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SUSTAINABLE DEVELOPMENT

Case: Energy production in Namibia

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TIIVISTELMÄ

Opinnäytetyön tarkoituksena on tarkastella kestävän kehityksen ulottuvuuksia yleisesti, sekä erilaisten energiantuotantotapojen kestävyyttä erityisesti Namibian kannalta.

Kestävästä kehityksestä on puhuttu jo vuosikymmeniä, nykyisin enemmän kuin koskaan. Mutta vaikka suurin osa tutkijoista, päättäjistä ja kansalaisista jo tietää maailman resurssien rajallisuudesta ja vaikkapa ilmastonmuutoksen haittavaikutuksista, niin kestävyys ei edelleenkään ole vallitsevaa todellisuutta. Käsitteen selventäminen saattaa auttaa ymmärtämään asioiden tärkeysjärjestystä, jolloin ensisijaisesti tarvittavien toimenpiteiden valinta olisi helpompaa. Elämämme on riippuvainen maapallon resursseista, joten viime kädessä kyseessä on oman lajimme tulevaisuus. Talousasiat ovat pitkälti jättäneet varjoonsa kestävän kehityksen sosiaaliset ja ympäristöulottuvuudet, vaikka kestävyiden kannalta olisi oleellisen tärkeää pystyä näkemään laajemmalti kuinka kaikki vaikuttaa kaikkeen.

Erityisesti fossiilisiin polttoaineisiin perustuvaa energiantuotantoa pidetään yleisesti yhtenä ilmastonmuutokseen eniten vaikuttavista tekijöistä. Monissa kehittyvissä maissa energiantuotannon infrastruktuuria rakennetaan parhaillaan, ja nyt tehtävät päätökset vaikuttavat vuosikymmenien päähän. Lännessä etsitään jatkuvasti puhtaampia energiamuotoja tyydyttämään kasvavaa kysyntää, mutta globaalisti olisi vähintään yhtä tärkeää rohkaista myös kehittyviä maita panostamaan kestäväan energiantuotantoon. Namibiassa pääosa energiasta tuotetaan vesivoimalla, ja aurinkovoima olisi luonnollinen ja kestävä tulevaisuuden valinta, koska olosuhteet ovat sille erittäin suotuisat. Namibia haluaa kuitenkin panostaa ydinvoimaan, koska se nähdään puhtaana ja kotimaisena vaihtoehtona.

Nykyiset ympäristö- ja sosiaaliset ongelmat ovat usein hankalia ratkaista. Ihminen on kuitenkin jo kävellyt kuussa, joten suuretkin ongelmat pystytään varmasti ratkaisemaan, mikäli yhteistä tahtoa vain löytyy. Kestävän kehityksen periaatteiden saattaminen käytäntöön auttaisi ihmiskuntaa kohti parempaa tulevaisuutta. Tämän tavoitteen saavuttamiseen tarvitaan meitä kaikkia.

Avainsanat: Kestävä kehitys, energiantuotanto, uusiutuva energia, ympäristövaikutukset, kehittyvät maat, Namibia.

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ABSTRACT

The aim of this study was to examine the concept of sustainable development in general and in connection with energy production methods especially in Namibia.

The benefits and obstacles of sustainable development have been discussed for several decades, currently more than ever. But although the majority of scientists, decision-makers and the general public recognize the limits of the global resources and the need to take action in environmental problems like climate change mitigation, in many respects the holistic approach to more sustainable ways is still not the reality. Clarifying the concept of sustainable development may help in focusing on the essentials, so that we could finally start to take determined steps towards better ways for the future. Our lives depend on the natural resources of this planet, so ultimately the decisions we make today have an impact on the future of our own species. Economical aspects have overshadowed many of the environmental and social dimensions of sustainability, but it is important to realize how all these are eventually connected.

Energy production is considered as one of the major contributors to climate change, especially when it comes to fossil fuels. Many less developed countries are currently building their energy infrastructure, and decisions made today affect decades ahead. The wealthy world is constantly looking for cleaner technologies in order to meet the needs of growing consumption, but globally it is at least as important to encourage the developing nations towards the same direction. In Namibia, the production of hydropower is currently dominant, and, due to local conditions, solar power would be the obvious and sustainable choice for the future. The current focus, however, is in nuclear power because it is considered as a clean and domestic option.

The environmental and social problems we face today are various and often difficult to solve. But man has conquered the moon already, so we are definitely capable of solving these problems as well, if we just find a common will to do so. Applying sustainable development will be a powerful tool towards a better future. The change for the better requires consciousness and participation from all of us.

Key words: Sustainable development, energy production, renewable energy, environmental impacts, less developed countries, Namibia.

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ABBREVIATIONS

AIDS	Aquired Immune Deficiency Syndrome
BAT	Best Available Technologies
BCE	Before Common Era
CDIAC	US Department of Energy's Carbon Dioxide Information Analysis Center
CFC	Chlorine-fluorine-carbon compounds
CO ₂	Carbon dioxide
CPI	Corruption Perceptions Index
DDT	Dichlorodiphenyltrichloroethane
EIA	US Energy Information Administration
EROEI	Energy return on energy investment
est.	Estimated
EU	European Union
FUAS	Federation of Universities of Applied Sciences
GDP	Gross Domestic Product
GMO	Genetically Manipulated Organism
GNH	Gross National Happiness
GPI	Genuine Progress Indicator
GTK	Geological Research Centre in Finland
GWh	Gigawatt-hour
ha	Hectare
HDI	Human Development Index
HIV	Human Immunodeficiency Virus
IEA	International Energy Agency
IMF	International Monetary Fund
IPCC	Intergovernmental Panel of Climate Change
KEPA	Service Centre for Development Cooperation in Finland
kWh	Kilowatt-hour
LAMK	Lahti University of Applied Sciences (LUAS)
LCA	Life Cycle Assessment
LDC	Less Developed Country
MWh	Megawatt-hour
N/A	Not available

NGO	Non-governmental Organization
ppm	Parts per million
PPP	Purchasing-power-parity
RBE	Resource Based Economy
REACH	European Community Regulation on chemicals and their safe use
SA	South Africa
SADC	Southern African Development Community
STUK	Radiation and Nuclear Safety Authority in Finland
SWAPO	South West Africa People's Organization
TJ	Terajoule
TKK	Aalto University School of Science and Technology (Finland)
TUKES	Finnish Safety and Chemicals Agency
TWh	Terawatt-hour
UN	United Nations
UNAM	University of Namibia
UNDP	United Nations Development Project
UNECE	United Nations Economic Commission for Europe
US	United States
USD	US Dollar
WHO	World Health Organization
VTT	Technical Research Centre of Finland
YLE	Finnish National Broadcasting Company

1 INTRODUCTION

Having been interested in environmental issues for about 20 years, enthusiastic attitude has turned into realistic idealism. During these recent engineering studies, I found my special interests on the wide field of environmental issues to be holistic sustainability and the future of energy production. As I got a chance to spend three months as an exchange student in Namibia during autumn 2010, it was clear that this experience would become an important part of my thesis.

In many less developed countries (LDCs) building modern infrastructure and making large scale decisions about energy production has only recently begun. Progress is fast and the decisions made today affect decades ahead, not just locally but globally as well. Various environmental problems are constantly increasing, or at least finally gaining more attention, all over the world. As we in the wealthy world are currently searching for sophisticated ways and technical solutions to deal with the problems, it would be essential to encourage the currently developing nations towards sustainability from the beginning as well. International co-operation in development aid could be a powerful tool towards this goal, assuming that we are willing to take into account the special features and needs of all variable LDCs, and to take action side by side with the locals.

The aim of this study is to examine the concept of sustainable development, and different energy production methods from the global sustainability point of view. The topic itself is very large and complicated, so the thesis is focused on the basics, yet with a holistic approach. The terms, conditions and costs of sustainability as well as development, together and separated, are widely discussed in many different contexts today. But how often do we actually stop to think what these issues are all about? In this case sustainability is considered as global, and development mainly as local. Everybody needs energy, but on a global scale production methods and amounts matter a lot. The focus in this case is especially on the conditions of LDCs and the differences between Europe and the Sub-Saharan Africa. The point of view aims to be environmentally considerate and human, and I wish to rationalize that as things are connected on a global scale, and the only reasonable way of development anywhere is towards sustainability.

2 THE CONCEPT OF SUSTAINABILITY

2.1 History in a nutshell

Largely spread and measurable damage started to become visible in people's own environments in various connections before any official discussion about sustainability took place. When common citizens noticed changes for worse considering their local surroundings, some of them got worried and started to protest against it. In general, small groups of people reacting were the beginning of environmental activism, as we know it today. In this chapter we take a bit closer look to the reasons why sustainability has broken into common knowledge after the early 1990's.

2.1.1 Background

Before we knew anything about sustainability as it is referred to today, the first international and influential community of environmentally aware scientists and intellectuals called The Club of Rome published the book "Limits to Growth" in 1972. This was one of the most important cornerstones in understanding that our planet with all its resources, on which our lives depend, is finite. Back then the basic message for that we cannot use more than we have was as simple as shown in Figure 1. It presents with simplified curves how constant growth of economy and population will eventually lead to the collapse of carrying capacity of the Earth. According to The Club of Rome this would certainly become reality sooner or later, unless overconsumption of limited resources and technical progress without environmental consideration would be discouraged in the near future.

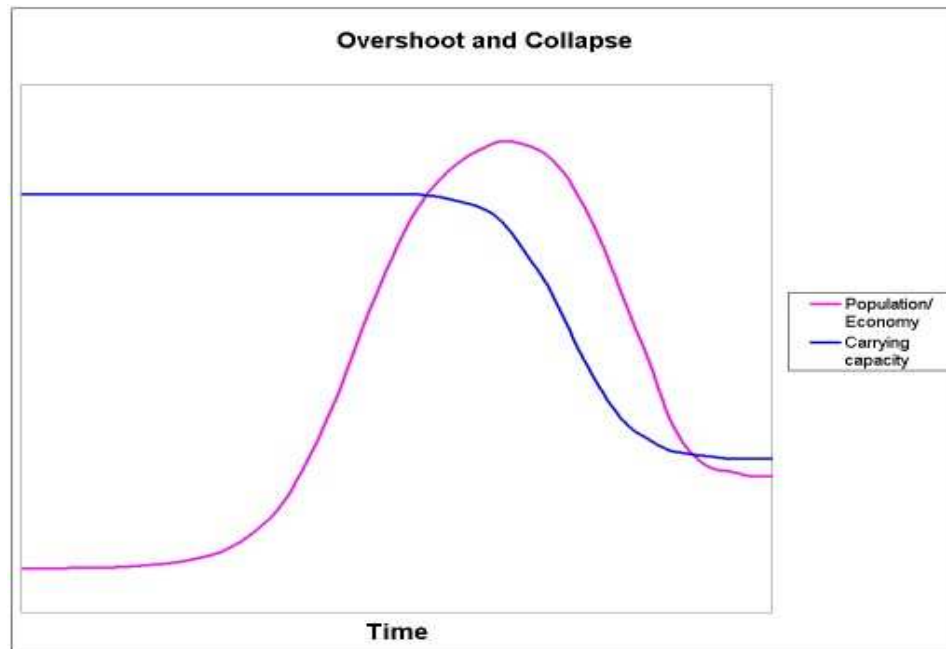


Figure 1: The problem according to The Club of Rome 1972. [Referred 27.2.2011]. Available at: <http://limitstogrowth.net/index.htm>.

