: Peter Diehl, WISE Uranium Project

Nuclear power chain



Waste storage

Radioactive waste is produced at all stages of the nuclear fuel chain. The storage of nuclear waste is the biggest problem in the entire fuel chain. Worldwide there is no safe solution to deal with the waste. Burying it in the deep underground runs the risk of leaks, now or in future. Above ground storage also has its problems and is not safe. It is extremely expensive to permanently store radioactive waste since radioactive decay will continue to take place for over 100,000 years.

Spent fuel rods are often stored in or near nuclear power plants. Different approaches to store nuclear waste have been made, but often meet fierce resistance from communities not wanting to have nuclear waste stored in their vicinity.

Transport

Throughout the nuclear chain, radioactive material is transported from one plant to another. Transport always carries the risk of accidents, theft and sabotage, the consequences of which can be devastating.

Dismantling

The process of shutting down a retired reactor is an essential step. Many reactors are currently reaching their retirement age or will do so in the near future. Strong irradiation of the reactor vessel causes it to degrade and the reactor has to be closed after some decades. The high levels of radiation in shutdown reactors make the dismantling procedure very complex, hazardous and costly.

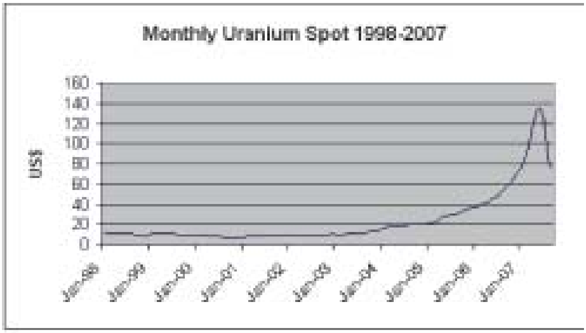
Uranium Mining in Namibia

Namibia has emerged as a new frontier for foreign uranium investors. The recent increase in uranium exploration and mining in Namibia is due to the fact that the global demand for uranium has increased dramatically. Concerns about the depletion of fossil fuels, peak oil and climate change have sent uranium prices skyrocketing.

As far as we understand, the uranium production from mines has been far lower than the demand for uranium by the nuclear industry, Thus deposits are considered worth mining which were not at a much lower uranium price. A new RUN on uranium has started.

The price of US$10/ pound of U_3O_8 was relatively stable for many years, but suddenly exploded to an astronomical apex of US$136 in mid-2007, before settling back to US$44 in October 2008

(www.uxc.com/review.)



Namibia is presently the world's fifth largest uranium producer after Canada, Australia, Kazakhstan and Russia, producing 8% of the world demand. If the planned projects get off the ground, Namibia could soon be producing well over 8,000 tons of U_3O_8 per annum, reaching a global market share of 10%.

The Namibian government has granted exploration licenses (EPL) to 21 companies for areas in the Erongo, Karas and Kunene. The Ministry of Mines and Energy (MME) has stopped issuing EPLs and will lift the temporary ban only once it has drafted a nuclear policy with the help of the International Atomic Energy Agency (IAEA).

To a large extent, the uranium deposits are situated in the protected Namib Naukluft Park, a pristine tourist destination. Uranium mining, like any other mining activity, creates an imbalance between economical benefits and ecological conservation. The natural environment as our most precious resource is sacrificed for short-term economic benefits.

Legislation

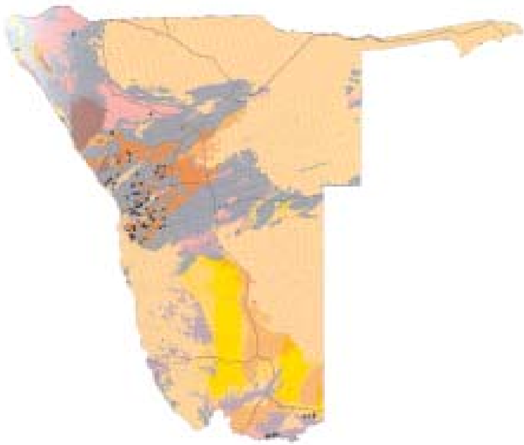
The Namibian Constitution of 1990 states in Article 95:

The State shall actively promote and maintain the welfare of the people by adopting, inter alia, policies aimed at … maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and utilisation of natural resources on a sustainable basis for the benefit of all Namibians both present and future; in particular shall provide measures against the dumping or recycling of foreign nuclear and toxic waste on Namibian territory.

