PREVENTING THE CLIMATE CRISIS: TESTING OUR COMMITMENTS

Al Gore, Our Choice, A Plan to Solve the Climate Crisis, New York: Melcher Media, 2009. 415 pages.

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Al Gore received a degree in government from Harvard University in 1969. Afterwards, he worked as a congressman and as a senator. In 1993 Gore was elected as the 45th vice president of the United States, and served for eight years. On top of all that, he and the Intergovernmental Panel on Climate Change (IPCC) were jointly awarded the Nobel Peace Price in 2007. That is quite a CV.

In Our Choice he powerfully argues that we have all the required technologies to prevent climate change. The only thing that is lacking is political will. The chapters of this book demonstrate Gore's technical understanding of the climate crisis. His explanations cover energy sources, living systems, ways to use energy efficiently, the obstacles we need to overcome, and a solution of how to effectively address the crisis. Shortly said, the readers of this book will be fascinated by Al Gore's knowledge in biology, engineering, economics, demography and of course politics.

One aspect that might not commonly be mentioned in a scientific review but I believe is unique of this book is the format. The book combines text - book style presentations of data with textual explanations of complex phenomena. It also includes hundreds of photographs with the quality rivaling that of the National Geographic.

The challenge of reviewing this book is that it consists of chapters covering different topics that can be read individually. Therefore, instead of reviewing each of the chapters separately, this review is structured to meet the purpose of providing a snapshot of the climate change debate and the progresses achieved. I will add perspectives that have not been covered in the already extensive explanation of Al Gore.

For that reason, the review is structured into several different sections. The first section explains Gore's main arguments and the consequences of climate change. Why is it crucial for us to reverse the current trends? The second part asserts about the options that are currently being developed. Some still require technological improvements while others only need a political commitment to be widely used. The third part of the review looks at the economic side of the coin. What policies have been developed, and what can be done at the macro and micro levels? The experience from Copenhagen shows that climate change is not only a matter of science but also of geopolitics. Therefore, a section is devoted to the geopolitical considerations affecting discussions on climate change. Without an agreement from China and the United States, an effective global agreement to reduce global warming will be held captive. The last section looks at the role of Indonesia which has made pledges at international forums. Are these commitments comparable to the realities on the ground?

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CLIMATE CHANGE, WHY SHOULD WE CARE?

"If you want to go quickly, go alone; if you want to go far, go together" - African proverb.

Gore urges us to do both at the same time, because the time is pressing to address the climate crisis. The three crises we are currently facing - the security crisis, the economic crisis, and the climate crisis - cannot be treated as separate pieces. There is one factor that is connecting the three, namely our dependency on carbon based fuels. These non - renewable resources endanger the world due to their potentials in negatively affecting the environment as well as their increasing scarcity (Gore 2009: 21) that triggers competition often among countries.

Al Gore is not alone in this position. In 2007, two Washington DC based prominent think - tanks, the Center for Strategic and International Studies (CSIS) and the Center for New American Security published a joint report titled The Age of Consequences: The Foreign Policy and National Security Implications of Global Climate Change, that is striking a similar tone. The authors of the report agree that the scarcity of natural resources and their vulnerabilities are closely interlinked. As natural resources become sparse they are more likely to become terrorist targets aiming at damaging a country's economy that are heavily reliant on those resources (CSIS, New American Security, 2007: 17). Moreover, the U.S. current account deficit is mainly caused by imports of foreign oil. For instance, during the first quarter of 2009 the U.S. current account deficit was at USD101.5 billion of which USD46 billion was due to imports of foreign petroleum and petroleum products (Gore 2009: 21), making an oil crisis an economic crisis for the U.S.