2.1.2 DDT, acid rains and ozone layer

As the first large scale environmental problems like dichlorodiphenyl-trichloroethane (DDT) in the 1960's, acid rains in the 1970's and ozone layer problem in the 1980's gained general knowledge, a new term for trying to improve things was needed.

DDT was, and is, an effective pesticide that was heavily used all over the world in the middle of the 20th century, until it was proved to be very durable in ecosystems and accumulating in the food chain. As severe difficulties were noticed with carnivore birds' reproduction, research was started quickly and it was found out that this man-made chemical was mainly to blame. Currently DDT manufacturing and usage is illegal in more than 30 countries, in Finland since 1976 (Suomen ympäristökeskus 2009). Nevertheless, in many LDC's it is still commonly used, either in agriculture or preventing malaria-spreading insects, due to its cost effectiveness. This is not punished by fines or considered illegal by the

international community, since the local advantages are estimated to exceed disadvantages (KEPA 2007).

Large areas of coniferous tree forests in Europe were destroyed because of the rapidly increased and unfiltered industrial emissions around the continent. As alkalinity dropped in soil and rainwater, the consistence of symbiotic microbe and fungus populations changed drastically. In Western Europe, the damages peaked at the industrial area Ruhr in Germany, where all forests literally died standing up. As this was proven to originate mainly from the harmful levels of sulphur dioxide and nitrogen oxide in the rainwater, rapid supranational actions were taken for the first time in environmental issues to prevent further damage. (Hakala & Välimäki 2003, 70-71 & 82.) Despite all the actions taken, the situation was not over instantly. The map in Figure 2 indicates the estimated risk of acid rain in the year 1993, in the areas where environmental factors in this respect were regularly and reliably monitored.

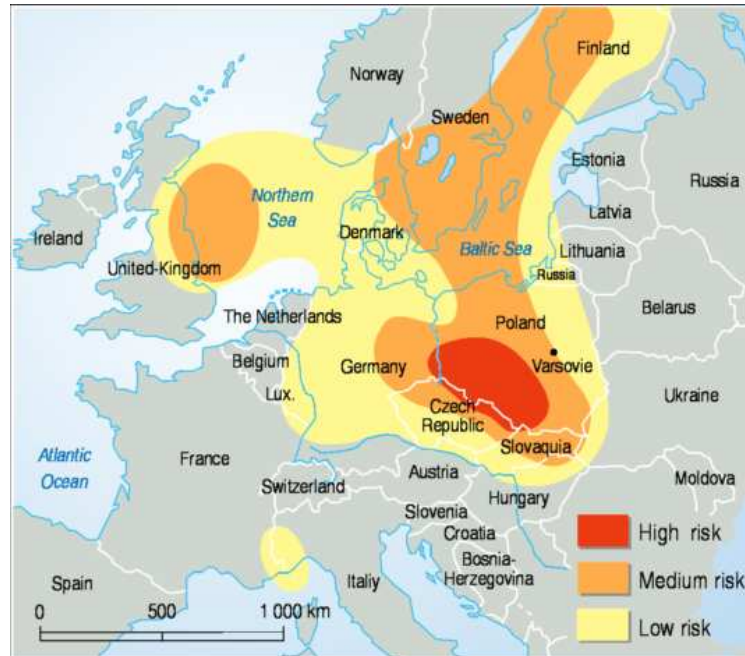


Figure 2: Acid rain potential in Europe in the year 1993. Rekacewicz, P. UNEP/GRID-Arendal [Referred 16.3.2011]. Available at: http://maps.grida.no/go/graphic/acid_rain_in_europe.

A very thin and delicate ozone layer surrounding the Earth in the upper atmosphere protects all life from the harmful UV-B radiation. It is essential up in the stratosphere, and already in 1970's it was insisted that man-made chemicals contribute to ozone layer depletion. This did not gain much immediate attention, but as more evidence was gathered and the seriousness of the health risks was understood, the Montreal Protocol treaty was introduced in 1987 to restrict the usage of harmful chemicals, especially CFC compounds. (Hakala & Välimäki 2003, 113-117 & 124.) Even though reaction was fast and effective, and 196 countries worldwide ratified the treaty eventually, the chemical compounds that cause ozone depletion take decades to move up to the stratosphere. In addition, they are very long-lasting as they get there, so it is estimated that without further drawbacks the ozone layer could recover around the year 2050 (Wikipedia 2011d). So, the situation is not over in this respect either. In the Finnish National Broadcasting Company (YLE) news there was a special announcement about unusually high ultraviolet radiation level in the early spring of 2011. Due to exceptionally 35 % thinner ozone layer than normally, UV was as plenty in March as normally during the late spring in May. People were recommended to wear sunglasses and avoid looking directly at the sun. (YLE 2011.)

2.1.3 Brundtland Commission and Rio de Janeiro Conference

Officially sustainable development was first introduced by the UN World Commission on Environment and Development (Brundtland Commission) in 1987, in the report "Our Common Future". The term sustainability was defined as "development which meets the needs of current generations without compromising the ability of future generations to meet their own needs". The former prime minister of Norway, Gro Harlem Brundtlandt, chaired the Commission with a passion, and the time was right for a fresh and somewhat different approach. Thus, the new term gained eager audience, as well as wider political and general knowledge, at the United Nations Conference on Environment and Development in Rio de Janeiro in 1992. (UNECE 2004-2005.)

Included in the Brundtland Commission report, the special Local Agenda 21 encouraged municipalities everywhere to take local actions. This was sort of revolutionary thinking as it handed over responsibility from top to bottom, and actually encouraged grass root actions to be taken. However, the sceptic debate about the concept of sustainable development was vivid as well. Some environmentally focused interest groups thought that this official approach would become some kind of smokescreen to encourage so called green washed business instead of taking real actions. And the economically focused corporations and other stakeholders required more emphasis on the economical and social aspects of sustainability, because environmental protection was considered to be too expensive and unprofitable. (UNECE 2004-2005.)

2.2 Where do we stand now

The issues under the concept of sustainability are innumerable, but there are some very important characteristics that clearly stand out in global debate today. Here we take a short but a little bit closer look at four of these essential topics: climate change, peaking nonrenewable resources, chemicalization and diminishing biodiversity.

2.2.1 Climate change is the major concern

According to current understanding, energy production is one of the most significant issues that contribute to global climate change. And climate change mitigation is certainly the globally most discussed environmental topic at the moment. Discussion started already in the 1970's, but it did not gain normative status until during the past decade. Water vapour is the strongest single substance that keeps our planet warm and cosy, but the current discussion about accelerating climate change (earlier called also as global warming) goes on around two main issues originating from human activities: the release of large quantities of anciently restored underground carbon dioxide (CO₂) storages back to the atmospherical circulation, and current agricultural or industrial emissions that add

substances like methane (CH_4), CFC –compounds and dinitrogen oxide (N_2O) into the delicate gaseous mixture that surrounds the earth. The problem is further increased by other changes in the carbon storage system, such as rapid deforestation and rising temperature in the surface layers of the oceans. During the past 200 years of human progress the concentration of CO_2 in the atmosphere has risen from 280 ppm to 370 ppm, that is more than for the past 420,000 years. (Hakala & Välimäki 2003, 89-93.)

As the climate change research has proceeded, the vast majority of scientist currently approve the human impact, but there is still a small but loud minority of so called climate sceptics who deny any of the affects originating from human actions. Of course the climate changes all the time, but natural variation is so slow that species and biosystems usually have time to adapt to it. But now some of the most recent reports from the Intergovernmental Panel of Climate Change (IPCC) even claim that climate change is proceeding faster than what was estimated in the worst scenarios only 10 years ago (IPCC 2007). It would be high time to pay less attention to arguing who is right or wrong, and to start concrete actions to prevent the changes from turning uncontrollable.

2.2.2 Peak oil and other peaks

Peak oil is another term that has not been taken seriously until recently. It describes the moment when global oil production is at its largest while still very profitable. After peaking oil production is estimated to become more expensive as it becomes more difficult. International Energy Agency (IEA) recognized its existence for the first time in their World Energy Outlook report 2010, and at the same time estimated that the current world oil production has peaked already around 2006 (Energy Bulletin 2010).

World oil production by type in the New Policies Scenario

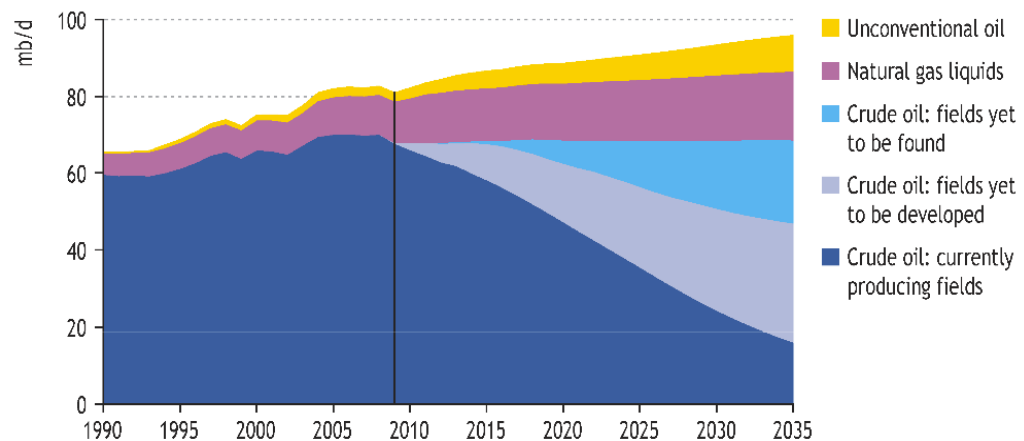


Figure 3: IEA New Policies Scenario 2010. [Referred 15.5.2011]. Available at: <http://www.energybulletin.net/stories/2010-11-11/iea-acknowledges-peak-oil>.

Another remarkable detail in the Figure 3 is that IEA expects new crude oil fields to be found or developed to the extent that the total crude oil production will not decrease at all during the next 25 years. As we know how dependent our societies are on oil and how eagerly the modern world has searched for it during the past 70 years, this part of the scenario could also be interpreted as wishful thinking. And even if new oil sources would be found in such large quantities, what happens after those new sources are used up in another 70 years? Anyway, peak oil is not about the world running out of oil completely. What matters more is the concept of Energy Return on Energy Investment (EROEI), a.k.a. the net energy that is gained by producing one barrel of oil. It is estimated that in the 1930's the gain was very close to 100 %, but in 2000 it had dropped to 11 %. Unless significant improvements in production methods occur, it is highly unlikely that this percentage will rise up again, because the easily accessible sources have been utilised already. (Vadén 2011.)