Though the constitution makes provision for sustainable development, there is a serious shortcoming of legislation and policies when it comes to nuclear fuels:

- The Minerals Policy of Namibia has some provisions on the protection of the environment but not the nuclear industry in particular.
- Namibia's Minerals Act (no 33 of 1992) requires an environmental assessment for all mining projects.
- The Atomic Energy and Radiation Protection Act was assented to in 2005 but will only commence on a date that the authorities will decide on. Only section 44 came into effect in May 2005.
- In 2007, after decades of ongoing uranium mining, the Namibian Chamber of Mines established a committee to deal with radiation protection issues in the uranium industry and to help with the development of best-practice standards for occupational health and environmental management for uranium mines.
- In December 2007, the Environmental Management Bill was tabled at the Namibian parliament after many years of preparation. It will commence on a date that the authorities will decide on.

With proper and implemented legislation we will be able to protect ourselves effectively against the unsustainable exploitation of our natural resources and the potential negative consequences for us and our environment.



The black spots indicate the distribution of uranium deposits in Namibia

Uranium mines in Namibia

Presently Namibia has two operational uranium mines, Rössing Uranium (Rössing) and Langer Heinrich Uranium (LHU).

Rössing Uranium is the first uranium mine in Namibia and has been in operation since 1976. The mine is owned to 69% by Rio Tinto; other shareholders are the government of Namibia with 3% (but GRN has the majority of 51% when it comes to voting rights), the government of Iran with 15%, the Industrial Development Corporation (IDC) of South Africa with 10% and local individual shareholders with 3%.

The mine is located in the Namib Desert close to the town of Arandis, 65km inland from Swakopmund. Rössing operates the largest open pit uranium mine in the world. In August 2007, the mine committed itself to an N$784 million (US$112 million) lifespan extension project that will see the mine through to

2022. However, in August 2008, Rössing, optimistic about the mine's future due to the boom in uranium prices, announced that uranium mining will go on until 2030. Rössing produced 3,046 tons U_3O_8 in 2007.

Rössing's open pit. The current size is 3 km long, 1.5 km wide and about 375 metres deep (Rössing, August 2008).

Langer Heinrich Uranium (LHU) is 100% owned by the Australian company Paladin Resources Ltd and commenced production in 2007. It is the world's first all new conventional uranium mine in two decades. The mine is located in the west of central Namibia in the protected Namib Naukluft Park and is expected to stay in operation until 2023. Ramp-up for a second stage is in progress; the possibility of a third stage was recently announced.

The fact that the mine is in the protected Namib Naukluft Park and the issue of water availability gave rise to great concern among stakeholders, but did not prevent MME and Ministry of Environment and Tourism (MET) from granting the mining license. Earthlife Namibia appealed to the government to stop mining operations at Langer Heinrich because mining uranium would not only pose health hazards but also environmental concerns such as loss of biodiversity and possible ground and surface water contamination – one of the serious issues that had not been addressed properly in the draft environmental impact assessment (EIA). The Öko-Institute in Germany reviewed the EIA on Earthlife's request and stated that the radiation doses are underestimated by a factor of four and that the proposed tailings management concept contains serious flaws. They concluded that, given these circumstances, a license should not have been granted.

Operating uranium mines (Rössing and Langer Heinrich) and exploration sites. The green line indicates protected areas.

Future uranium mines

Mining licenses have been granted and construction has commenced at Trekkopje (UraMin, Areva) and at Valencia (Forsys Metal). Initial production at the mines is planned in 2009 and 2010 respectively. In addition, prospecting is taking place at Goanikontes, Aussinanis, Tubas, Tumas, Ripnes, Nakop, Sandwich Bay, Kaoko and other places. Some of the new uranium projects will evolve into mines. Russia's leading uranium mining company, Atomredmetzoloto, a subsidiary of the state nuclear power company Atomenergoprom, said on June 2, 2008, it intends to start uranium prospecting in Klein Spitzkoppe area in the third quarter of 2008.

Foreign companies make huge and quick profits through mining uranium in Namibia and other African countries. Companies from e.g. Canada and Australia have to adhere to sophisticated and strictly implemented environmental and social standards in their own countries, while most African countries don't have proper legislation. Taxes and royalties in African countries are significantly lower than in western countries. In Africa, the rate of unemployment is high and labour is cheep.

Where does Namibia's uranium go?

In 2004, Rössing exported 106 tons U_3O_8 to China. This was the first export of a western producer to China. In 2007, Rössing produced 3,046 tons U_3O_8 of which 30% was sold to North America, 13% to Europe, 29% to Asia and 26% to Japan. UraMin, soon mining at Trekkopje, will sell 35% of its uranium output to China. This raises some serious questions to be answered by our government:

- Can Namibia guarantee that the exported uranium is not used for proliferation of nuclear weapons?
- Will one day the nuclear waste, as a product of the yellow cake produced in Namibia, come back to be stored in our country?
- Will Iran demand uranium from Namibia, bearing in mind that Iranian government owns 15% of Rössing Uranium shares?