Scientists have also warned us of storms such as Hurricane Katrina that will become more frequent as climate change becomes more severe (Gore 2009: 350). Katrina created human casualties as well as destroyed infrastructures. The cost of the damage reached USD80 billion, about 1.800 people were killed and about 70.000 soldiers were mobilized. Something that Council of Foreign Relations (CFR) scholar Joshua W. Busby identified as additional burden that spread resources even thinner in a time when the United States had to cope with the security challenges in Iraq and Afghanistan (Busby 2007: 1). This shows that climate change is threatening even the most powerful countries.

The danger will even be greater for poorer countries. The Maldives, for example, is predicted to be inhabitable by the end of the century. In order to raise international awareness of climate change and to stimulate progressive discussions in Copenhagen, President Mohammed Nasheed conducted a cabinet meeting under water in 2009 (BBC 2009). Unfortunately, the immediate results of Copenhagen were far from his expectations.

Africa as whole only contributes to 3 - 4 percent of emissions in the world, but the capacities of African countries to respond to the changes triggered by climate change are among the weakest in the world (Severino 2009). Countries in sub - Saharan Africa are currently already under stress due to food shortages, diseases and conflicts. All

these can be exacerbated by climate change, and weak governments will face difficulties in managing the risks. Quoting Secretary General of the United Nations Ban Ki - moon, Gore elucidates that droughts that have reduced the water capacity of the Lake Chad triggered massive migrations of Chadians into Sudan, placing additional strain on the competition for resources in the conflict ridden the and arid land of Sudan (Gore 2009: 240). This is the injustice of climate change, it is driven by industrialized countries, but affecting developing countries most.

Also, in many poor countries slash - and - burn agricultures pushing into forest areas significantly reduce the capacity of forests to absorb CO2 and lead often to diminishing rainfall which in turn cause freshwater shortages (Gore 2009: 231). In 2009, thousands of the population of Mexico City did not have access to water due to low levels of rainfall during that year. Rising temperatures also reduce the survival capabilities of trees. The University of Arizona finds out that due to temperature increases trees are more vulnerable during droughts. Furthermore, the research of the University of Tel Aviv shows evidence that temperature increases are likely to increase the numbers of lightning strikes and thus is a potential to increase forest fires (Gore 2009: 188).

Another dangerous effect of climate change that has not merited sufficient attention in Our Choice is the relationship between climate change and human health. The first IPCC report in 1991 only meagerly addresses this relationship. Yet, the effects of climate change for human health has gained more prominent attention these days. Already the second IPCC report published in 1996 devotes a whole chapter on this issue. The World Health Organization (WHO) asserts that climate change can directly affect human health through impacts of thermal stress, or death and injuries acquired during floods and storms. At the same time, climate change also indirectly threatens human health through vector born diseases, water and air quality, as well as food availability (WHO 2003: 11). Malaria which has been killing around 1 million people / year is predicted to experience a 14 percent increase due to climate change in 2030. Moreover, climate change is also projected to double the percentage of people at risk from dengue from 30 percent to 60 percent by 2070 (World Bank 2010: 97).

Despite all the above risks, calling for adequate political collective will to address climate change will be a challenging task. The Stern Review on the Economics of Climate Change a widely quoted report commissioned by Sir Nicholas Stern, an academic from the London School of Economics (LSE), shows the scientific consensus that the increase of greenhouse gases is profoundly influenced by human activities (Stern 2006). However, science often has its limitations in setting people's perceptions. Using a polling by the Pew Research Center for People & the Press titled "A Deeper Partisan Divide Over Global Warming", Al Gore explains how political affiliations affect people's opinion on climate change. Seventy five percent of Democrats believe that humans are causing global warming, whereas only 19 percent of Republicans share that opinion (Gore 2009: 352). In conflict ridden countries and in poverty stricken areas climate change is also less likely to become a priority. The main concern of people will be their day to day survival. For politicians, climate change is becoming a more urgent issue these days. However, the devastating effects of climate change will only be felt in the distant future, beyond the next election cycles. This factor significantly reduces the urgency in addressing climate change. According to Gore, Hurricane Katrina which wrecked havoc in the state of Louisiana did not get the politicians to become more sensitive on climate issues (Gore 2009: 350).