Oil is probably currently the most acute, but by no means the only resource peaking in the relatively near future. Between the years 1950-2000 the total consumption of copper, lead, zinc, tin and nickel increased from 6.5 million tonnes a year close to 28 million tonnes. Phosphorus, the vital nutrient for modern

agricultural industry, is about to peak in the near future. Calculations are made to estimate will there be enough uranium for another 100 or 200 years of nuclear power production. Even if many resources are still available for hundreds of years, the richest and easiest sources will soon be used up if the consumption keeps on growing exponentially. Again and again the next peak means more expensive commodities and more waste from the production. With valuable metals the economical advantages of recycling are already visible, but in order to reach for global ecological sustainability we need to focus on recycling as much as possible of all the precious non-renewable resources. (Meadows et al. 2005, 126-138.)

2.2.3 Chemicalization and diminishing biodiversity

One of the most acute matters of concern is rapidly expanding chemicalization. Some 30-40 years ago certain industrial chemicals were first noticed and later proven to be toxic for animals, as for example pesticides accumulated in the food chain and harmed reproduction processes. Today there are well over 100,000 commercial chemicals on the worldwide market, and alone in Finland over 30,000 manufactured or imported products include substances that are proven to be harmful or dangerous to human health or environment (TUKES 2011). In addition to these straight out dangerous chemicals we also eat, drink and breathe dozens of different chemicals every day, either willingly or involuntarily. In Finland, as in the whole European Union (EU), the world's strictest chemical regulation called REACH entered into force in 2007. Its aim is to improve the safety of using chemicals, but also to enhance competitiveness of the European chemical industry. (European Commission 2011.) In this respect the public generally trusts the authorities to keep us safe. But there are also studies about many allowed chemicals that are suspected to contribute to illnesses from allergies to mutations and cancer, and as these have come to general knowledge people start to wonder. The fact is that even if the allowed small amounts of specific substances are tested and proven harmless, we use and consume so many different chemicals, that finding out all the possible multiplicative effects or consequences of long-term exposure is impossible. That is why some people have taken initiative and in order

to be on the safe side avoid buying and consuming products that include additive substances like flavourants, preservatives, fragrances, GMOs or nanoparticles. For example consumption of organic food is increasing according to European Commission (EC 2011).

Diminishing biodiversity does not sound like a very acute problem to a common urban citizen. Species have emerged and faded away as long as the biosphere has evolved, but also extinctions are estimated to have accelerated due to changes in habitats, ecosystems, feeding possibilities or climate. All the creatures do not seem to be that important at first, but if we just think about the bacteria and fungus that take care of all the biowaste in the world, the point of view might be changed. We still do not know very much about all the various symbiotic or co-operative species that affect our lives, and that makes it really difficult to estimate the damage that mass extinction of any specific species might cause. Just as an example, in 2006 millions of beehives were suddenly destroyed across 35 states of America, and as these were used to pollinate the commercial farmings, local economical losses were remarkable. As the scientists looked for the reason to this strange incident, they came across to the fact that 70 % of the global food production is pollinated by honey bees. They also calculated that without these insects mankind would have 4 years to survive. “No more bees, no more pollination, no more plants, no more animals, no more man.” (Guardian 2007.) This is a bit exaggerated of course, because the mankind tends to be exceptionally inventive when in trouble. But the main point of us being heterotrophics makes us completely dependent on the nature and the autotrophic plants that originally provide us with all the nutrients we need.

2.3 Why changes are needed

However trendy or commonly accepted the concept of sustainability is, it is still not largely in action. Institutions and governments fund sustainability through research and technical development, negotiate about common rules, and publish worldwide agreements and recommendations. Big companies produce environmental reports, adopt affiliate programmes for standardised sustainability or

focus their commercials on “greener future”. Even though we already have alternative technologies, capabilities to invent them further and all the best intentions to do so, it seems like the whole world is stuck into comprehensive changes being too expensive. Financial research resources in the world may be plentier than ever, but at the same time those are also accumulating in the hands of worldwide corporations. This brings an unbearable dilemma to the scientific research that should be independent and based on open source sharing and wanting to boost the general knowledge instead of maximizing the profits. Business certainly needs to be profitable, otherwise nothing in the financial world moves forward. But should there also be some kind of moral limits between profitability and greediness? Social or ecological sustainability has been the driving force for many currently influential NGOs, like The Red Cross, The World Wildlife Fund or Greenpeace. This kind of volunteer-based action should not be entirely separated from the normative business principals if we want comprehensive sustainability to take the leading role in all development.

3 THE CONCEPT OF DEVELOPMENT

3.1 History in a nutshell

In general the base and first step for all development is that the conditions on planet Earth were converted suitable for human species during millions and millions of years of evolution (Hakala & Välimäki 2003, 19-20). Was then the beginning of human development the capability to use fire or the invention of wheel? In this case we do not need to go back that far, since there was a lot of natural development going on among all human communities everywhere before we even knew anything about each other.

Modern development boosted when industrial revolution started in Western Europe during the 18th and 19th centuries (Wikipedia 2011c). As it proceeded rapidly we started to look around for more resources for further development. The colonialization of Africa took place mainly in the 19th and 20th century, and Europe soon became aware of the so called primitive black cultures in the vast continent. However, development is originally a profoundly western phenomenon that is still defined mostly by economical growth and technical achievements. Western societies were defined as developed and sophisticated by ourselves, and consequently all the other societies despite their special skills, capabilities, unique cultures or other features were something else. The concept “underdeveloped” was introduced in the 1940’s, because for us to be developed it was essential to have less developed countries to be compared with. The common understanding then was that this was a natural state, and that the only way out of underdevelopment was to improve material and technical well-being. (Wilska et al. 2004, 15-16.)

3.2 Where do we stand now

One definition for development is “act of improving by expanding or enlarging or refining” (Hyperdictionary 2010a). This definitely holds true in Europe, but is a very limited point of view considering the current reality in the LDCs. The level of general knowledge differs quite a bit in Europe and Africa, and the wealthy world has adopted a somewhat patronizing attitude while spreading our better ways all over the world. Today most of the official intervention comes to LDCs from the outside as financial development aid from governments, other institutions or Non-Governmental Organizations (NGOs). Along the way lots of positive impacts have been received by helping the poor. But giving institutional money for development purposes may also be seen as the easy way to clear our bad conscience rather than an efficient tool to help the less fortunate nations to proceed. In addition to this, direct financial aid may also turn to contribute to severe corruption problems in many LDCs. Also, the different aspects of global sustainability has only started to be openly discussed, so it is not all that sure if we are the wisest in deciding how things should be done after all.

3.2.1 Development can be positive or negative

Development is usually considered as something positive; it has to do with technical and other improvements that make peoples lives easier and more comfortable. However, the concept is not always very clear. There are lots of different theories and studies trying to open the concept of development, but these mostly focus on pretty limited economical or technical issues. It is not easy to see the big picture with all the cultural, social and environmental extensions of sustainability.

In a book teaching us basics of developing countries, Koponen and coworkers define development as a combination of two different approaches: the contents, as what can and should be considered as development, and the function, as how development is implemented. Development can be seen either as the goal that needs to be reached, or as the means enabling constant progress. In their case the concept of development consists of three parts: defined ideal to reach, empirical

historical frame and deliberate intervention. Based on these extensions the modern idea of development promises that the ideal will be reached by rationally planned and well-established intervention. (Koponen et al. 2007, 50-59.) This to genuinely happen would require sincere will to make things better, not just to secure western worlds trade interests in the less developed part of the world. Inadequate knowledge of culture and history of the target country may at its worse lead to wrong definition of the local ideal, which leads to inadequate or irrational project planning. That is how the best intentions may also turn to something negative.

According to Allen & Thomas, Chambers (1997) has defined development simply as a “good change”, but modern development is a much more complicated phenomenon. When development is used as a synonym for progress it often includes previous traditional ways of life fading away, because those are generally considered as less developed. So as a cost of good for society at large, like more wealth and better health care, we also get drawbacks on individual level, such as rapid change of established living patterns or social exclusion of those who are not able or willing to keep up with the changes. (Allen & Thomas 2000, 23-24.) This means that modern development may also be something that divides countries and people instead of bringing us together reaching for the common goal of a better life for everybody.

3.2.2 Measuring development

Modern idea of development tends to traditionally focus on an average national standard of living based on gross domestic product (GDP), technical achievements and international trade key figures within different nations. GDP is widely used as an accepted tool to compare a degree of development, but in many cases it is not the best way to estimate social well-being, general happiness, or even economical status of the majority inside a country. Measurement standards of development could certainly use a face-lift, and as this has spread to wider awareness, for example United Nations has introduced a concept of Human Development Index (HDI). It takes into account also two important factors outside economy: life expectancy and schooling rates (UN 2010). At least this is a small step to the right

direction. It is high time to realise that economical wealth alone does not make us developed, civilized or happy.

As development is expected to lead to better life, there have also been many attempts to go further in measuring general well-being than what HDI is able to determine. Of course it will never be possible to measure abstract and subjective thing like happiness with scientific accuracy, but these studies are important in order to find out what makes people content with their lives in different cultural environments. The concept of Gross National Happiness (GNH) is probably the best known of these happiness indexes, since it was introduced already in the 1970's (Wikipedia 2011e). The latest update for the attempt to define average well-being within a nation by GNH is based on the terms in Table 1.

Table 1: A second-generation GNH concept according to Med Jones (2006).

Measure of wellness	Indicated via survey and/or statistical measurement of
Economic	consumer debt, average income and income distribution
Environmental	pollution, noise and traffic
Physical	severe illnesses
Mental	usage of antidepressants and rise or decline of psychotherapy patients
Workplace	unemployment, job change and workplace complaints and lawsuits
Social	discrimination, safety, divorce rates, crime rates etc.
Political	quality of local democracy, individual freedom and foreign conflicts

Source: Wikipedia 2011e

Another rather commonly known indicator of wider development is Genuine Progress Indicator (GPI), introduced in the 1990's. It is based on quality of life aspects, environmental damage levels and consequences of unsustainable lifestyles, and mostly used within research and development. GPI was counted for the first time for Finland in 2008, for the time frame beginning from the 1970's. It showed that our GPI was growing until 1989, and has constantly decreased since then. The results showed significant differences compared to our development defined by GDP, and the main reasons for this were estimated to be increased differences in income distribution and environmental concerns. (Tilastokeskus 2008.)

None of the numerous well-being or happiness indexes have any official status in measuring development so far, and the debate about correct and essential indicators continues.