Impacts of Uranium Mining

Where there is uranium there is suffering:

Mining activities have a devastating, long term effect on the environment, the social situation and public health. Uranium mining is more dangerous than other forms of mining due to the radioactivity of the ore and tailings. Due to enormous generation of (radioactive) dust, mining uranium in an open pit makes the process even more disastrous, negatively affecting the health of the workers and the residents and leaving behind huge scars in the landscape. Much uranium mining is taking place in the protected Namib Naukluft Park and the West Coast Recreation Area, both attractive tourist destinations, a fact often not properly addressed in environmental and social assessments (ESA).

A strategic environment and economic management plan has to be in place for the mining areas and for all Namibia in order to plan and implement integrated development, which does not only cater for the construction of more uranium mines but has long-term sustainable development for all sectors in mind. This is the responsibility of the Namibian government and the companies that come to mine and make profits here.

Why our health is at risk from radiation

Remember, uranium decays “naturally” in a chain of 15 elements into stable lead. While it is decaying the respective atoms emit/ shoot off parts of the atom - this is alpha-, beta- or gamma-radiation - and turn into another radioactive element, called radionuclide.

Radiation at the outside of the body is not the most dangerous thing; it is much more dangerous when radionuclides taken up into the body e.g. by breathing in radon gas and dust which holds radioactive elements, or by getting some radioactive material into the body by eating, drinking or smoking where radioactive materials are around, e.g. in uranium mines. Radioactive elements can also enter the body via food (vegetables, meat, fish etc.) which has been exposed to radioactivity, be it in the vicinity of uranium mines or in the surroundings of nuclear power plants. These “exposure paths” need to be identified – specifically taking into account the environment and the diet of people living near uranium mines.

There is no such thing as a safe dose of radiation. When alpha-, beta- and gamma-radiation interact with human bodies, they can kill tissue or damage the genetic material contained in our cells. When large doses of radiation are received, large amounts of body tissue may be killed, sometimes fatally. At lower doses, genetic damage is more likely, causing mutations and possibly cancer. Since these cancers may take years or decades to develop, it is very difficult to determine whether the dose of radiation has caused a specific cancer. It is difficult to relate the delayed impact on a worker's health to work in a uranium mine or for the worker to obtain legal proof in order to receive compensation. However, through statistical research, the effects of radiation, also of low-level radiation on humans, have been studied and effects could be proven. For example, the Navajo Uranium Miners and Millers Compensation Committee in Arizona, US, has succeeded in securing compensation from the US government for miners and millworkers.

In Germany, uranium was mined from 1848 until 1990 by the Soviet-German company Wismut. Many workers died due to work-related health conditions; 5,237 workers suffering from lung cancer received compensation. The mine was shut down after reunification of Eastern and Western Germany due to enormous negative social and environmental impacts.

A study done in Namibia by LaRRI reveals that many workers complain of illnesses they contribute to their many years of service at Rössing Uranium.

Dust plumes are blown from the central Namib out to the sea for hundreds of kilometers with seasonal berg winds, as seen in this satellite photo.

Radiation exposure may also significantly increase the risk of other diseases such as heart disease, stroke, pneumonia, and liver problems. The open-pit mining will cause increased levels of dust carrying radioactive particulates which may reach the coastal area and can lodge in the lungs.

Radiation Protection

as relatively new “science” has emerged mainly after the nuclear bombs had been dropped on Hiroshima and Nagasaki in 1945 and military and scientists began to study the effects of ionizing radiation.

Socio-economic conditions will change

At an unemployment rate of 37%, investments creating work opportunities are highly welcome. However, Namibia and its citizens need to consider the long-term price we will pay for short-term benefits from uranium mining. Socio-economic impacts of large project developments are often not properly considered. The uranium boom in the Erongo will draw migrant labourers and their families from other parts of the country. This will put pressure on housing, schools, hospitals, other public institutions as well as water and electricity supplies. There is a risk that additional artificial settlements like Arandis and Usakos will develop and that dense settlements will add to the HIV/AIDS infection rate. And what will happen to the communities, heavily dependent on income from the mine, once the mines are decommissioned? These are serious issues and need to be catered for from the very beginning of new developments.

Example Niger:

Although Niger is one of the major producers and exporters of uranium from its Arlit and Akokan mines (AREVA), the country is – after 40 years of mining – still considered one of the five poorest countries in the world. 90% of the inhabitants of Niger do not have access to electricity – though their uranium deposits are fuelling the world’s nuclear power plants.

Uranium is found in 13 African countries and is mined and or explored by companies from other continents.

The natural environment is our precious asset

There is always a land-use conflict between mining and conservation, with mining currently enjoying priority in Namibia. The result is limited options for other uses of the land, such as for tourism. Another serious impact is the degradation of the bio-physical environment, resulting in habitat and biodiversity loss.

