Energy and climate

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ENERGY AND CLIMATE submitted at the IMC University of Applied Science Krems Master’s Programme International Business and Export-oriented Management by Paulo Azeredo Maximilian Gierlinger Mario Schlichtinger Subject: International Institutions & Strategic Relations (IISR1) Lector: Prof. (FH) MMag. Dr. Anis Bajrektarevic Table of contents 1 Introduction 3 2 Energy 3 2. 1 General 3 2. 1. 1 Primary Energy Mix 3 2. 1. 2 Production and Consumption 5 2. 1. 3 Renewable Energy Resources 5 2. 2 Fossil Fuels and Carbon Emissions 5 2. 2. 1 De-Carbonization Trend 5 2. 2. 2 Air pollution 6 2. 2. 3 Kyoto Protocol 6 2. 3 Alternatives 7 2. 3. 1 Energy 7 2. 3. 2 Hydro Storage proprieties 10 2. 3. 3 Iceland — world’s first hydrogen economy 10 2. 3. 4 Car fuels 10 3 Climate 11 3. 1 Definitions 11 3. 1. 1 Weather 11 3. 1. 2 Climate 11 3. 2 Climate change 12 3. 2. 1 What Is Global Warming And Climate Change? 12 3. 2. 2 What Is The Greenhouse Effect? 13 3. 2. 3 What Are The Main Indicators Of Climate Change? 14 3. 2. 4 What Are The Impacts Of Global Warming? 15 4 Organizations 17 4. 1 GNESD 17 4. 2 WMO 18 4. 3 UNFCCC 19 5 Conclusion 21 6 Sources 22 Introduction The issue of sustainability has become more and more important and famous during the past years, not only in the media but also in the economy. Initiatives of “ thinking green" and “ greening the supply chain" to “ act in a sustainable way" are getting better known and are becoming more and more business practice. But what is the reason behind that? Companies, and also nations need a certain amount of energy and this certain amount has been growing since the 19th century. This energy needs to be withdrawn from somewhere, so various source of energy are being used and not all of them work without polluting the environment. As pollution throughout the last decades has

increased in exploding dimensions, causing numerous problems all over the globe (the leaking ozone layer, endangered natural habitat of animals, injured / killed animals and humans, etc.) and as some resources humanity is relying upon today are scarce, or will be scarce in the future a restructuring of the sourcing of energy in necessary. In this paper information about the current and past situation concerning energy and climate, as well as trends in the future will be given. An overview over contemporary issues concerning energy and climate will be performed and ways to deal with the situations. Also content of this paper is an overview over some institutions that try to better the situation by setting regulations for nations and for the economy. Energy In the following will be explained how nations gain their energy and from which sources, a short overview on the issue of production and consumption of energy, and renewable resources will be given. Then issues of fossil fuels and issues that arrive with its usage will be addressed, as well as a short overview over the Kyoto Protocol will be given. 1 General 1 Primary Energy Mix The amount of energy a country needs is different from one nation to another, also the source of its energy varies. As many different sources of energy are used the terminology of an “ Energy Mix" is necessary. Basically five various sources of energy are available to humanity nowadays: - Oil - Natural Gas - Coal - Nuclear Energy - Renewable Energy Sources What renewable energy sources are will be explained later on in this paper. As stated above, every nation uses different sources for energy which leads to the so called energy mix. The decision on what sources to use are based on four criteria: - Availability of the source - Energy needs of the nation - Economic, social, and environmental issues - Political issues (which depend