3.2.3 Ethics of development

Socially development is a complicated thing. Expanding trade makes huge changes in developing societies as it has impacts on employment, general access to goods and regional integration, just to mention a few (Laitinen 2010). However, these impacts are not always just positive. For example finding a decent and fairly well paid job may be a blessing for the lucky ones in Africa, and why not in modern recessive Europe as well. But on the whole in many LDCs unemployment rates are so high, that no trade extension could fix it even if proper education was available to everybody. Increasing differences in income and living standard lead to social insecurity and crime, which is a serious drawback to general social development. In Namibia the biggest trade partner is South Africa (SA). Since independent 20 years ago many SA store chains have landed in Windhoek to offer everything imaginable, mostly produced in or at least imported via SA. When I was talking about surprisingly changing prices with my local landlady, she told me that the great majority of people have their payday in the end of the month. Then they are able to go to the fancy stores for more than just the every day maize meal. Suddenly, but very regularly, as I was to notice during the next months, prices go up even some 15-30 % for a few days. Is this ethical?

First, of course, we should reach a common understanding of what ethics means in terms of development, and how it should be implemented. As opinions differ a lot, it is not easy to find a common goal to work for. For example in education, some think everybody should have exactly the same opportunities, and some would put emphasis on preferring just the most talented, however that is measured. Or concerning employment; is it better to build a factory that provides wealth for some villagers, or should the community receive common resources so that everybody could have a bit higher standard of living by working together? Libertalists see taxation that is used to fund development aid among lots of other things, as unfair interfering with ones personal freedom. So in their opinion inequalities caused by circumstances should not be corrected, as this would logically lead to a slippery slope, like to an “obligation to give one eye to a blind man”. It is also common, that people who have lived all their lives oppressed, are not able to hope for more or use all the resources that might be available. Well-being is not something that can be measured quantitatively or precisely, so one of the big questions is also who knows better. Maybe outsiders should not interfere at all if help is not wanted, even though helper himself would think it is desperately needed. (Gylling 2004, 107-111.)

3.3 Why changes are needed

Many different actors and aims promote large variety of development projects concerning LDCs. These do not always co-operate very well, and in many cases valuable resources could be used more efficiently.

3.3.1 Different actors seldom co-operate

The official ways of the public sector are mostly bi- or multilateral intergovernmental co-operation between countries, and programs or campaigns carried out by global non-profit organizations like UN. Additionally there is a private sector that makes business out of development, and a civil sector that includes all kinds of NGOs and also smaller local activist groups formed by

ordinary citizens. There may be situations when different operators run separate projects in the same place aiming to the same goal. Whether this originates from genuine lack of communication or disagreements about who is the most competent to be in charge, it results to the financial and human resources being wasted. Donors, being as variable as actors, provide the financial support that makes development aid possible. Governments in the wealthy world finance the public sector, but this is usually a more or less internationally agreed must instead of genuine willing to help. As UN recommends 0,7 % of GDP to be used in development aid, in Finland the figure was only 0,54 % in 2009, but still increased significantly from the 0,44 % in 2008 (FORMIN 2010). The absolute sums on public sector are large, but not always very efficiently used. Heavy bureaucracy, typical in both western institutions and administrations in developing countries, costs a lot. And sometimes the “free money” may even contribute to corruption problem within receiving authorities.

3.3.2 Learning from failures is essential

While exchanging in Namibia last autumn, I got the impression that private and civil sector have a wider effect with less money on actually making common people's lives better. It is easier to point out the real needs in a smaller scale, and working together for a common goal empowers locals to contribute to making the change and taking initiative in their own hands. While public intergovernmental development aid is usually paid by official agreements from top to bottom, private and civil sector are able to focus on local and personal level, considering circumstances and cultural features while trying to solve problems. However, meaning well is not enough. Even with NGOs actions taken are not always free of failures, as Wanjiku wa Ngugi points out in an essay about experiences in Kenya.

When I was growing up in the seventies, Kenya was on a more promising economic path, journey than the Kenya of today. The emphasis for development then was that since government was failing, international NGOs could help propel the country towards development. So there were donor driven projects with their own management structures outside government. There was a lot of emphasis placed on rural development. I remember seeing NGOs (they were the ones with the big cars) involved in

many donor funded rural projects such as digging of wells. There was one particular well that was dug near where we lived, but about a month after, a small part fell off or broke and because the local shops didn't store any spare parts, that was the end of the project. I didn't think about it at the time, but in retrospect now, It was foolhardy to build a well whose spare parts were not locally available, and since the NGO had "completed" its project, there was no going back, no follow-up, nothing. Till today whenever I visit Kenya, that lonely abandoned well is a reminder of development aid gone wrong. It was a sheer waste of time, and money. (wa Ngugi 2010.)

The main point should be in working equally together on a long-term basis towards social and cultural development as well as progressing economical and technical improvements. Giving ready-made options does not necessarily work well in all the different places, and also the sometimes rather humiliating roles of donor and recipient should be forgotten. All the actors are needed to make things happen, so maybe there could be a chance to learn from each other instead of plain and sometimes faux giving and receiving.

4 CASE STUDY: ENERGY PRODUCTION IN NAMIBIA

4.1 About energy

All life on Earth is based on sufficient energy, and the basic energy source that has enabled both millions of years of evolution and past centuries of modern development is the Sun.

4.1.1 Basics in a nutshell

Autotrophic plants turn solar energy useful for us, among all the other heterotrophic species, in photosynthesis. Without the energy based on this process we would not exist. (Hakala & Välimäki 2003, 94 & 240.) During the era of modern technical and industrial progress man has made countless inventions that make our lives easier and more comfortable. Things like steam engines, paper mills, pharmaceutical industry, shopping malls, district heating, cars, refrigerators, vacuum cleaners and PCs have brought us lots of benefits in our every day life. But both production and consumption of all the commodities we need today require huge amounts of energy. The rapid progress the wealthy part of the world has witnessed since the beginning of the 20th century has been mostly based on the easily available and efficient fossil energy sources.

4.1.2 The world runs on fossil fuels

About 90 % of the world's energy production originates from fossil material, such as coal, crude oil, natural gas, brown coal, tar sand and turf (Hakala & Välimäki 2003, 240). These are in all forms originally created by solar energy and formed to be ancient storages of leftover hydrocarbons. Coal originates from plants, oil from animals, and the remains of their biomass have gotten buried into layered sediments some 50 million years ago. As the layers got thicker during millions of years, the pressure combined with the heat from below the crust of earth made the biomass to convert to what we know as fossil energy sources. (Roberts 2006, 42.) The slow underground or underwater conversion process made more space for oxygen in the atmosphere gas mixture so that evolution

proceeded towards enabling life as it is today. (Hakala & Välimäki 2003, 94-95.) Especially oil is very energy efficient, but also a multi purpose substance; most of the modern plastics, fabrics, furnitures and many other commodities are basically made of oil. Burning these fuels for energy has given us plenty of cheap energy for many decades, but little by little we have grown to realize that this has its negative effects as well. We are releasing the hydrocarbon storages rapidly back to the atmosphere, and it may seriously harm the gas balance that has enabled our evolution. And not only ours, since also countless plant, animal and marine ecosystems have evolved hand in hand with us. Currently the basis of the western worlds well established infrastructure and standard of living in general is oil. Fossil fuel consumption has increased over 70 % between 1970 and 2002, and for a long time many economists saw growing energy consumption as a prerequisite for economic growth that equals to high living standards and general well-being. (State of the World 2004, 25.)

4.2 Comparing Europe and Africa

There are rich and poor people in every community; some are categorized by the number of cows in their backyard and some by their bank account. Europe is a highly educated and industrialized continent, while most of Africa has just begun its modern development. Still there are also many basic similarities in all human communities.

4.2.1 Similarities and differences

One definition of poorness is “the state of having little or no money and few or no material possessions” (Hyperdictionary 2010b). This is, however, a very subjective definition and varies a lot amongst different cultures. How much is little money or few material possessions? The absolute poorness is easy to define with just common sense: it means one fails to fulfill the daily basic physical needs of food, water and shelter without unreasonable effort. In addition to these, for mental well-being it is extremely important also to be able to communicate with others, and to give and receive love and companionship. Maslow’s hierarchy of

needs is a commonly accepted suggestion of what we all would need to be content with our lives.

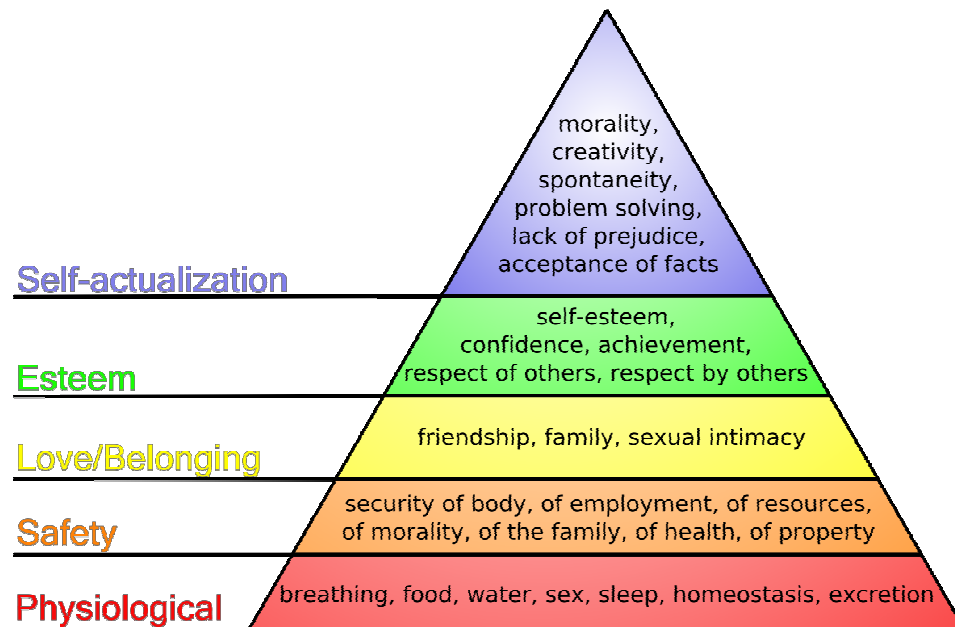


Figure 4: Maslow's hierarchy of needs. [Referred 20.5.2011]. Available at: http://psychology.wikia.com/wiki/Maslow%27s_hierarchy_of_needs.





Sufficient energy certainly belongs to the “Safety of resources” part on the second level in Figure 4. However, the severe problems with the lowest base layers of this pyramid have been long gone in the western world, while many LDCs in Sub-Saharan Africa still struggle with sufficient food or water. The concepts of globalization and sustainable development have raised the ethical question, if it is reasonable for some to fulfill all their actual or imagined needs while others suffer from the lack of physiological basics to survive.

4.2.2 Clarifying the differences quantitatively

To make these differences more concrete, some key figures will be compared in this chapter. For example the total energy consumption in Finland was 1,466,880 TJ in the year 2007 (Energiatilasto: Vuosikirja 2009, 28). This equals to 407,466 GWh, and divided by population gives us the consumption of about 76 MWh per capita. In Namibia the total annual energy consumption per capita for the same year was approximately 7.5 MWh (von Oertzen 2008, 1). So the differences are remarkable.