Albert Einstein warned more than half a century ago:

> ***"If the bee disappeared off the surface of the globe then man would only have four years of life left. No more bees, no more pollination, no more plants, no more animals, no more man."***

His words of warning point to the importance of the protection of biodiversity; the loss of one species interrupts the natural cycle and can have fatal effects on many other species, including humans.

Radiation is harmful to all plant and animal life on the planet, and the genetic heritage developed over millions of years can be lost forever if radiation is allowed to mutate and damage animal and plant genes.

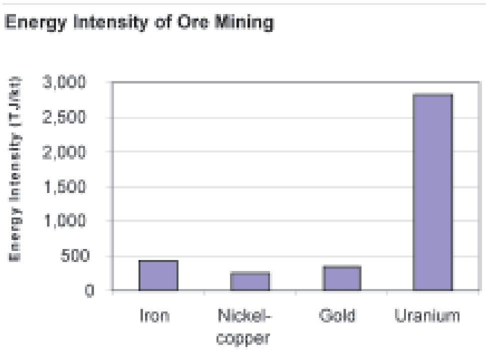
In Namibia, the unique lichen fields east of Wlozkasbaken are under severe threat due to the desalination plant and the water pipe line from the coast to the Trekkopje mine. Lichen fields are a very peculiar phenomenon which have developed in evolutionary time scales and require a very specific combination of environmental factors. There is nothing similar elsewhere on this planet! These lichen fields should be seen as another living fossil like the famous

Wlotzkasbaken's unique lichen field

Welwitchia mirabilis, which might also be under threat through mining operations at other areas.

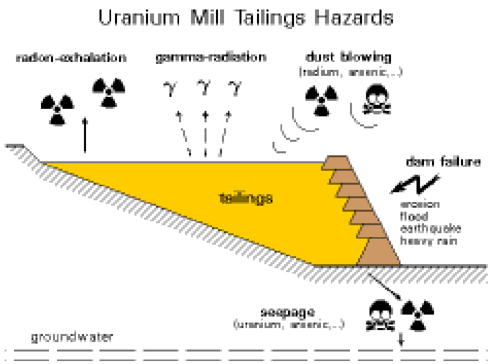
Global warming and nuclear power generation

The nuclear lobby claims that nuclear power generation is preventing climate change. However, the reality is that while nuclear fission is carbon dioxide (CO_2) free, the entire nuclear fuel chain emits three to four times more CO_2 per unit of energy produced than renewable energy generation such as from solar and wind. Uranium enrichment, in particular, is extremely energy and carbon intensive. When the entire process of energy generation is considered, renewable energy and energy efficiency prove to be more economical, effective and internationally accepted methods of reducing CO_2 emissions.



Radiation from the tailings

Uranium mill tailings contain a variety of contaminants that have to be safely contained for hundreds of thousands of years, due to the long half-life of some of the decay products, to avoid environmental hazards. Due to the mechanical milling, the material is no longer rock-like but more sand-like, thus becoming susceptible for dispersion into the environment, e.g. by wind, which enhances the spreading of radon gas.



Since the milling process only extracts the uranium from the ore, many radioactive decay products remain in the tailings. Among these are long-lived radionuclides such as thorium-230 (80,000 years half-life) and radium-226 (1,600 years half-life). The latter is of specific concern, since it continuously decays to radon-222 and as a gas can easily escape from the tailings deposit. Radon presents a lung-cancer hazard when inhaled.

Please note: **"half-life" means that HALF of the radioactive element is still there, the other half has decayed into another radioactive element – it does not mean that half of the element has "disappeared"**

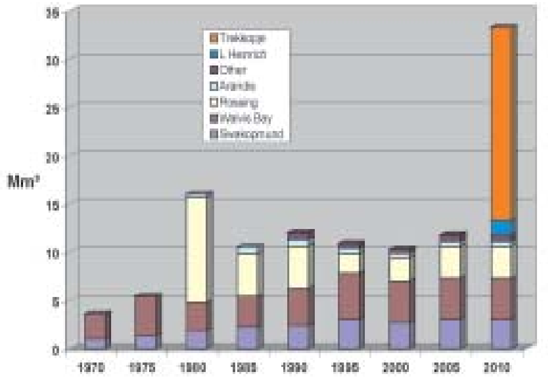
Studies have shown that radon gas can travel hundreds of miles with the wind during several days. Radon-222 has a half-life of 3.8 days – which means that after 3.8 days still half of the radon will be there – the other half will have decayed into another radioactive element, probably dropping onto the soil, on plants, vegetables, surface water or else. Thus radioactive elements can spread widely and far away from the mines.

The long half-life of some of the radionuclides makes it necessary to "dispose of" wastes from the mining and milling process safely for a very long time.
This poses serious challenges:

- How can future be foreseen for hundreds of years?
- How can it be assured that hundreds of years from now people will still understand the dangers of uranium tailings and leave them alone?
- How can containments be designed which will last thousands of years?