on the above) Differences in the sourcing of energy can not only be seen due to the economical standard of a country, as the United States of America and France for example — who both belong to the “ first world" — totally differ in the means of nuclear energy. The United States of America derives 8. 5% of their primary energy (terminology explained later) from nuclear power, whereas France derive one third of their primary energy from nuclear power, using four times as many nuclear energy than the United States. The reason behind this is France’s philosophy of independence concerning energy. Due to this strategy of energy sourcing France contributes relatively little greenhouse gas to the world compared to other nations. Primary energy, as mentioned above, is the energy needed to produce electricity. Primarily, electricity can be gotten via the usage of the five different energy sources mentioned above. Then the amount needed to produce the amount of electricity a nation needs is called primary energy. As in the past (and to some point still nowadays) the focus for energy laid upon fossil fuels the trend is now moving towards renewable energy sources and nuclear power. The International Energy Agency has set a target for 2030 which looks like the following compared to 2007: [1] | | 2007 | 2030 | | Oil | 34% | 30% | | Natural Gas | 20. 9% | 20. 5% | | Coal | 26. 5% | 16. 6% | | Nuclear Energy | 5. 9% | 9. 5% | | Renewable Energy | 12. 7% | 23. 4% | Table 1 Targets for 2030 [1] 2 Production and Consumption As the population and the industrialization worldwide are growing the need and demand for energy is growing as well. In the last century the need for energy dramatically increased, especially in last decades; from 1980 to 1998 the demand for energy of the total world increased by 32% and this number increased even more during the last

years. Countries with an exploding need for energy, like China, crave for quick solutions and therefore often invest into fossil fuels. For example China is currently following a plan to triple their number of coal fired plant in the next two decades. Source: http://www. whole-systems. org/oil. html Whereas many countries look for solutions using solar, wind and hydro energy especially in the third world there are many regions where people still cook and heat with completely different resources, namely biomass. The number of people in these developing countries relying on biomass is about 2. 5 billion and in many regions biomass stands for 90% of household energy consumption, which will increase to 2. 7 billion by 2030, representing one third of the world’s population. As the use of biomass is generally seen as sustainable and many nations try to use it as a renewable energy resource one could suggest that this number of people relying on biomass is good. However, what is not considered here is the way these resources are harvested and the circumstances several millions of people are exposed to while harvesting. About 1. 3 million people die every year due to exposure to indoor air pollution from biomass. A solution for this would be switching to modern cooking fuels and technology, however, these fuels and technologies are mostly non-available to the people due to per-capita income or infrastructure in the region. [2] 3 Renewable Energy Resources In the past decades humanity has polluted the planet a lot mostly due to the excessive usage of fossil fuels and CO2 emissions, meaning the greenhouse effect. Therefore and due to the scarcity of several resources the demand to use sustainable resources arose, these are also called renewable resources, because unlike fossil fuels humans are able to reproduce some of the

renewable resources, the others are able to reproduce them themselves. The mostly used renewable resources are wind power, hydro power, solar power, biomass and geothermal power. These five resources are going to be explained later on in this paper. [3] 2 Fossil Fuels and Carbon Emissions 1 De-Carbonization Trend As stated above, in the past (and to some extend still nowadays) a very big part of the energy sources are fossil fuels. Due to the mentioned pollution a trend of de-carbonization started and is now growing. The meaning of de-carbonization is quite simple, it deals with the reduction of the usage of fossil fuels to reduce the amount of carbon being used — hence the de-carbonization trend. With the reduction of carbon being used and therefore less CO2 emission the greenhouse effect would be reduced, which affected the global warming process in a positive way. Therefore the usage of energy sources which support the de-carbonization is attractive and many nations thrive towards it. With the usage of renewable resources this aim is possible. However, as the economy plays a huge role in the world we are living in and the switching to renewable resources will become competitive in 15 years the de-carbonization trend is only slowly growing. [4] In numbers; per year only 0. 3% of the used energy systems are replaced by systems causing fewer carbon emissions. So it will take some time until renewable energy sources become attractive also in economical matters, but regarding the topics of sustainability and global warming the issue of de-carbonization is already very urgent. [5] 2 Air pollution Anything that is blown into the air and can cause a damage in any thinkable way contributes to the pollution of the air. As a lot of energy is being won through burning various materials this issue is very important. To some people air