Despite these grim circumstances, Gore provides us with a shimmering light of hope. There are technological innovations that will assist us in coping with this universal threat. The next section discusses the plus and minuses of the currently available options. The question is; will they be developed in time to help us and the next generation?

THE TOOLS IN OUR HANDS

Renewable energy options must be explored because currently the world is relying on the same basket of fossil energy. Oil especially, is located only in a number of pockets in the world. A disruption in one area could destabilize overall supply. In addition, the volatility of oil prices makes it difficult to conduct long term planning. Oil went from USD147 / barrel in 2007 to only USD33 / barrel in 2008 (The New York Times March 25 2010). Luckily some new options are available.

Generally speaking, renewable sources of energies will be cheaper than our main current sources because of three reasons (Gore 2009: 58)

• Once the required infrastructure is available, the fuel will be available for free. Unlike non - renewable energy sources such as oil and coal, wind and sunlight will always be available for us.

• The technologies to tap into alternative energy sources are still in development. Therefore, it is very likely that they will become more efficient in the future.

• Once there is an effective global commitment to shift toward renewable energy, the volume of production will automatically reduce their costs.

Writing in Foreign Affairs, S. Julio Friedman and Thomas Homer - Dixon argue that energy efficiency will never be sufficient in helping us dealing with our energy needs, because efficiency has increased only by two percent annually over the last 20 years while global economic growth has grown over 3 percent (Friedman & Homer - Dixon 2004: 74). But, precisely for this reason, we cannot afford to rely solely on energy efficiency, but must go the long road of exploring renewable energy sources.

Solar power. Until today, oil, coal and natural gas still contributes to 86.5 percent of our energy source. All the energy that is contained in all the oil, coal and gas supplies in the world are comparable to the energy that the world receives from the sun in only 50 days. However, there are basically two main problems for solar power. First, it is facing what Gore calls as the "intermittency problem". Despite the fact that the energy is available for free, it is not available at all times. Sunlight is not available during the night, and clouds during the days are limiting the electricity produced from solar power, making it a challenge even for Jakarta to be exclusively reliable on solar power. The challenge will intensify if we look at the degree of sunlight that cities such as New York, London, Moscow and Tokyo receive. Solar panels are used to capture sunlight and to turn it into energy. However, each square meter of panel only receive a little power every day. To power Tokyo solely from solar energy would require an area as huge as the Honshu islands to be covered with photovoltaic cells (Friedman & Homer - Dixon 2004: 77).

In his book Gore pointed us towards a technology development in solar power that must be appreciated. Nowadays, there are two different methods for creating electricity from sunlight. The first method is known as concentrated solar thermal (CST). Here, sunlight is used to heat liquids which turn to steam and move electricity generators. CST plants are huge and need a large installation of steel, glass and concrete. The second method is known as photovoltaic (PV). The energy in the sun's photons will set free electrons in the PV cells creating an electrical current leaving the PV cell. As mentioned above, CST needs a lot of materials which are not available in huge stocks. The costs of PVs, alternatively, which are made from silicon, the most profuse substance on earth after oxygen, are less likely to decrease when production is scaled up. Gore also explains that doubling the production volume of PVs has led to a decrease of 20 percent in its cost. Photovoltaic cells can also be deplored on roof tops to produce electricity for homes. It can become especially effective if combined with "net metering" that allows people to sell electricity to power grids at a time when electricity is not needed. The Paul VI audience hall in the Vatican is one of the buildings today that use PVs as one of their electricity source.

Gore further explains that the intermittency problem of solar energy can be mitigated by creating a national smart grid that compensates lost energies from minimal sunlight by solar energies in brighter places. However, solar energy is still expensive. Consecutively, costs can only be reduced through government policies that compensates for the difference in cost between solar energy and fossil fuel. California, for instance, under the leadership of Arnold Schwarzenegger has promulgated laws that require buildings to obtain their energy from renewable sources. China and Taiwan are beginning to build competence as a PV producer.