Water, our scarce resource

In Namibia, water is generally a scarce natural resource that is used intensively in mining activities. Rössing Uranium used 3.3 million m^3 of fresh water in 2007, amounting to 0.26 m^3 per tonne of ore processed.



Actual and projected water consumption for the coast in millions of cubic meters

Langer Heinrich Uranium water requirements are estimated at 0.87 m^3 water per tonne of ore processed, that amounts to approximately 1.3 million m^3 per year. Trekkopje, the next uranium mine to start operation in 2009, expects to have an annual demand of 20 million m^3. Valencia's water demand will be 3 million m^3 per year (EIA/EMP 2008**).** The water has to be supplied by the coastal area and transported via pipeline to the mining sites.

A desalination plant is presently under construction at Wlozkasbaken as a joint venture between UraMin and NamWater. Although the residents look forward to the prospect of having access to water, it is to be expected that water tariffs for coastal residents will rise once the plant delivers desalinated water. NamWater has embarked on the process of establishing another desalination plant, which aims to supply water to the mines at the coast by the beginning of 2010. Desalination of sea water has its own impact on the marine life and needs to be considered carefully.

Another concern is the huge amount of water used during the mining process on an arid environment. It will certainly change the eco-system, change the flow of the riverbeds, wash away the topsoil, and attract foreign animal species.

The run-off will not be clean water, it will be contaminated with toxic chemicals used in the leaching process and with uranium. It can also contaminate the groundwater.

Groundwater

In a desert area without any perennial streams, groundwater is a scarce resource. It can be affected by seepage from the tailings disposal and contaminated in such a way that it can no longer be utilised safely. To avoid this, long-term monitoring and testing of groundwater samples need to be undertaken. In an arid country like Namibia with low rainfall, it might take long time for pollutants to be washed into the groundwater table.

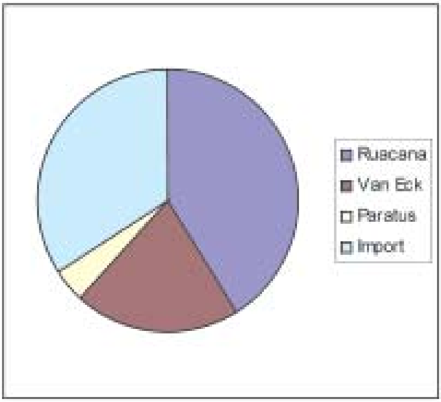
Tourism

Tourism is one of Namibia's main income generating industries. We should continue to benefit from our unique natural attractions by keeping our natural environment intact and not letting it be ruined by mining. Tourists come to Namibia to experience its natural beauty and not the affects of mining and prospecting. Tourism can continue to provide sustainable jobs for our people, while uranium mining provides only short-term benefits to a few with long term consequences for many.

Different options to generate energy

Namibia, being heavily dependent on electricity imports, mainly from South Africa, is facing a power crisis. Namibia consumes about 3,000 Gigawatt hours (GWh) of electricity per year. The present electricity demand is 450 Megawatts (MW), of which a maximum 393 MW could be produced in the country under optimal conditions i.e. high rainfall levels for hydroelectric power generation. However, this can drop by 40% in dry seasons. NamPower is currently considering constructing a 200, 400 or 800 MW coal-fired power station at Walvis Bay.

The demand of electricity will drastically increase when more uranium mines start production. Rössing presently utilises 30 MW of capacity from NamPower and has applied for an additional 10 MW. LHU presently uses 10 MW but will need 25 MW by 2011. UraMin will demand 24 MW when it starts mining at Trekkopje in 2009. In 2011, 26.3% of Namibia's present electricity production will be used by these three mines alone. At the same time, more than 60% of the Namibian public has no access to electricity.



Present power supply for Namibia (NamPower)

Namibia has three power stations: Ruacana (hydro) produces 240 MW (during rare times of high water level in the Kunene river), Van Eck (coal fired) 120 MW and Paratus (diesel) 20 MW.

Currently, Namibia imports most of its electricity from South Africa and other countries in the region. A special arrangement between NamPower and Eskom, the South African Power utility, enables Namibia to buy and utilise the surplus energy from SA.

Energy efficiency is a strong tool to save energy and will be discussed in the last part of this booklet. Let us have a look at some of the alternative options to generate electricity.

Renewable Energy is People's Power

Renewable Energy Technologies (RETs) draw on energy that is continually replenished by natural processes: energy from the sun, wind, the water cycle (rivers and oceans), geothermal (heat within the earth) and biomass (plant matter like wood) are all renewable and have far less negative impacts than stock energy like fossil fuels – coal, gas and oil – and uranium.