pollution does not seem like a very urgent topic, but the easiest visible form of air pollution is smog which can be found in larger cities. However, most cases of air pollution are not as visible as smog and therefore a sort of “ invisible danger". CO2 is the biggest issue of air pollution as it is generated by each breathing animal and by burning fuel or natural gas. Within the last 150 years humanity achieved a higher level of CO2 in the atmosphere than there has been in the last hundreds of thousands of years. All this contributes to the already several times mentioned greenhouse effect which influences the climate change on the planet and leads to global warming. As global warming affects the whole planet this is an issue that concerns all nations, which again is a driver for industries to act more sustainable than they have done in the past. To do so governments came up with various regulations and rules for nations and industries to limit their emissions. One of them is the Kyoto Protocol which will be explained in the following. [6] 3 Kyoto Protocol The treaty signed in Kyoto which was issued by the United Nations Framework Convention on Climate Change (UNFCCC, explained in detail later on) is known under the name Kyoto Protocol. This Kyoto Protocol binds 37 industrialized nations to fulfill targets by three market-based mechanisms: - Emissions Trading - Clean Development Mechanism (CDM) - Joint Implementation (JI) The term Emissions Trading stands for the following: Every nation was given set targets for their allowed emissions for a certain period, creating a new commodity — emission reduction / removal. Since CO2 is the number one greenhouse gas this is also called the carbon market and therefore all other emissions are transferred into one ton of CO2. The CDM allows nations to establish an emission-reducing program in a

developing country which also counts for reaching their set targets. The calculation is done by earning “ certified emission credits" (CERs) which are equivalent to one ton of CO2. The JI mechanism is used to encourage nations to work together on emission reduction. If one nation contributes in a project of another nation or executes the project they can earn “ emission reduction units" (ERUs) which again count for a ton of CO2 emissions. [7] The emissions of each partaking country are strictly monitored but when the set goals are not met no financial sanctions are executed, only a loss in welfare. [8] 3 Alternatives As explained, a trend towards non fossil fuel resources can be seen, the so called renewable resources 1 Energy 1 Wind Power Wind Power is one of the cheapest methods of alternative energy generation. However, to achieve a low market price, it requires a very careful feasibility study of implementation, analyzing the meteorological conditions about the area where the Wind Farm is supposed to be created. The environmental impacts are minimal, with no air pollution at all and no consumption of water. The constancy of wind in a specific spot is similar if we compare long cycles of time (year to year) however it may have a wide oscillation from day to day. Wind turbines convert the kinetic energy in moving air into rotational energy, which in turn is converted to electricity. Since wind speeds vary from month to month and second to second, the amount of electricity wind can make varies constantly. Sometimes a wind turbine will make no power at all. This variability does affect the value of the wind power, but not in the way many people expect. The ratio of actual productivity in a year to this theoretical maximum is called the capacity factor. Wind power plants have a low capacity factor 20-50% if compared with the Biomass and other thermo

plants. However we should remember that capacity and efficiency are not the same. Efficiency is the ratio of the useful output to the effort input. The mechanical conversion efficiency of commercial wind turbines is a fairly high, in the range of 90%. Wind power plants have a much lower capacity factor but a much higher efficiency than typical fossil fuel plants. A higher capacity factor is just one of many factors in judging a power plant as feasible, making investments more attractive. [9] 2 Solar Power The solar power is considered an expensive way of renewable energy generation. It turns solar light and heat into electric energy without emissions of gases or any other polluters during this process. However the solar cells industrial manufacturing emits greenhouse gases and cadmium. Cadmium in its metallic form is a toxic substance that has the tendency to accumulate in ecological food chains. The amount of cadmium used in thin-film PV modules is relatively small (5-10 g/m²) and with proper emission control techniques in place the cadmium emissions from module production can be almost zero. Current PV technologies lead to cadmium emissions of 0. 3-0. 9 microgram/kWh over the whole life-cycle. Since solar planes are not exposed to the sun light during the night, it requires some storage technology. Molten salt is an ionic liquid which due its thermo properties can storage the heat for longer times of periods including overnight. Other process of storage which can be applied for all the others energy plants is the pumped-storage hydroelectricity, which will be explained later. [10] 3 Biomass Energy Energy can be produced by thermo process using biologic fuel (solid or liquid) as combustive. Biomass energy is derived from six distinct energy sources: garbage, wood, plants, waste, landfill gases, and alcohol fuels. Although