Wind. Windmills, the trade mark of the Netherlands, are utilizing on the wind to grind wheat. Today wind is utilized to produce electricity. The development of wind technology began in 1973 and 1979 when oil prices hiked.

"Wind farms" the term used to describe an area filled with giant towers (45 to 105 meters) equipped with three giant blades (27 to 45 meters), a rotor and an electric generator can be seen in a number of areas in the United States and Europe. Areas where the wind blows at over 15 miles / hour are the most suitable ones for wind farms.

The technical challenge for wind technology is that the best places to get a strong wind are usually far from population areas. The most wind farms are still located on land. However, there are efforts to shift towards offshore locations, because on the flat surfaces of the oceans, the wind can blow unhindered. Windmills can also be placed above oil platforms creating additional sources of energy. Transmission cables are used to carry the electricity back on land. It turns out that they are quite inexpensive and countries like United Kingdom, Ireland, the Netherlands, Denmark, Sweden and China are nowadays relying on offshore wind as an alternative renewable energy source. Yet, like solar power, windmills are also facing the intermittency problem. Lack of wind leads to lack of electricity.

Geothermal. U.S. Secretary of Energy Stephen Chu asserts that geothermal energy is "effectively unlimited". Yet, as compared to solar and wind, geothermal energy is still the least understood. In general, people still have the perception that geothermal energy is only available in specific locations where hot water bubbles spring to the surface. Gore compares this phenomenon with the past when people believed that coal and oil were only available in the small volume that could be found at the earth surface. The UN World Energy Assessment Report elucidates that the energy from geothermal resource is equal to 280.000 times the annual consumption of primary energy in the world.

Unlike wind and solar, geothermal energy does not have an intermittency problem. Once the plant is in place, the energy will be available all the time. It also does not create CO2 emissions like fossil fuels. The best locations for geothermal power point is the "Ring of Fire" which stresses from the eastern coast of New Zealand to Samoa, Papua New Guinea, Indonesia, Philippines, Japan, North America, Central America and the western part of South America. Another suitable spot is the where the heat from the magma in the earth mantle finds its way to the surface as is the case in the Yellowstone National Park (Gore 2009: 98).

Geothermal sites usually have a sufficient amount of water underground and permeable rocks where the water could circulate and absorb heat. The energy is drawn from hot water or hot steam. Recent developments in technology enable us now to exploit energy from sites with less water. The new technology is known as Enhanced Geothermal Systems (EGS). Water is pumped into the earth and returns as hot steam or

very hot water which can be used to move turbines to create electricity. However, special care needs to be given to the drilling process. A company that tried to tap into geothermal energy caused an earthquake at the scale of 3.4 in Basel, Switzerland.

Despite being located on the Ring of Fire, Indonesia is behind in geothermal energy. Exploration of geothermal energy was initiated in 1972 through the cooperation between Pertamina, the French, and the New Zealand government. The ITB elucidates that geothermal explorations require a high level of funding and contain a high degree of risks. In order to be profitable, the site must be able to create steam for 25 - 30 years. The electricity must also be transferred to consumers which would need additional installations. The Indonesian government has made commitments to scale up geothermal energy from 807 MWe in 2005 to 9500 MWe in 2025 (ITB 2008: 14).

Biofuel. This is probably the most popular, yet at the same time the most controversial renewable energy source. The U.S. army, for example, is now testing an F/A -18 aircraft that is running on biofuels which is considered to be 4 percent more efficient (The New York Times, March 25 2010). At the same time protests from the civil society are occurring because the growing need for biofuel is impinging on the land rights and food security of the poor (The New York Times, April 5 2010).