RETs support bottom-up, decentralized development. They are more labour intensive and allow community participation and ownership. Government actions to increase access to energy should support projects that will make sustainable energy services affordable for the people. Electricity generated from renewable resources is likely to be cheaper in the medium and long term than energy generated from fossil fuel and uranium. Developing RETs would free Namibia from its dependence on expensive fuel imports, provide Namibia carbon credits as a source of income, and give Namibia a clean and secure domestic supply of energy.

Sun

The sun's energy can be collected directly to create both high temperature steam and low temperature heat. The steam can be used to drive electric turbines or to power chemical processes. Low temperature solar thermal systems are used to heat water, rooms, and crop drying as well as slow cooking. Passive solar refers to constructing buildings to provide natural heating or cooling

In Namibia we have more than enough of this renewable energy resource to supply all of our energy needs, yet we make very little use of it. Namibia is one of the sunniest countries on earth with a solar radiation of about 6 kWh per square meter per day. Yet the utilization of solar energy in our country is at a low of 1%. Solar energy is mostly used for water heating (about 2 MW installed) in urban houses, for electricity generation in rural areas and for water pumping.

Wind

Like solar energy, Namibia has abundant wind resources along the coast that are scarcely used. Farmers use wind mills to pump water for their livestock, and Namibia has one wind turbine at Walvisbay with a capacity of 220 kW, enough to supply 50 to 100 homes.

Small Scale Hydro

The energy in falling water or pressurized water can be converted into electrical or mechanical energy. Due to the environmental and social impacts of large dams, sustainable energy should focus on small-scale projects. In Namibia we have the Ruacana hydropower station, which has a generation capacity of 240 MW at high water level of the Kunene.

Biomass

Biomass refers to any plant or animal matter, including human waste and agricultural waste, such as plant residue or manure. Bio-energy is the form of heat or electricity that can be produced by using biomass directly as fuel or by converting it to bio-gas. Liquid bio-fuels (diesel or ethanol) can be produced from various crops. However, bio-mass is only a renewable resource if any agricultural activities involved are sustainable.

Fossil Energy

Reserves of fossil fuels such as oil, gas and coal are decreasing rapidly, and alternative sources have to be found. Furthermore, the exploitation, transport and burning of fossil fuels is extremely polluting. Burning fossil fuels contributes significantly to air pollution and emits large amounts of carbon dioxide (CO_2), which contributes to climate change. Since the industrial revolution, the CO_2 content in the earth’s atmosphere increased drastically.

In Namibia, the Van Eck coal-fired power station in Windhoek generates round about 25% of the country’s electricity by burning coal imported from South Africa. This is very expensive. According to NamPower, operation of the Van Eck power station costs N$1 million per day.

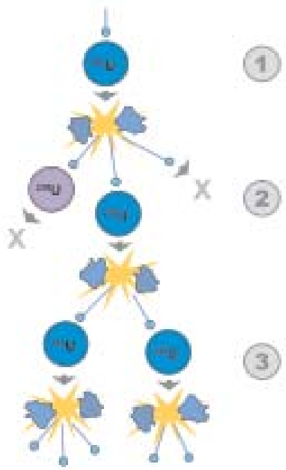
Due to increased demand and repeated mishaps at the nuclear power plant Koeberg in the Cape, the power supply to Namibia from South Africa has drastically decreased. This means that Namibia has to rely heavily on the dirty and costly power generated by Van Eck station, which continues to pump black smoke into the air.

Nuclear energy

Nuclear energy is energy released by the splitting (fission) of the nuclei of atoms. This is done in the reactor of a nuclear power plant with the help of uranium, which is an effective nuclear fuel because it can change between a number of different isotopes by adding or losing neutrons. Such unstable isotopes are radioactive and as a result pose a health risk to all life on earth. A German study has found that children under five years are at a 60% greater risk of getting cancer and 120% greater risk of getting leukemia if they live within five kilometers of a nuclear power station. The case-control study covers the 16 locations of German nuclear power stations over a period of 24 years.

The process of nuclear fission is complex and not easy to understand for a layperson. The following may briefly explain the nuclear fission chain reaction.

1. A U-235 atom absorbs a neutron and fissions into two new atoms (fission fragments), releasing three new neutrons and some binding energy.
2. One of those neutrons is absorbed by an atom of U-238 and does not continue the reaction. Another neutron is simply lost and does not collide with anything, also not continuing the reaction. However, one neutron does collide with an atom of U-235, which then fissions and releases two neutrons and some binding energy.
3. Both of those neutrons collide with U-235 atoms, each of which fissions and releases between one and three neutrons, which can then continue the reaction.



When radioactive atoms decay, they give off one or more of four types of radiation: alpha particles, beta particles, x-rays and gamma rays, and neutrons. These rays and particles are called ionizing radiation because they cause the formation from ions - electrically charged particles - from particles which were previously neutral. Ions are atoms that have lost one or more electrons due to radiation. Radiation causes ionizing in tissues, disrupting and injuring the cellular atoms. Ionizing radiation acts almost like a bullet; shot through the body, it disrupts the complex web of cellular life processes. Today it is well known that uranium miners have a high risk to die from lung cancer which can be caused by radon, the gaseous effluent of the uranium-238 decay chain (I. Schmitz-Feuerhake, R. Bertell, 2008).