biomass energy is renewable, using biomass as a fuel produces air pollution in the form of carbon monoxide, carbon dioxide, NOx (nitrogen oxides), VOCs (volatile organic compounds), particulates and other pollutants, in some cases at levels above those from traditional fuel sources such as coal or natural gas. Furthermore depending on the type of plantation it will require: water and fossil fuel consumption by tractors and machines used during the process. The production of biomass sources, when it is not garbage or biologic waste, competes directly with the agriculture, bringing it to a situation called Food vs. Fuel dilemma. Differently from solar and wind energy Biomass power plants have a high capacity factor with a plenty control over its production. It is possible to generate the amount of energy according to the peaks and dips of demand within a day. 4 Geothermal Energy It is possible to generate electric energy due the geothermal heating process. In some few cases it is not even necessary to go much deeper than 100 meters in order to found enough heat to move the turbine. However in the great part of the world it is necessary to go between 500 — 1, 000 meters deep in earth to reach enough high temperatures. It has a high capacity factor but with low efficiency. It means, just a small part of the high potential energy irradiated is converted in electricity. Some of the environment issues to be considered are the gases which are released at the process: carbon dioxide (CO_2), hydrogen sulfide (H_2S), methane (CH_4) and ammonia (NH_3). These gases contribute not only for the global warming but also for the incidence of acid rain. The constant bad small and non-stop noise can be also considered as polluter externalities for the social and ecological environment. Furthermore, the pumping hydraulic process, which consists in

pumping water to the pit in order to release the gases, can cause instability in the soil and even trigger earthquakes. Such adversity was already faced by New Zealand and Germany in the past. Doing an economic analysis, after the full creation of an energy plant, the geothermal electricity is the cheapest compared with others renewable energy sources. However, there is a high investment risk at the implementation process. The construction of a geothermal energy plant requires some geological studies of the possible areas to assure a feasible capacity of energy generation. [11] 5 Hydro Power Another well-known and world-wide implemented renewable energy source is the hydropower. It generates energy due the flowing of water from a river or water reservoir. The cost of hydroelectricity is relatively low, making it a competitive source of renewable electricity. It is considered a flexible source of energy which has a rapid responsiveness to the changes of demand. Hydropower plants emit a very low quantities of greenhouse gases and other polluters, however there are some environmental impacts created by them. In most of cases it is necessary the submersion of extensive areas upstream of the dams, destroying biologically rich and productive lowland and riverside valley forests, marshland and grasslands. The loss of land is often exacerbated by habitat fragmentation of surrounding areas caused by the reservoir, 40 — 80 millions of people worldwide had to be relocated due hydropower plants. The high vulnerability for natural catastrophes is also concerned by the implementation. The second largest hydropower plant in the world belongs to Brazil and Paraguay. It is located on the border from the two countries at the Parana River. On the time of it constructions, Argentina claimed for an interruption of the works based on national security reasons.

Argentinean government argued that in case of a natural or military catastrophe several cities located downstream of Parana River could disappear in a couple of minutes swallowed by the hydropower water. Apart from that the two neighbor countries would have plenty control at the volume of water from this important local river. 2 Hydro Storage proprieties When integrated with others renewable energy sources the hydropower permits the energy to be storage. If the production of energy cannot be stopped and there is a low demand for energy at the moment, this energy can pump the water to a higher reservoir which will be released when the demand for energy increases again. Figure 1 shows how a Pumped-Storage Plant looks like. [pic] Figure 1: Pumped-Storage [12] 3 Iceland — world’s first hydrogen economy Iceland has taken the first ambitious steps towards becoming the world's first hydrogen-powered economy. With 99% of electricity coming via geysers and hydroelectric dams, is politically committed to becoming the world's first hydrogen economy - cutting greenhouse emissions to zero, it hopes, within 30 years leading a global energy revolution. At the moment Iceland still need oil, this commodity is responsible for 35% from its energy demand, which are mainly needed in transport, fishing and metals production. Ironically, this make the country one of the world's higher per capita carbon emitters. However we should not think that the case of Iceland would fit to all economies. Liquid hydrogen is one of the most concentrated energy substances. It is important to remember that the storage of hydrogen is very dangerous. Furthermore the liquid state of this gas needs high pressure and very deep temperatures (-252. 88°C) to be very carefully manipulated. These conditions require a