The following Tables 2,3 & 4 were compiled in order to make the differences inside and between the two continents visible and more understandable. Finland represents one of the wealthiest nations of the world, and Bulgaria was chosen to point out the contrast inside Europe. From Sub-Saharan Africa the pair of countries is South Africa as a wealthy one and Namibia as less developed. The aim is not to value these countries compared to each other, but to raise a question if something could and should be done about the current inequality. The features for the tables were chosen to give some idea of the variability in different walks of life. These are by all means not complete or totally comparable, but with solid figures it is hopefully easier to perceive that inequality is something that we live with everywhere, from local to global level.





Table 2: General facts about compared countries. All figures are from 2009 or 2010 unless mentioned otherwise.

				
GENERAL	Bulgaria	Finland	Namibia	South Africa
Total area (km ²)	110,879 ⁽²⁾	338,145 ⁽⁴⁾	824,292 ⁽¹⁾	1,219,090 ⁽³⁾
Total population (million)	7.53 ⁽²⁾	5.38 ⁽⁷⁾	2.11 ⁽¹⁾	49.91 ⁽³⁾
Population/km ²	68	16	3	41
Life expectancy at birth (years)	73.7 ⁽⁶⁾	80.1 ⁽⁶⁾	62.1 ⁽⁶⁾	52.0 ⁽⁶⁾
Population below poverty line (%)	21.8 (2008) ⁽¹¹⁾	N/A	55.8 ⁽⁹⁾	50 (2000 est.) ⁽¹²⁾
Unempl. rate (% of labour force)	8.3 ⁽²⁾	7.6 ⁽⁸⁾	51.2 ⁽⁵⁾	24.8 ⁽³⁾

SOURCES: 1) EconomyWatch 2011a, 2) EconomyWatch 2011b, 3) EconomyWatch 2011c, 4) EconomyWatch 2011d, 5) IndexMundi 2010, 6) UN 2010, 7) Statistics Finland 2011a, 8) Statistics Finland 2011b, 9) The World Factbook 2011a, 10) The World Factbook 2011b, 11) The World Factbook 2011c, 12) The World Factbook 2011d, 13) Transparency International 2011, 14) FORMIN 2011a, 15) FORMIN 2011b, 16) Wikipedia 2011a, 17) Reporters Without Borders 2011, 18) Globalis 2011, 19) Wikipedia 2011b

Table 2 shows how different these countries are in general. Africa is a vast continent, and also the countries tend to be very big compared to Europe. We are used to think that Finland is a very spacious country, but there is still a big difference compared to Namibia, one of the most sparsely populated countries in the whole world. For Europeans it is also incomprehensible that a country with more than a half of the population both unemployed and under the poverty line could be functional.





Table 3: Economical facts about compared countries. All figures are from 2009 or 2010.

				
ECONOMY	Bulgaria	Finland	Namibia	South Africa
GDP (PPP) (billion USD)	90.76 ⁽²⁾	185.02 ⁽⁴⁾	14.58 ⁽¹⁾	524.34 ⁽³⁾
GDP (PPP) per capita (USD)	12,053	34,390	6,910	10,506
Total government net debt (% of GDP)	5.61 ⁽²⁾	-40.7 ⁽⁴⁾	14.6 ⁽¹⁾	30.3 ⁽³⁾
Inflation (consumer price change %)	2.22 ⁽²⁾	1.40 ⁽⁴⁾	6.52 ⁽¹⁾	5.56 ⁽³⁾
Exports (billion USD)	19.33 ⁽¹¹⁾	73.53 ⁽¹⁰⁾	4.28 ⁽⁹⁾	76.86 ⁽¹²⁾
Exports per capita (USD)	2,567	13,667	2,028	1,540
Imports (billion USD)	22.78 ⁽¹¹⁾	69.11 ⁽¹⁰⁾	5.15 ⁽⁹⁾	77.04 ⁽¹²⁾
Imports per capita (USD)	3,025	12,846	2,441	1,544
Current account balance (billion USD)	-1.345 ⁽²⁾	3.315 ⁽⁴⁾	-0.293 ⁽¹⁾	-15.189 ⁽³⁾
Current account balance (% of GDP)	-2.999 ⁽²⁾	1.429 ⁽⁴⁾	-2.557 ⁽¹⁾	-4.286 ⁽³⁾
Current account balance per capita (USD)	-179	616	-138	-304

SOURCES: 1) EconomyWatch 2011a, 2) EconomyWatch 2011b, 3) EconomyWatch 2011c, 4) EconomyWatch 2011d, 5) IndexMundi 2010, 6) UN 2010, 7) Statistics Finland 2011a, 8) Statistics Finland 2011b, 9) The World Factbook 2011a, 10) The World Factbook 2011b, 11) The World Factbook 2011c, 12) The World Factbook 2011d, 13) Transparency International 2011, 14) FORMIN 2011a, 15) FORMIN 2011b, 16) Wikipedia 2011a, 17) Reporters Without Borders 2011, 18) Globalis 2011, 19) Wikipedia 2011b

Table 3 examines the currently most normative indicator of development, economy. South Africa beats others with their GDP without question, but when we look at the per capita figures and remember that half of the population there are below poverty line, it is clear that economical well-being is not very evenly spread. In Europe inflation is something like 1-2 % and in Africa 5-6 %, that is a very big difference. What comes to current account balance per capita, in Bulgaria it is a bit surprisingly even worse than in Namibia. But the two extremes, Finnish +616 against South African -304, are very far away from each other.

Table 4: Other facts about compared countries. All figures are from 2009 or 2010 unless mentioned otherwise.

	 Bulgaria	 Finland	 Namibia	 South Africa
OTHERS				
Electricity production (million MWh)	4.31 ⁽¹¹⁾	77.44 ⁽¹⁰⁾	1.49 ⁽⁹⁾	240.3 ⁽¹²⁾
Electricity consumption (million MWh)	28.30 ⁽¹¹⁾	87.25 ⁽¹⁰⁾	2.85 ⁽⁹⁾	215.1 (2007 est.) ⁽¹²⁾
Electricity consumption per capita (MWh)	3.76	16.22	1.35	4.31
Human Development Index (HDI)	0.743 ⁽⁶⁾	0.871 ⁽⁶⁾	0.606 ⁽⁶⁾	0.597 ⁽⁶⁾
HDI worldwide ranking	58 ⁽⁶⁾	16 ⁽⁶⁾	105 ⁽⁶⁾	110 ⁽⁶⁾
Corruption Index ranking	73 ⁽¹³⁾	4 ⁽¹³⁾	56 ⁽¹³⁾	54 ⁽¹³⁾
Democracy Index ranking	51 ⁽¹⁶⁾	7 ⁽¹⁴⁾	69 ⁽¹⁴⁾	30 ⁽¹⁵⁾
World Press Freedom Index ranking	70 ⁽¹⁷⁾	1 ⁽¹⁴⁾	21 ⁽¹⁴⁾	38 ⁽¹⁵⁾
Ecological footprint (ha per capita, 2008)	2.7 (2001) ⁽¹⁸⁾	2.7 ⁽¹⁴⁾	0.7 ⁽¹⁴⁾	2.7 ⁽¹⁵⁾
CO ² emissions (tonnes per capita, 2007)	6.8 ⁽¹⁹⁾	12.1 ⁽¹⁹⁾	1.5 ⁽¹⁹⁾	8.8 ⁽¹⁹⁾
CO ² emissions ranking (2007)	62 ⁽¹⁹⁾	23 ⁽¹⁹⁾	136 ⁽¹⁹⁾	46 ⁽¹⁹⁾

SOURCES: 1) EconomyWatch 2011a, 2) EconomyWatch 2011b, 3) EconomyWatch 2011c, 4) EconomyWatch 2011d, 5) IndexMundi 2010, 6) UN 2010, 7) Statistics Finland 2011a, 8) Statistics Finland 2011b, 9) The World Factbook 2011a, 10) The World Factbook 2011b, 11) The World Factbook 2011c, 12) The World Factbook 2011d, 13) Transparency International 2011, 14) FORMIN 2011a, 15) FORMIN 2011b, 16) Wikipedia 2011a, 17) Reporters Without Borders 2011, 18) Globalis 2011, 19) Wikipedia 2011b

And finally in Table 4 there are some features that might be included when development will be examined from the sustainability or global well-being point of view in the future. Finland is clearly on the top when it comes to electricity consumption and HDI (see chapter 3.2.2. about HDI), but concerning the factors that contribute to for example climate change, Namibia is undeniably the best: their ecological footprint is a stunning 0.7 against the others' 2.7. If we think about this in a global scale from the sustainability point of view, it is not really important who is on the top or bottom in any of these statistics. Some kind of balance should be found before the world is able to focus on a common goal.

4.3 About Namibia

Namibia is a sparsely populated, dry country situated on the Atlantic coast of South-West Africa. It is bordered by the rivers Kunene and Cubango in the North, and the Orange in the South, and deserts Namib in the West and Kalahari in the East. Finnish people usually know Namibia because our former president, Martti Ahtisaari, was contributing to the independence negotiations, but most Namibians are familiar with Finland primarily through the Christian missionaries that arrived to Owamboland (In Finnish Ambomaa) more than a century ago. Namibians are very tolerant towards foreigners as they are used to live among a large variety of traditional cultures and languages inside their own homeland. The recent apartheid era has resulted to that all kind of sorting of people is a very delicate matter for most of the people, so even though people are proud of their special tribal features they mostly want to think about themselves as just Namibians (Pikkarainen et al. 2004, 70-71).

The climate is from semi-arid to arid, big part of the country is dry bush or deserts. Rainy season is during the local summertime, usually from November till March, and as all the inland rivers dry out during the dry season the only perennial rivers are the ones running along the borders. Water is very scarce in Namibia, and the increasing commercial and domestic needs are constantly competing over the limited sources. Currently big commercially financed investments for water consuming mining industry and tourism are politically encouraged and preferred over domestic needs. (Moyo 2010.) The warmest months are January and February, and even though the rainy season lasts for several months, on average there are over 300 sunny days per year. In the desert the daytime temperature rises regularly to over 40 degrees Celsius, while in the nighttime it may drop below zero. (Pikkarainen et al. 2004, 19.) On the map in Figure 5 it is easy to see the straight-line borders, typical to previously colonized African countries.



Figure 5: The map of Namibia. [Referred 22.5.2011]. Available at: <http://www.worldatlas.com/webimage/countrys/africa/lcolor/nacolor.htm>.

4.3.1 Short history

The area of current Namibia has been a rugged home for various tribes such as San (also known as Bushmen), Himbas and Hereros for thousands of years. Some rock paintings suggest that the first signs of human cultures date back to 26,000 BCE. The first foreign explorers and ivory hunters entered the country around 1850's and Germans colonized the area in the end of the 19th century. (Nambiatourism 2011.) The land is scarcely populated, and the traditional cultures have evolved relatively isolated, according to the local possibilities the nature has offered.