Is biofuel really that effective in preventing climate change? Al Gore answers a very crucial question in regards to biofuels. He asserts that "full life cycle analyses are necessary to accurately determine which approaches are truly beneficial in solving the climate crisis" (Gore 2009: 114). He further explains that although biomass is renewable, - because the energy stored in plants is derived from sunlight, and the plant can always be replaced by another - the process of transforming a plant into energy often requires nonrenewable fossil fuel.

Contrary to popular believe, biofuel still has a number of weaknesses. The first generation of ethanol (one of the biofuels) is created by converting corn, palm oil, soy and other food crops. The diversions of cropland from food production to biofuel production have led to the increase of food prices. This diversion has exacerbated the effects of the prolonged drought in Australia which reduced a considerable amount from the world's food production. Water provision is another challenge.

In the refining process, one gallon of ethanol requires four gallons of water which is more required than the refining process of gasoline where only one and a half gallon of water is needed (Gore 2009: 120). Though corn plantations in the U.S. traditionally use rain water, the increase of production of biofuel has led to expansions into other areas making water provision for ethanol production a challenge.

Fortunately, the next generation of biofuel is within our grasp. Instead of food crop based it will be based on perennial grasses such as the switchgrass and the miscanthus, thus, reducing the strain on food prices. Using switchgrass has the benefit that regular harvesting of switchgrass increases the soil's sequestration of carbon. Moreover, unlike food crop, the second generation biofuel does not require petroleum based fertilizer and so is more effective in reducing climate change.

Carbon capture and sequestration (CCS). The basic idea of CCS is to capture CO2 in the atmosphere and to store it deep underground or at the bottom of the ocean. However, a technical obstacle looms. Until today, scientists are not yet sure about the most appropriate locations for storing CO2. They are also uncertain about the level of CO2 that can be stored underground. Gore describes that if all CO2 produced by coal electricity plants in the U.S. would be captured and turned into liquid forms to be stored in repositories, the volume would be equal to 30 million barrels of oil per day, or equivalent to three times the daily imports of oil by the U.S.. At the same time he warns that CCS technology is still in its formative stage. Therefore, people must be cautious about oil companies making the claim that CCS will be widely available in the near future. Often, this information is only used to build opinion that there is already a way to mitigate the risks of burning fossil fuels.

Public opposition is another obstacle that CCS projects must deal with. In the Netherlands a site for CCS has been blocked due to protests from people in the vicinity. The town council considered that the site is one of the most populated areas in the Netherlands, and thus the ExxonMobile - Royal Dutch Shell joint venture has been put on a hold.

Since CCS is a relatively recent initiative, it often still lacks a robust legal component. A paper by Harvard University explains that from

19 CCS sites, 11 have legal issues. Projects with the capacity between 2.000 - 10.000 tons and above 10.000 tons of injected CO2 are dealing with some sort of legal barrier. A project in Thornton, California for instance was not able to ensure that the injected CO2 is not violating the boundaries of the site (Hart 2009: 19). Beating the technical, legal and public opinion barrier will be crucial if CCS should play a major role in reducing CO2.

Nuclear power. Compared per pound, uranium contains 3 million more energy than coal. Therefore, the idea of using uranium as a source of energy was attractive in the past. Nevertheless, citing an MIT study Gore explains that it is improbable that nuclear power will be a source of energy to replace fossil fuels.

Generally speaking, public opinion on nuclear power is often negatively shaped by the experiences of the Three Miles Island in Pennsylvania, and the Chernobyl accident in 1986. Also, there are still disputes about the storages of nuclear wastes that are going to be dangerous for the next thousands of years (Gore 2009: 155).

There are other issues that are more technical faced by the nuclear industry. The cost for building a nuclear plant has increased dramatically. In the 1970s, it would cost USD400 million to build a plant, today the necessary cost is around USD4 billion. The cost for building a nuclear plant is increasing at a rate of 15 percent per annum. The length of time for regulatory approval for building a nuclear plant also adds to the costs of building a nuclear plant. The decline in nuclear power is also disencouraging engineers to have a career in this sector. In the U.S., about a third of engineers will retire by 2012, making a transfer and production of knowledge in the nuclear industry a challenge.