special technology making for nowadays not possible to imagine a universal worldwide use. [13] 4 Car fuels Alternative car fuels are all fuels out of the traditional petro-diesel. We listed the following technologies: Air engine, Battery-electric, Solar, Dimethyl ether fuel, Ammonia fuelled vehicles, Biofuels (Ethanol, Biodiesel, Biogas), Charcoal, Compressed natural gas (CNG), Hydrogen, Liquid nitrogen car, Liquefied Natural Gas (LNG), Auto gas (LPG), Steam, Wood gas. Most of these technologies were developed and encourage by governments worldwide with the intention of reduce the oil dependency. This was the case of several countries from the called third world on the decade of 1970 and 1980. These countries had a high agricultural potential summed I high dependence o oil, the ethanol had a meaning of independency for them. The ethanol automotive technology is much older than we imagine, Ford motors developed the first car moved by ethanol over a hundred year ago. However since alcohol was forbidden in the United States in 1919, Ford was forced to leave this project. LPG and Biofuels are listed on the top of the rank of alternative automotive fuels. According to the LP Gas association more than 17 million LPG cars were sold in 2010. Although LPG is considered a green fuel due its lower exhaust emissions, we should not forget that it is a fossil combustive derivate from petroleum. [14] Climate In this chapter an overview about issues concerning climate and which affect climate change will be given. To limit the topic, the focus lies upon climate change only. At first definitions about the various terms are given. “ Energy is what you need, climate is what you expect and weather is what you finally get! " [18] 1 Definitions 1 Weather Weather is the day-to-day state of the atmosphere and its short-term (from hours to a few weeks)

variations such as temperature, humidity, precipitation, cloudiness, visibility or wind. [19] 2 Climate Climate is statistical information, a synthesis of weather variation focusing on a specific area for a specified interval. Climate is usually based on the weather in one locality averaged for at least 30 years. [20] 1 Climate Variability Definition 1: Climate variability refers to shorter term (daily, seasonal, annual, inter-annual, several years) variations in climate, including the fluctuations associated with El NiÃ±o (dry) or La NiÃ±a (wet) events. [20] Definition 2: Climate variability refers to variations in the mean state and other climate statistics (standard deviations, the occurrence of extremes, etc.) on all temporal and spatial scales beyond those of individual weather events. Variability may result from natural internal processes within the climate system (internal variability) or from variations in natural or anthropogenic external forces (external variability). [19] 2 Climate Change Definition 1: Climate change refers to long-term (decades or longer) trends in climate averages such as the global warming that has been observed over the past century, and long-term changes in variability (e. g. in the frequency, severity and duration of extreme events). [20] Definition 2: Climate change refers to any change in climate over time, whether due to natural variability or anthropogenic forces. [19] 2 Climate change 1 What Is Global Warming And Climate Change? Global warming and climate change refer to an increase in average global temperatures. Natural events and human activities are believed to be contributing to an increase in average global temperatures. [21] In the following graph the global temperature of the last 130 years is shown. Based on the years from 1960 to 1980 it can be seen that the temperature was rising steadily. [pic] Figure 2:

Global Temperature 1880-2011 [21] In the period from 1880 to 1935, the temperature anomaly was consistently negative. In contrast, since 1980 the anomaly has been consistently positive. The 1917 temperature anomaly (-0. 47 °C) was the lowest year on record. Since 1917, global temperature has warmed, with the most recent years showing the highest anomalies of +0. 6 °C in the past 120 years. [21] This is caused primarily by increases in “ greenhouse" gases such as Carbon Dioxide (CO2). [21] The greenhouse effect is very important when we talk about climate change as it relates to the gases which keep the Earth warm. Although the greenhouse effect is a naturally occurring phenomenon, it is believed that the effect could be intensified by human activity and the emission of gases into the atmosphere. It is the extra greenhouse gases which humans have released which are thought to pose the strongest threat. [22] 2 What Is The Greenhouse Effect? The term greenhouse is used in conjunction with the phenomenon known as the greenhouse effect: [21] - Energy from the sun drives the earth’s weather and climate, and heats the earth’s surface. - In turn, the earth radiates energy back into space. - Some atmospheric gases (water vapor, carbon dioxide, and other gases) trap some of the outgoing energy, retaining heat somewhat like the glass panels of a greenhouse. - These gases are therefore known as greenhouse gases. - The greenhouse effect is the rise in temperature on Earth as certain gases in the atmosphere trap energy. [pic] Figure 3: Greenhouse Effect [21] One of the most famous greenhouse gases is CO2 known as carbon dioxide. The concentration of carbon dioxide (CO2) in Earth's atmosphere has reached 391 ppm (parts per million) as of October 2012 and rose by 2. 0 ppm/yr during 2000—2009. [25] [pic] Figure 4:

Atmospheric Carbon Dioxide [25] It is used in photosynthesis (in plants and other photoautotrophs), and despite its relatively small overall concentration in the atmosphere, CO2 is an important component of Earth's atmosphere because it absorbs and emits infrared radiation. [25] 3 What Are The Main Indicators Of Climate Change? Figure 5 shows 7 indicators that would be expected to increase in a warming world and 3 indicators would be expected to decrease (and they are): [pic] Figure 5: Main Indicators of Climate Change [21] Beside the main indicators of climate change there are also indicators of a human fingerprint on climate change [21]: - Shrinking thermosphere - Cooling stratosphere - Rising tropopause - Less oxygen in the air - More fossil fuel carbon in the air - 30 billion tons of CO2 per year - More heat returning to Earth - Nights warming faster than days - More fossil fuel carbon in coral It can be assumed that humans contribute a lot to climate change. 4 What Are The Impacts Of Global Warming? 1 Rapid Changes in Global Temperature Increased greenhouse gases and the greenhouse effect has contributed to an overall warming of the Earth’s climate, leading to a global warming (even though some regions may experience cooling, or wetter weather, while the temperature of the planet on average would rise) [21]. 2 Small Average Global Temperature Change Can Have A Big Impact Even just a 2°C increase can have impacts around the world to biodiversity, agriculture, the oceans etc. [21] 3 Extreme Weather Patterns Most scientists believe that the warming of the climate will lead to more extreme weather patterns such as [21]: - More hurricanes and drought ((Super-Storms and Increase In World Hunger) - Longer spells of dry heat or intense rain ((Polar Caps melting and floods) Polar caps melting The polar caps are melting faster and faster. In

July of 2012 we reached the highest level ever (100, 000 sq. km a day). The rate of ice loss is faster than the models can capture and we can expect the Arctic to be ice-free in summer by 2050. This is because the ice-free season is far longer now. Twenty years ago it was about a month. Now it's three months. The consequences of losing the Arctic's ice coverage for the summer months are expected to be immense. If the White Sea ice no longer reflects sunlight back into space, the region can be expected to heat up even more than at present. This could lead to an increase in ocean temperatures with unknown effects on weather systems in northern latitudes. On the other hand longer ice-free summers are expected to open up the Arctic Ocean to oil and mining as well as to more trade. This will be good for the economy, but it will have unpredictable effects on social change. [24] Floods Flooding can cause a range of health impacts and risks, including: death and injury, contaminated drinking water, hazardous material spills, increased populations of disease-carrying insects and rodents, moldy houses, and community disruption and displacement. [26] 4 Ecosystem Impacts With global warming on the increase and species’ habitats on the decrease, the chances for various ecosystems to adapt naturally are diminishing [21]: - Rapid global heating according to a US National Academy of Science warning; - Dramatic increase in greenhouse gas emissions; - Ozone loss aggravated by global warming; - Ozone loss likely to aggravate global warming; - Warming of the oceans leads to increased greenhouse gases; - Permafrost thawing will aggravate global warming; - Oceanic changes observed that may aggravate the situation; - A vicious circle whereby each problem will exacerbate other problems which will feedback into each other;