Along the proceeding of colonialization the Christian missionaries from Europe started to “civilize the savages” of the African continent, and in Namibia especially German and Finnish were active during the turn of the 19th and 20th century (Pikkarainen et al. 2004, 70-71). After The World War I South Africa took over Namibia, and kept it under the apartheid ruling until the black empowerment and international pressure resulted to independence. South West African People’s Organisation (SWAPO) started Namibian independence struggle in 1966 and it lasted for 24 years. (Namibiatourism 2011.) The Independence Declaration was given with United Nations strong support 21.3.1990. Sam Nujoma, one of the most important SWAPO leaders, became the first president of independent Namibia and ruled for fifteen years 1990-2005 (EB 2011).

4.3.2 People and society

The tribes, languages and traditions inside the small population are extremely variable. The population consists of more than ten local black tribes, the biggest being The Owambo (Ambo) with the share of about 50 %. The white minority of about 6 % is small but economically still very influential. (Pikkarainen et al. 2004, 110.) Politically neutral English, informally also called Namlish because of the very unique accent, was chosen to be the official language in 1990, but numerous tribal languages along with German and Afrikaans are still commonly spoken. During 20 years of independence younger population has learned their new language well, but in rural areas there are still many places where elderly population does not speak English, a.k.a. the sole official language, at all. The literacy rate in Namibia is announced to be 88 % (Worldbank 2009).

Namibian family structure differs a lot from ours. The core family does not have the same meaning, and households are commonly task-orientated residential units, larger kinships that share the economical and functional responsibility. Familial relationships may also develop outside blood or marriage ties, and be based on social, emotional or psychological aspects. (Edwards-Jauch 2010, 3 & 14.) The vast majority of Namibians are Christians, even though tribal animism and other traditional religions are still locally practiced. (Pikkarainen et al 2004, 107-110.)

Christianity is commonly very close to every day life, for example the lecturer in Polytechnic of Namibia often referred to water as “the Gods greatest gift”.

Namibians are very proud to be an independent and variable nation, and love to share knowledge about their cultural traditions and traditional festivities in any gatherings whenever they get a chance.

4.3.3 Socio-economic structures

Along with the independence national politics changed almost overnight to be from totally white to totally black. SWAPO is the dominating party and current political power is almost entirely in the hands of the Owambo tribe. Former white rulers have lost some of their political influence, but are still remarkable landowners or businessmen with lots of economical power. The only center of population that can be called a city by western standards is the capital Windhoek with its 223,000 inhabitants according to the official census of 2001. As Windhoek covered about 11 % of the Namibian population 10 years ago, it is estimated that about 25 % of the national population will be living in the Windhoek urban area in the year 2030. (City of Windhoek 2010.) The leading political party SWAPO gives its own estimation that the population of Windhoek has grown from 185,000 in 1995 to 350,000 in 2009 (SWAPO Party 2010). Whatever the correct figures are the city is growing fast and Windhoek is running out of space. The city is situated on a basin almost 1700 meters above the sea level, surrounded by Auas and Eros mountains plus Khomas highland. This means that as more people are pouring in, the townships will be even more crowded in the near future. The commercial city centre with modern corporate buildings, shopping malls and expensive block of flats apartments is very small, surrounded by wealthy and mostly white private house neighbourhoods. About 80 % of the urban Windhoek population is living in the black and rapidly growing townships on the poor and crowded outskirts of Windhoek. Outside the capital the most of the population lives in African-style cities or other centrals and villages mostly defined by ethnics. (van Rooi 2010.)

Vast majority of the population is rural and still largely self-employed in agriculture, but tourism is a rapidly growing sector of the economy. In urban areas

there is a silently accepted sector that we would probably define as grey economy, which works as a way to survive for those who can't find an official job.

Officially over 50 % of available labour potential is unemployed in the formal sector (U.S. Department of State 2010). Population is sharply divided to the rich and the poor, so average gross domestic product (GDP) doesn't tell all that much about general living conditions in Namibia. GDP is relatively high compared to other developing countries in Africa, but Namibia also has one of the most unequal income distributions on the continent. Wealth used to be directly related to skin colour during apartheid, but after independence also black middle class has increased.

The biggest problems are increasing crime rates, especially in urban areas where differences in standard of living are enormous, and serious illnesses, especially the AIDS/HIV epidemics (van Rooi 2010). The estimated HIV prevalence rate for 2008 was 17,8 % of the whole population, and Namibia is ranked to be one of the top five AIDS-affected countries in the world (Edwards-Jauch 2010, 30).

4.3.4 Economics and trade

Mining industry is the main source of foreign income and the most important exported products are diamonds, uranium, lead, copper and zinc (Ministry of Trade and Industry 2010). Mining industry is dominant, despite that the benefits to the common Namibians are limited and local environmental problems often huge (Komen 2010). Export value of diamonds in 2009 was 1.3 billion USD, and this alone was over 40 % of the total exports income (Worldbank 2010). The mining industry is largely owned by foreign corporations, and a very limited share of this income ends up to benefitting domestic economy. To change this, the Namibian government has decided to take action in establishing state owned mineral mining companies. The first one, Epangelo Mining (Pty) Limited, was founded in 2009 (Elomaa 2010, 21).

Rapidly increasing source of income is tourism, and in the year 2009 the services sector on the whole covered already 58 % of GDP (Worldbank 2010). Tourist attractions in Namibia are usually built up to be ecological and planned to have a

positive impact on both nature reservation and rural development. In order to boost tourism in an environmentally friendly way Namibia is the first nation that has made environment protection a constitutional issue. For example Article 95 highlights “maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and utilisation of living natural resources on a sustainable basis for the benefits of all Namibians...” (Republic of Namibia 2010). About one fourth of the land area is under environmental protection, though most of this uninhabited (Pikkarainen et al. 2004, 42).

90 % of Namibian imports originate from South Africa, most of the foodstuff and commodities available in Namibia come from there. South Africa is the most important trade partner, but in infrastructure, construction and building industry China is growing fast. The balance of payments in 2008 was heavily deficient, against 3,7 billion USD worth of exports of goods and services, imports were worth 4,5 billion. (SADC Trade 2008.) In the key sectors like energy and water the enterprises are state-owned, at least for the time being (Komen 2010).

4.4 Energy production in Namibia

Since Namibia has existed only 20 years as an independent nation, it has been catching up rapidly with western development standards during the past decades, albeit only locally and on certain fields. The development aid along with the flow of somewhat increased investments, nowadays mainly from China and Russia, has enabled modernizing the infrastructure in the urban areas of the country (Komen 2010).

4.4.1 Background

The capital Windhoek is nowadays a relatively well-established mini-metropolis, where lots of rural population see chances for a wealthier life. People are not moving in from just the rural or African-style urban areas inside Namibia, but also from surrounding countries, especially Angola and Zimbabwe. The estimated population growth in the city is 10 % a year, and urbanization has begun to strongly affect the traditional lifestyles of black Namibians. (van Rooi 2010).

Energy consumption in the capital and industrial or mining areas around the country is increasing exponentially, as the energy intensive large-scale production methods are gradually introduced to the developing young market. At the same time it would be essential to provide the poorer districts of Namibia with electricity supplies. Namibia was able to produce only about 20 % of the primary energy it needed in the year 2008, and in the near future the situation might get even worse (EIA 2010). In Figures 6 and 7 are the graphs of energy production and consumption, but it is essential to notice that scales are not directly comparable. So from the consumed 0.075 Quardrillion Btu Namibia is able to produce only 0.015.

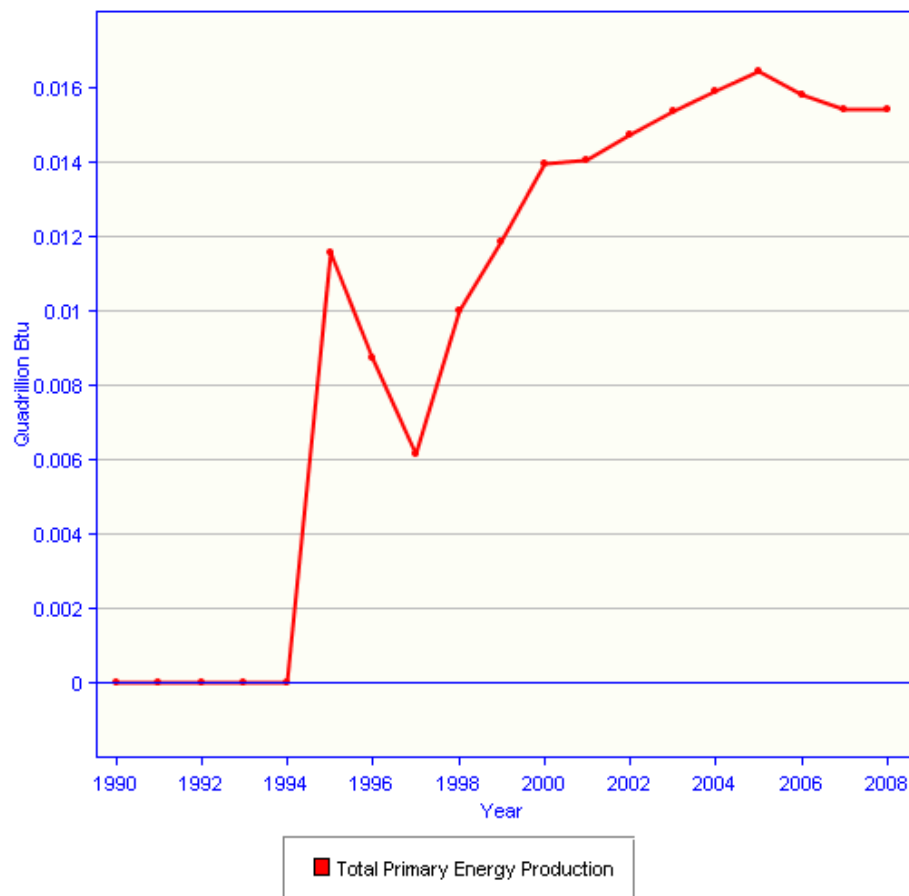


Figure 6: Primary energy production in Namibia 1990-2008. [Referred 14.4.2010]. Available at: <http://www.eia.gov/countries/country-data.cfm?fips=WA#undefined>.