Malign and other radiation-linked diseases in other sites of the body are predominately attributed to uranium deposits because the exposure is accompanied by the inhalation of uranium dust.

Uranium is a natural, radioactive and also toxic heavy metal, which is unavoidably taken up with solid and liquid food (E. Schnug 2006). Mammals have a particular high sensitivity to uranium. Once the uranium is in the organism, it is transferred to the extra-cellular fluids and transported through the blood to other organs (C. Busby, 2008). Uranium is building up in bone and poisoning especially the lung, liver and kidney. More recently, it has been shown, that uranium also targets the brain (ENVIRHOM 2006). Claims of the existence of a threshold below which radiation effects on human health are negligible are clearly wrong (R. Betrell 1995). Uranium is a hazard for health and environment.

There are naturally occurring sources of radiation in the environment. The degree of exposure varies from place to place. Health authorities increasingly believe it plays a role in a range of cancers, birth defects and other health problems.

In addition we are now exposed to an increasing amount of radiation from human activity of the civil-military chain such as uranium mining and processing, nuclear weaponry and testing, operating nuclear facilities, radiation contamination due to nuclear power plants and nuclear waste disposal. Not to mention accidents, which happen every day; just the peak of the iceberg enters the headlines of international press.

The debate about nuclear energy is emerging again after decades of silence by the nuclear industry. China's and India's fast growing economies demand a huge power supply and are opting for nuclear power. Contrary to renewable energy, nuclear energy is not sustainable. The global resources of uranium are not infinite.

High-level nuclear waste is the biggest problem in the nuclear fuel chain because there is no solution for safe storage. Nuclear waste remains radioactive for at least 100,000 years, a problem that many future generations will be burdened with.

Nuclear accidents are mostly a combination of technological and human failure, so they can never be ruled out completely. A nuclear accident can have terrible impacts on many generations to come. The consequences of the nuclear explosion at the power station of Chernobyl 22 years ago still burden many people, especially children born with birth defects, giving them a limited chance of leading a normal life, and the environment. There is a risk of radiation contamination in all stages of the nuclear chain. Research and experience show that even low-level radiation does have serious health and environmental effects.

Terrorist attacks can never be ruled out; if successful they may result in even more deadly and far reaching spread than that of September 11th 2001 on New York and Washington.

The legacy of mining and processing uranium goes on after closure of the mine and are still not accomplished worldwide. The mitigation process must be financed; the workers and their families need compensation.

When opting for nuclear power, it has to be considered that nuclear energy is, on average, between two and four times more expensive than electricity produced from fossil fuels. The enormous costs of decommissioning a nuclear power plant and dealing with nuclear waste are mostly neglected in cost-benefit calculations, so are the social and environmental costs associated with nuclear power.

The nuclear chain starts right here in Namibia, where uranium is mined and exported for nuclear power generation and perhaps the production of nuclear weapons. The prospect of nuclear accidents and its long-term global environmental, health and socio-economic consequences must be fully understood and acknowledged by governments when considering their energy policies and allowing uranium mining.

Plans to build a nuclear power station and an enrichment plant in Namibia were announced in a statement by MME in March 2008. According to MME, “Before Namibia can build either nuclear power stations or uranium processing plants, it requires a nuclear regulatory framework to be in place and to be developed in conjunction with the International Atomic Energy Agency (IAEA).”

We urge our government not to opt for nuclear energy generation. Instead Namibia could be a leading example for renewable energy on the African continent.

The voices of uranium workers

Findings from LaRRI

Between July and August 2008, LaRRI conducted a study on uranium mining in Namibia. The study sought to understand the nature of uranium mining in Namibia and its possible social and economic implications. Information was gathered from the Ministry of Mines and Energy as well as the Ministry of Environment and Tourism. Additional data was also collected through the interviews with some officials of Rössing uranium mine. Current and former workers of Rössing uranium and trade union representatives were also interviewed. The major findings were:

- Rössing's safety programmes were of an acceptable standard and information about safety was acceptable, however, workers did not fully understand the content of the health and safety manuals.
  For instance a worker argued:

> **…nobody really seems to know the content of the policy, especially the workers at the mine who do the basic work. You hear a lot about safety issues but very little about the health part. I believe that these things should be explained and made clear to all the workers when workers take up employment. But when they have not been made clear to me, maybe I will pick it up through the years by myself. All you hear about is wear your safety shoes, do this and it's all about safety and the company but very little about the worker's health (Rössing worker).**

As reflected in the comments above by a worker, workers argued that the company did not provide satisfactory information about the link between exposure to radiation and possible health problems.