- Massive extinction of species will aggravate the environmental crisis; - Sudden collapse of biological and ecological systems may occur, but will have a very slow recovery; - While effective measures can decrease global warming and other problems the World community has repeatedly failed to establish cooperation. 5 Rising Sea Levels Water expands when heated, and sea levels are expected to rise due to climate change. Rising sea levels will also result as the polar caps begin to melt. Rising sea levels will impact many coastlines, and a large mass of humanity lives near the coasts or by major rivers. [21] 6 Increasing Ocean Acidification These are the 3 main concepts [21]: 1. More CO2 in the atmosphere means more CO2 in the ocean; 2. Atmospheric CO2 is dissolved in the ocean, which becomes more acidic; and 3. The resulting changes in the chemistry of the oceans disrupt the ability of plants and animals in the sea to make shells and skeletons of calcium carbonate, while dissolving shells already formed. Organizations There are several organizations worldwide that try to make the situation regarding energy and climate better and more sustainable by setting targets and regulations for nations. In the following an overview over three of these organizations will be given. 1 GNESD The Global Network on Energy for Sustainable Development (GNESD) is a UNEP facilitated knowledge network of Member Centres and network partners worldwide, renowned for their work on energy, development, and environment issues. The main objective of GNESD is to work for reaching the Millennium Development Goals (MDG) by: - Strengthening the Members Centres’ ability to acquire, assimilate, and apply existing knowledge and experiences. - Working for a better understanding of the links between sustainable energy and other

development and environment priorities, and technology and policy options, leading to better articulation of practical policies that can be adopted so as to promote energy for sustainable energy. - Working to change government policies and programs, and private sector, investments, so that these favor energy for sustainable development approaches. - Promoting a communication infrastructure that provides a means for Members to share experiences and draw on each other’s strengths, expertise, and skills, and - Strengthened South-South and North-South exchange of knowledge and collaboration on energy issues of common interest. Member Centres and Associates coordinate joint activities within the fields shown above, exchange information, carry out analytical studies and supply policy support. GNESD thereby makes it easier for each Member Centre to provide environmentally sound energy policy advice supporting sustainable development. The work in GNESD is theme driven and carried out on the basis of ad-hoc Working Groups consisting of representatives from the participating Member Centres of Excellence. [15] 2 WMO The vision of WMO is to provide world leadership in expertise and international cooperation in weather, climate, hydrology and water resources and related environmental issues and thereby contribute to the safety and well-being of people throughout the world and to the economic benefit of all nations. The mission of WMO is to: - Facilitate worldwide cooperation in the establishment of networks of stations for the making of meteorological observations as well as hydrological and other geophysical observations related to meteorology, and to promote the establishment and maintenance of centres charged with the provision of meteorological and related services. - Promote the

establishment and maintenance of systems for the rapid exchange of meteorological and related information. - Promote standardization of meteorological and related observations and to ensure the uniform publication of observations and statistics. - Further the application of meteorology to aviation, shipping, water problems, agriculture and other human activities. - Promote activities in operational hydrology and to further close cooperation between Meteorological and Hydrological Services. - Encourage research and training in meteorology and, as appropriate, in related fields, and to assist in coordinating the international aspects of such research and training. [16] 3 UNFCCC The United Nations Framework Convention on Climate Change and the Kyoto Protocol are serviced by the secretariat, also known as the Climate Change Secretariat, whose mandate is laid out in general terms in Article 8 of the Convention. The main functions of the secretariat are to: - make practical arrangements for sessions of the Convention and Protocol bodies - monitor implementation of the commitments under the Convention and the Protocol through collection, analysis and review of information and data provided by Parties - assist Parties in implementing their commitments - support negotiations, including through the provision of substantive analysis - maintain registries for the issuance of emission credits and for the assigned amounts of emissions of Parties that are traded under emission trading schemes - provide support to the compliance regime of the Kyoto Protocol - coordinate with the secretariats of other relevant international bodies, notably the Global Environment Facility (GEF) and its implementing agencies (UNDP, UNEP and the World Bank), the Intergovernmental Panel on Climate Change (IPCC), and