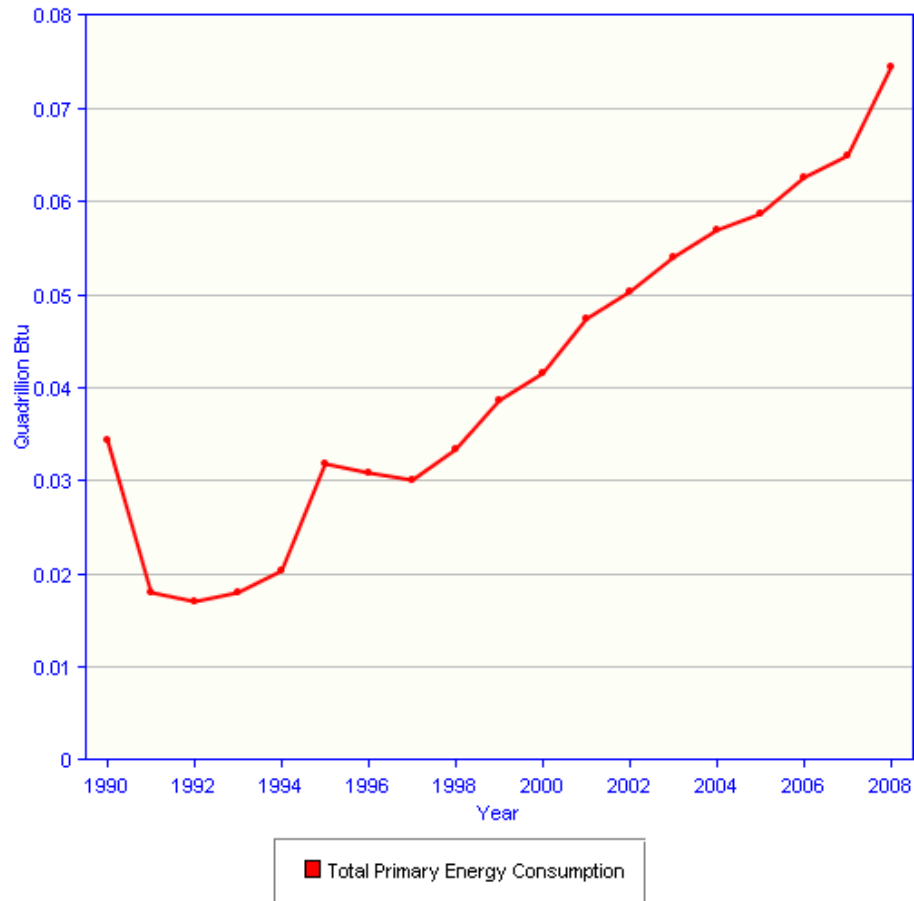


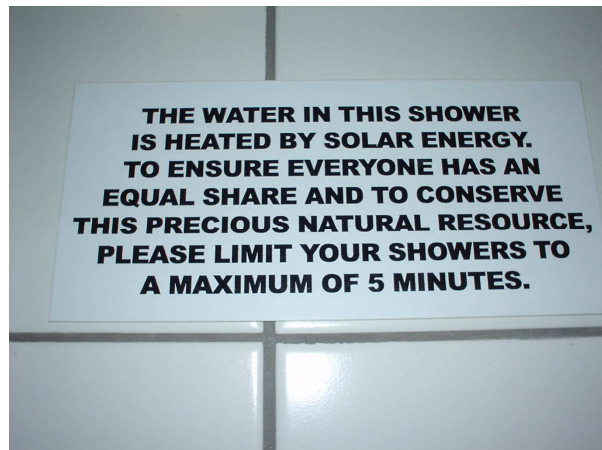
Figure 7: Primary energy consumption in Namibia 1990-2008 (EIA 2010). [Referred 14.4.2010]. Available at: <http://www.eia.gov/countries/country-data.cfm?fips=WA#undefined>.

4.4.2 Current structures

In LDCs rapid development in energy production usually means relatively modern power plants, but the main energy sources are still fossil coal and oil. In Namibia, however, the majority of domestic energy is currently produced with hydropower. Energy consumption is expected to increase exponentially as the modern development in the country proceeds, living standard expectations get higher and tourism expands all at the same time. There are three main energy production plants for the whole country, though several others are planned to be started as soon as possible. Unfortunately there are chronic problems with financing even the existing projects, and many of those are already years behind

the schedule compared to the original construction plannings. (Nampower 2010b, 28-29.) The estimated usage time for a power plants is usually close to 50 years, so the production methods are established for a long time every time a new plant is opened. Since Namibia does not have own coal or oil resources (EIA 2010), but plenty of uranium instead (Ministry of Trade and Industry 2010), nuclear power is commonly seen as a domestic, modern and ecologically clean alternative.

Solar power is also used, but considering availability it is surprisingly marginal. In urban areas some wealthy and environmentally aware people install solar panels mostly for hot water purposes. Many travelling facilities, however, have chosen solar power as a main source of electricity and are sincerely participating and promoting the idea of ecological and sustainable tourism.



Picture 1: Bathroom in Guesthouse Chameleon, Windhoek, Namibia. (Photo: Päivi Lahti 2010)

Simple solar cookers are also provided to rural areas where most of the wood in the surrounding area is used up, but the locals usually avoid using these until there is no other choice. The main reason is that the basic daily food, maize meal porridge called pap, needs constant stirring while cooking, and preparing food is a social and collective happening as well. The women are used to work in groups around open fire and have learned to avoid accidents with it, but these cookers

work differently and it is easy to get yourself burned or fail with the cooking (Komen 2010). The proper guidance in using these stoves might be the simple trick to increase the popularity and usage of this environmentally friendly cooking method significantly.



Picture 2: Typical rural solar stove in Narrec, Namibia. (Photo: Päivi Lahti 2010.)

At the moment solar power usage is not widespread enough to have any significant impact to the power production scheme on the whole.

4.4.3 Nampower

The national power company Nampower's ambitious vision is "To be a leading energy company in Africa, which excels in customer service, people development and technological innovation." (Nampower 2010a). Reaching this goal is not going to happen in a very near future, because the whole infrastructure with pipelines etc. needs to be built from the beginning in each case, distances are extremely long and financial resources very limited.

TRANSMISSION MAP

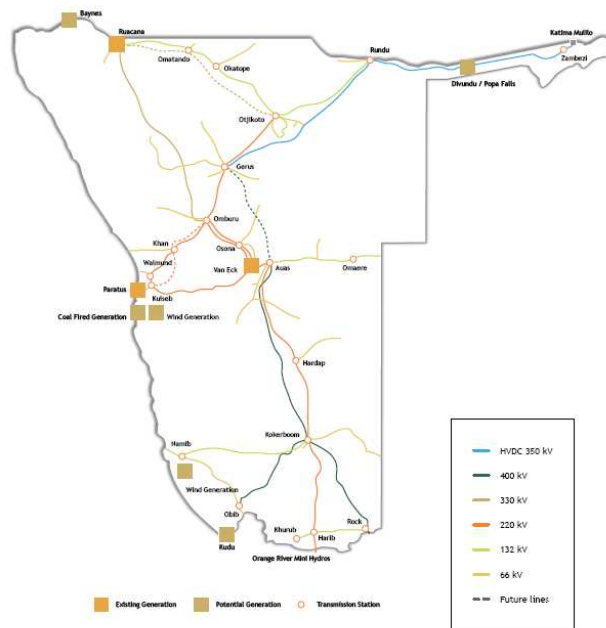


Figure 8: Power generation and transmission map of Namibia (Nampower 2010b, 11).

The three orange marks on the Figure 8 represent existing power generation plants. Ruacana up in the north close to the most densely populated areas in Namibia consists of three units producing hydropower, and the fourth unit of 92 MW is expected to be installed by March 2012. Ruacana was responsible for 96 % of the domestic power production during the financial year 2009/2010. Van Eck Power station close to Windhoek in central Namibia uses coal, and by burning 42,300 tonnes it produced 4 % of the domestic energy. Van Eck has received complaints from public and businesses about its particle emissions, and is supposed to be only an emergency standby power station. However there has been critical power supply shortages since 2006 and van Eck has been in production more or less regularly. The third one, Paratus, on the west coast of the Atlantic Ocean, close to Walvis Bay and near the main mining areas, is currently out of production. The six light green marks stand for planned power stations, including production from coal, diesel, gas, hydro and wind. Many of these are severely delayed due to financial, technical or ecological adversities. (Nampower 2010b, 28-29.)

4.4.4 Namibia counts on nuclear power

For facing the increasing energy demand there is a strong political will to start utilizing nuclear power in the near future. Some 10 % of world market uranium comes from Namibia, but most of the profitable mineral markets are in the hands of foreigners as a remnant of the recent colonial and apartheid era (Komen 2010). The current Namibian government sees nuclear power as a domestic and safe option, and wishes to have a state-owned nuclear power plant in action by the year 2018 to boost the Namibian economy. Since the financing of the project is still wide open, the timetable is probably not very realistic, but otherwise the planning is well on its way. In October 2009 there was a ministerial 3-day-visit from Namibia to Finland, although this visit managed to escape the Finnish media headlines efficiently. The Minister of Mines and Energy, though already former since the previous elections, Mr. Erkki Nghimtina led his party to meet Finnish Ministers Väyrynen and Pekkarinen. The party visited e.g. Geological Research Center (GTK), Radiation and Nuclear Safety Authority (STUK), Olkiluoto nuclear power plant and Aalto University School of Science and Technology (TKK). (Elomaa 2010, 20-21.) Obviously this trip was arranged in order to explore the details of the Finnish way to handle nuclear power production.

4.4.5 Potentials of renewable energy

In Namibia the most obvious renewable choice would be to focus on promoting solar power, since there are usually over 300 sunny days in a year. Even during the rainy season showers and cloudiness are occasional, and it is very rare to have a day without any sunshine. Other remarkable potential would be wind or wave power on the west coast, where Atlantic Ocean is close to the main mining areas. Mining industry will demand huge amounts of energy in the near future. Not just for their current operational actions, but also because there are new energy intensive sea water desalination plants planned to the coast to provide the large amounts of water needed in mining industry (Moyo 2010). Desalination methods would possibly give some relief to the acute need of potable domestic drinking water close to mining areas as well, but the sustainability issues about producing the massive amounts of energy they need should be carefully considered before

the actions. Wind power is already planned to be produced along the west coast in the near future, but the actual financing is everything but clear (Nampower 2010b, 34).

Small-scale experiments for local environmentally friendly alternative energy sources are also getting more common, but unfortunately these usually lack sufficient funding to get any reliable results. Last autumn at least one biofuel experiment was closed due to “non-profitability” after only 6 months from starting it (Komen 2010). There are also some individual researches for local solutions from time to time. For example Technical Research Center of Finland (VTT) has been a partner in an experimental study of local bush biomass production in the years 2006-2007. The method was discovered to be profitable if certain requirements were met. (VTT 2008.) But due to lack of financial resources for further development nothing has happened so far to concretize the promising results and to utilize this domestic and renewable alternative.

5 WHY SUSTAINABLE DEVELOPMENT?

Both challenges and possibilities of sustainable development are many. The challenges may seem so huge that it tends to cause both single people and nations to focus on things that are easier to handle. However, problems do need solving, and that has to happen one step at a time. But the essential thing is to start making globally shared decisions that focus further than just on the next quarter year or generation, in Finland and Namibia as well as all over the world. The challenges of sustainability could also be turned to possibilities if wide enough global change of values and co-operation would turn into reality. Here are some of the current challenges, where the more sustainable holistic approach might make a big difference.

5.1 Environment and health

Environment forms the limits and resources for all human action. Most poor countries are situated in challenging environments facing more or less regular draughts, hurricanes or other catastrophes, without sufficient resources to try to prevent or repair the damage. Climate change is also likely to affect first and foremost the poorest countries that struggle with their living conditions already. Diverse environment that provides us with clean food and water will be the most valuable natural resource in the future. That is why solving environmental problems and sustainability should be the leading thought in all development. (Hakola et al. 2010.)