- Workers were not informed adequately about the dangers associated with uranium mining.
- Many workers were exposed to dust and inhaled radon gas on a daily basis.

- Some current and former workers have contracted respiratory diseases such as TB as well as lung cancer.
- Many have developed chest and breathing problems.

The quotes below amplify the extent of worker's health concerns:

…A lot of people are complaining of TB and I don't know if the TB is caused by the dusty environment. The white cars in the plant turn into a yellowish colour after some time. If the cars turn yellowish what about the people who are working there every day, what does it do their health? … Even if we do question these types of things; we don't get satisfactory answers from management (Rössing worker).

I see a difference in my health; especially in my chest I have a problem. Especially in the open pit we are exposed to too much dust. I work in the open pit for most of my day (8am to 4pm); the place is full of dust. Sometimes you don't see the dust but you are exposed to it (Rössing worker).

- Workers no longer trusted the opinion of the medical personnel at Rössing because they believed the true nature of their health problems is never revealed. The quotes below highlight firstly the fact that workers do not trust the company doctors any longer and secondly, they expect Rössing to show some level of care:

…I consult private doctors annually to keep track of my health status because I don't trust the mine doctor. …It's only when workers have left Rössing; gone to private doctors that they are told the true reflection of their health status in terms of illnesses which means the mine doctor is gambling with the health of the workers and manipulating their files (Rössing worker).

The union representative appealed:

First of all what we want is to make a policy, a policy of after care. If a person has been detected with an occupational disease how should he be cared for from the company side and what type of compensation should he receive? Presently we do not have a policy on how to compensate people who have occupational diseases, the policy that we are having is only for disability (Union representative at Rössing).

- The real impact of uranium mining on the health of workers and surrounding community is yet unknown.
- Workers were calling for the assistance of outside experts to provide independent opinion on their health status, as many - especially those who have worked for more than 15 years - believe they were already suffering from occupational health related problems linked to exposure to radiation.

LaRRI therefore concluded that despite its contribution to GDP, mining has short-term benefits, but long-term consequences. The negative effect on the health of the community is often subtle and unexpected. Namibia therefore needs a clear strategy to evaluate the sustainability, ethics and responsibility of external investment in the extractive sectors. With the support of civil society and the community, the government can develop the capacity to design such strategies.

We can all act responsibly

Energy efficiency

Energy efficiency is the most effective tool to save energy and money by using less energy to provide the same level of energy service. An example would be insulating our home to use less heating and cooling energy to achieve the same temperature. Another example would be installing compact fluorescent light (CFL) to attain the same level of illumination than with outdated incandescent light bulbs, which are enormous energy wasters.

In Namibia, NamPower distributed over 800,000 CFLs to local households free of charge. According to NamPower, saving of electricity is estimated between 10 to 12 MW.

Energy efficiency and renewable energy are said to be the “twin pillars” of sustainable energy. Energy efficient buildings, industrial processes and transportation could reduce the world’s energy needs in 2050 by one third, and be crucial in controlling global emissions of greenhouse gases, according to the International Energy Agency.

Energy efficient household appliances

Modern energy efficient appliances, such as refrigerators, freezers, ovens, stoves, dishwashers, washing machines and dryers, use significantly less energy than older appliances. Current energy efficient refrigerators, for example, use 40 percent less energy than conventional models. Modern power management systems also reduce energy usage by turning off idle appliances or putting them into a low-energy mode after a certain time.

Solar water heaters (SWH) are very efficient in utilising solar energy for water heating and are a durable technology. A SWH can reduce a household’s electricity demand by up to 50% and save a lot of money.

Namibia’s sun supplies us with a strong solar energy resource and each household could make use of a SWH. The initial costs are still relatively high;

however, they can be recovered in three to five years from the savings, depending on the electricity tariff. With increasing tariffs the demand of SWH increases in Namibia.

A solar water heater gets installed

Energy efficient building design

A building's location and surroundings play a key role in regulating its temperature and illumination. For example, in Namibia roofs of suitable design on the north facing side of the building provide shade and thus decrease the amount of heat that will be transferred into the rooms. Glass windows, if not shaded, trap heat inside. A dark roof absorbs heat and makes the rooms hotter, unless insulation is used. White roofs save energy in our sunny climate.

Energy efficient vehicles

Smaller and lighter vehicles significantly improve fuel economy. More advanced tires, with decreased tire-to-road friction and rolling resistance, can save fuel. Fuel savings can be achieved by keeping tires inflated to the correct pressure and replacing a clogged air filter.

Energy conservation is broader than energy efficiency in that it encompasses using less energy to achieve a lesser energy service, for example through behavioural change. Examples would be dressing according to season, cooling a room less in summer and heating less in winter, walking more, driving less, working in a less brightly lit room.

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