other relevant conventions. Specific tasks include: - the preparation of official documents for the COP and subsidiary bodies - the coordination of In-Depth Reviews of Annex I Party national communications - the compilation of greenhouse gas inventory data. The growth in technical work needed since the adoption of the Kyoto Protocol (e. g. on reporting guidelines and the LULUCF sector) is leading to a trend of increased technical expertise within the secretariat. The secretariat is institutionally linked to the United Nations without being integrated in any program, and administered under United Nations Rules and Regulations. It now employs some 470 staff, including staff on temporary appointments, from all over the world. Its head, the Executive Secretary, is appointed by the Secretary-General of the United Nations in consultation with the COP through its Bureau, and currently holds the rank of Assistant-Secretary-General. The Executive Secretary reports to the Secretary-General through the Under-Secretary-General heading the Department of Management on administrative and financial matters, and through the Under-Secretary-General heading the Department for Economic and Social Affairs on other matters. As an impartial body of international civil servants, the secretariat is accountable, through the Executive Secretary, to the COP, CMP and subsidiary bodies and carries out those tasks that fall under its mandate in the Convention and program budget. The COP, CMP and subsidiary bodies will often request a specific assignment from the secretariat within this mandate, for example, to prepare a background study on a particular issue. The secretariat is guided in its work by the Bureau of the COP. Since August 1996, the secretariat has been located in Bonn, Germany. It moved from its previous location in Geneva, Switzerland,

following an offer from Germany to host the secretariat, an offer accepted by COP 1. Every two years, the Executive Secretary proposes a program budget, setting out the main tasks to be performed by the secretariat in the coming biennium and the funding needed to carry out this work. This proposal is considered in the Subsidiary Body for Implementation (SBI), which then recommends a program budget for approval by the COP. The program budget is funded by contributions from Parties, their shares being based on the UN scale of assessment. The secretariat's structure is kept under review to ensure that it responds to the changing needs of the climate change process. [17] Conclusion The current situation the world is in today needs a change in the way energy is being sourced. This change has been started and is very important. Not only due to the scarcity of resources such as oil but also due to issues such as pollution, greenhouse effect, etc. The process of global warming is not only affecting the temperature on the planet but has also other impacts, such as extreme weather conditions due to changes in the sea level, etc. These effects do not only harm natural habitat of animals but also endanger humans in populated areas. A first global try to reduce the amount of emissions caused by humanity that had noticeable effects was the Kyoto Protocol which has been adapted over the years. Worldwide 37 industrialized nations are partaking and consistently trying to reduce their amount of emissions or the one of others. Since then and even before a big number of various institutions and organizations worldwide has been showing up, all of them trying to make the situation concerning energy and climate better. The mentioned Kyoto Protocol was issued by one of these — the UNFCCC. The awareness about the scarcity of resources and that using

several resources causes or has an impact on the explained issues brought humanity in the direction of looking for renewable resources, alternatives for the one being used now. These alternatives have been explained in this paper and also their advantages compared to resources such as fossil fuels. However, when thinking economically renewable resources are still not competitive but will be in 15 years time, also developing nations still rely on oil, coal and others, massively contributing to the CO2 emissions worldwide. So the trend of using renewable resources is getting bigger and from year to year more energy systems are replaced by ones with lower or no contribution to the greenhouse effect. Organizations keep on setting regulations for companies and nations to continue drive this trend. Interesting in terms of the future development will be if the set targets of various institutions and the forecast will be proven true. Sources Source [1]: http://www. planete-energies. com/en/the-energy-of-tomorrow/the-energy-mix/the-energy-mix-definition-256. html Source [2]: World Energy Outlook 2006 by OECD / IEA Source [3]: http://greenliving. nationalgeographic. com/definition-examples-renewable-resources-2504. html Source [4]: http://www. iiasa. ac. at/web/home/research/researchProjects/ClimateGovernance. en. html Source [5]: http://www. ipcc. ch/publications_and_data/ar4/wg3/en/ch3s3-4-1. html Source [6]: http://environment. nationalgeographic. com/environment/global-warming/pollution-overview/ Source [7]: http://unfccc. int/kyoto_protocol/items/2830. php Source [8]: http://www. cicero. uio. no/fulltext/index_e. aspx? id= 3029 Source [9]: http://www. umass. edu/windenergy/publications/published/communityWindFactSheets/RERL_Fac

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