Health is generally very closely connected not only to the general level of development in a country, but also to the condition of the environment. Often there are more diseases close to industrial areas in LDCs as emissions are not always filtered or mining areas may poison the drinking water. The problem multiplies because of the poor or non-existent health care system. (Komen 2010.) However, there are limits with this connection, because in many developed countries where techniques are often better and health care system works well, some diseases like overweight caused cardiac problems and diabetes have increased drastically. Alcohol or drug abuse is a very common problem in both

LDCs and wealthier nations and AIDS has grown to be a major problem in Africa. Sexual health knowledge is inadequate and still often rejected due to traditions, which makes it very difficult to deal with the problem. In Namibia the most common lethal diseases are AIDS, malaria and tuberculosis. (Pikkarainen et al. 2004, 183.)

5.2 Population growth and urbanization

Rapid population growth has made the world to realize that our natural resources are finite. One of the most threatening future scenarios is uncontrollable population growth that causes insufficiency of various resources and leads to conflicts. More political will to share common good is needed before poor people in rural agriculture based areas can afford having less children. (Hakola et al. 2010.)

Urbanization has happened fast and is still accelerating, especially in developing countries in Asia and Africa. 2008 was the first year when more than half of the world's population lived in cities. Rural people want to move to cities to find a job and have a better life, but some of them just have to move as a result of losing their original agricultural source of income due to environmental problems or political changes in land usage. The uncontrollable urbanization expands poor slums, and in developing countries there is no way to build infrastructure at the same pace. This leads to drastic increase of urban poverty, grey economy and crime, as most of the urban population is living in very challenging conditions without adequate sanitation and health care or even drinking water and food. (Hakola et al. 2010).

5.3 Poverty, food security and livelihood

Poverty in developing countries is usually one of the most profound challenges to face. It affects population growth, crime rates and general stability of the societies. Hygiene level in poor slums causes diseases, and in LDCs it is very hard to rise up from poverty as education is primarily chargeable and unemployment rates very high. It has been seen many times over that education is a very strong tool to

fight poverty, but again there is a question about financing. Who pays if the nations can't afford to offer proper education free of charge for their own people. Referring to the global sustainability the question could also be: Can the rich afford to help the poor? (Sachs 2005, 288-290.)

Food security, when defined as “when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life” (WHO 1996) should be reality in the modern world. At the same time it is a very western expression. For us food security is endangered if we can't have our favourite yoghurt for a week due to transportation strike or other inconvenience. As experts of international development co-operation, Miia Toikka and Sofie Sandström are answering the tricky question about solving the hunger problem, they point out that hunger has never been a technical problem, but political, as there is more than enough food produced, the real problem is extremely uneven access to it. (Toikka & Sandström 2009.) Poverty, inequality and lack of democracy are the main reasons that lead to hunger. Globally we produce more food than ever, and there is enough food for sufficient nourishment to all the people. We should just find the common will to stop wasting it and share it more equally.

In LDCs agriculture is still the main source of livelihood. Changes in agriculture affect the base of development especially in the local level. Political changes in land usage may endanger sufficient food if arable land is sold, or potable water for local population is considered less important than irrigation of commercial plantations. The population is growing fast, and the poorest countries still struggle with hunger, even though food production has become more and more efficient. Modern food production occupies huge amounts of new forest and grasslands, and at the same time intensified agriculture is turning land useless elsewhere, due to soil erosion, salination, pesticides or other environmental damages. Limited agricultural areas are also in many cases increasingly used to produce more profitable cash crops instead of food. So even more efficiency would be needed, but the means could be harmful for environment. This affects the productivity of farmland in the long run, and is a very profound and difficult problem to solve. (Hakola et al. 2010.)

5.4 Education and gender

Among others Professor Dankit Nassiuma highlights education as the base for all development. This is very appropriate, since education gives more possibilities and understanding about complicated ways of the world. As he says, education is a very powerful driver of both economic and social development; accordingly it should become available to everyone right after sufficient water and food. Still many governments, and not only in the developing world, tend to put the good of the poorest aside if an international cooperation project needs large investments. (Nassiuma 2010.) For a better world and more equal development both sustainability and ethics issues should be crossing through the whole educational field, including economics and engineering. Simply put, any society is as strong as its weakest link, and it is up to us if we see this fact concerning our family, neighbourhood, city, country, continent, or the whole world.

Women work hard for their communities, but often lack the appreciation doing so in the LDCs. They are also considered as crucial actors in development, especially in the fields of family planning, birth control and better health care. However the fact remains that in most of the LDCs traditional and culturally built-in male overpower is still reality, and women are more or less outside the common decision-making. Changes are needed to gain more equal communities, ready to develop further. Since the 70's and 80's there have been various more or less feminist approaches to oppression and violence towards women in LDCs (Koponen et al. 2007, 239-242), but the reality has not changed drastically for better. As we in the western world are already used to gender equality and independent women, we tend to forget that things did not happen overnight here either. Major changes in social structures need time and space to adjust to the cultural frame. Too much information too fast and focusing on educating only women may turn the basically good intentions into something else. Why would men accept their new, emancipated and demanding spouses without complaints if they have no idea about the benefits? After all, even empowered women are not enough to form a balanced community, men are also needed. So it is essential to introduce better ways and benefits of equality to all members to avoid cultural, domestic and personal conflicts.

5.5 Sustainable engineering

Engineers are often considered as a specific group of people both by the public and themselves, like many other professionals on their own fields as well. Technological advantages have brought a lot of development and prosperity to many people, thus modern technology is often trusted to solve all kinds of problems, including those it has created itself. The field of engineering needs a whole new approach in order to create truly sustainable solutions for the future. Visionary engineers like Jaques Fresco dedicating his adult life to The Venus Project or Eero Paloheimo exporting ecological cities from Finland to China give an example about thinking differently. Both of them work with a large group of people from variable branches sharing the same vision, which probably enables their rather radical approach to a conservative technocrat tradition. Changing the views includes multidisciplinary co-operation in advancing best available technologies (BAT), for example using recyclability and smart waste management as the baseline in planning and designing new products or manufacturing systems. Also using other recently developed tools like life cycle assessment (LCA) or cradle-to-cradle thinking while designing and engineering new technological solutions would help technology to solve problems in a sustainable way. However, engineering in general needs a comprehensive change of attitude in order to move from the narrow economic values towards broader visions of environmentally and ecologically less harmful development.

6 DISCUSSION

Energy issues are extremely important for all well-being and development, whether we talk about global sustainability, climate change or national and individual level. When the topic of this thesis took shape I thought that I knew rather well what was going on, but little did I know after all. Studying these things a bit deeper and staying for a while in Namibia made me even more determined about that alongside economic prosperity and new technologies the mankind also needs a completely new approach. Sustainability is not something the governments or institutions have discovered, but coming to this point where serious attempts are made to change the ways we are consuming energy, is originally the result of small groups of individual activists. So the change originally starts with the conscious individuals, and there is no point in thinking that one person cannot influence anyway. Maybe the time has come to change our thinking from a “I want” towards a “we can” world.

It seems like after the breakthrough of the original concept of sustainable development (see page 5) the focus has been lost somewhere on the line, and that is why I wanted to try to clarify these concepts. The real issue seems to hide under a pile of more acute concerns, like how to be able to keep all the future private passenger cars running more environmentally friendly, or gradually diminish the local industrial emissions in order to get the globally agreed financial benefits while also fighting the global warming. We need to see that everything affects everything, and try to find more comprehensive solutions that do not cause further problems elsewhere. To make a change, the global world needs re-evaluation of common values in order to find a holistic focus on the essentials first. The problems presented in chapter 5 are wide and challenging, but if we have been able to fly to the moon, we are also able to face these challenges if we decide to do so.

A lot of discussion about the costs of sustainability is going on, but ultimately we cannot afford to be without it, because we live out of resources that we are not able to provide ourselves. After the millennium the dilemma between our monetary system that is based on consumerism and principles of sustainability has

encouraged a lot of discussion and some rather exceptional NGOs. The established perspective of money making the world go round is still very strong, but as environmental problems and social inequality are increasing all over the world, the critics of our current way of life are getting louder. For example the Degrowth movement (also referred as Downshifting) wants to pay more attention to the finite resources and cutting down the constant growth of overconsumption (Degrowthfinland 2011). The Zeitgeist movement takes a step further discussing changing our monetary system completely to a Resource Based Economy (RBE) that would be controlled by scientific methods instead of political or economical norms and decisions (The Zeitgeist Movement 2011). The new approach of these movements also includes not having strict organizations, but depending on people taking action and sharing multidisciplinary knowledge on open source principals. Social media and efficient networking have enabled these kinds of movements that reach like-minded people all over the world in a relatively short time.

7 CONCLUSIONS

Energy issues are generally a very popular topic around the world. Sustainability has become somewhat of a trend during the past decade among decision-makers as well as common people, and practically everybody has a more or less reasoned opinion about it. In general, lots of official debates about issues like alternatives for sufficient energy production in the future, economic evaluation of nature, or preserving the environment and resources for future generations is going on, but very little has actually happened so far. The challenges seem overwhelmingly large and sometimes impossible to deal with. In addition, the UN has lost some of its affluence concerning current global problems, so we are lacking a worldwide strong authority to efficiently deal with large-scale issues outside the economy. When dozens or hundreds of countries are negotiating global agreements, all of them have their own interests in mind, and finding the truly sustainable solutions may feel like less essential than coming to a short scale agreement that gives minor benefits for everybody.

Energy production in Namibia is a very up-to-date issue, because the consumption is growing fast, financial resources are very limited and the infrastructure incomplete and very expensive to establish because of long distances. Maybe international community could have an agreement about financial aid for energy production to be focused on renewable, local solutions, and about financing research to find the most sustainable options in Namibia as well as other LDCs. That kind of focus could also produce benefits to wealthy countries in order to find new ways to provide our more remote areas with sustainable energy supplies. I do not have anything against nuclear power in itself, but the mining industry's environmental problems and worker exploitation should stop. And it is also hard to believe that we are seriously considering burying the dangerous radioactive waste underground for some 100,000 years. If it is estimated that man started to cultivate crops only about 10,000 years ago, there is something terribly wrong with modern man's sense of proportion if we feel sure to be able to handle that kind of project safely enough. Sustainability requires a sensible way to deal with waste management before the new power production technologies will be applied.

Maybe we should not even try to find a new dominant energy source such as oil has become, but to focus more to local conditions and possibilities to produce enough renewable and sustainable energy. Taxation could be a powerful tool to regulate consumption: a certain basic amount of energy per person would be free of charge or very cheap, but as the consumption increases the prices would also go up step by step. In reality, there is, of course, very little I can do to affect Namibia's decisions about their energy future, progressive global taxation of energy consumption, or to urge forward the concept of sustainable development. But that does not matter, because the sustainable development of the future lies on more efficient sharing of goods, prosperity and open source information. For that we need large, international networks of environmentally aware engineers and other professionals who are genuinely focusing on better future for everybody. Mahatma Gandhi has said: "Be the change you want to see in the world". When there are enough like-minded people, we can achieve anything. Sustainability included.

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