Pessimism is affecting the whole spectrum of the nuclear industry. Suppliers are unwilling to manufacture parts unless there is a demand. Utilities will not purchase parts unless investors are ready with the funding. But, investors are also hesitant to provide funding if there is a short of supplies in the market which could lead to a postponement of the whole process as well as increased prices. Lack of standardization among reactors is another impediment which has added to the cost and effectiveness of maintenance.

Should more energy be provided through nuclear power, more nuclear reactors must be build. But, in addition to the above mentioned reasons, the world's ability to process and mine uranium is also still very limited. Some proponents of nuclear power have offered the option of reprocessing spent fuel to create new supplies. Yet, this option too has led to another hindrance, namely proliferation. Reprocessing will increase the availability of uranium which can be acquired to build nuclear weapons. Graham Allison, an expert on nuclear proliferation and terrorism from Harvard warns that unless safeguards are improved, the probability for terrorists to detonate a nuclear weapon in a U.S city will reach 50 percent in the next 10 years.

Lastly, not every country will have access to nuclear technology. The recent U.S - India nuclear deal was considered highly controversial since India is not a member of the Nuclear Non - Proliferation Treaty. Therefore, nuclear power is unlikely to play a major role as our renewable energy source.

"A bad workman blames his tools", a proverb says. By reading Gore's explanations about our options in reducing climate change, we can conclude that Al Gore is definitely not a bad workman. He realizes that a lot of technologies would need improvements in order to be more efficient and to fully utilize renewable energy sources, yet for him the glass is more than half full.

SUSTAINABLE ECONOMICSECONOMIES

"It's the economy stupid" says a reminder on the wall of Bill Clinton's office during the 1992 campaign. The economy has been the epicentrum of political debates between socialism and capitalism (Heywood 2002: 177), and because climate change is political, it is not exempt from the influence of economics. The cost of stabilizing CO2 emissions (CO2e) at 500 - 550 part per million (ppm) is estimated to be at 1 percent of GDP in 2050 (Stern 2006), a cost that is not cheap but should be affordable. The Copenhagen commitment stipulates that USD30 billion should be made available in the period 2010 - 2012 for adaptation and mitigation measures. A number that seems trivial compared to the hundreds of billions spent to save the banks from the U.S depression (Stiglitz 2010).

The economics of climate change is explained in Chapter 15 of the book. Gore shares the opinion of Sir Nicholas Stern, that climate change is the greatest market failure in history. This failure must be fixed and governments have allocated resources to cope with the dangers of climate change. But, Gore's powerful point is that to make climate change prevention a sustainable effort, there must be a paradigm shift in the economy that takes into considerations the environment. Only the market will provide sufficient resources for mitigation and adaptation. Don J. Melnick, a conservation biology professor at Columbia University asserts, "We can't get money into funds for starving children and people with AIDS. So getting money for trees is complete fantasy" (CFR 2009). The market will touch every aspect of climate change, from carbon tax, cap - and - trade system, the carbon market and many more.

So, the questions are: (1) what are the driving forces of emissions in the current market? (2) how do we utilize our economic tools to deal with these factors? In answering the first question, Gore points at fundamental flaws in our economies. Pollutions that create severe environmental damage are often merely treated as negative "externalities". He ironically asserts that the odorless and invisibility of CO2 has made it also undetectable to market calculations. We have taken for granted the fact that we are dumping 90 million tons of CO2 every hour in the atmosphere.

The Gross Domestic Product (GDP) he explains is another impediment in calculating the costs. The GDP which was invented around the 1930s takes into considerations produced goods and services, and capital goods, yet neglecting environmental costs and human resources. Therefore, the GDP is an inadequate tool to measure human well - being. If we have a price on carbon, this externality will be more visible to the market and will be taken more seriously in our economic decision making.

The environmental bubble the author argues is comparable to the subprime mortgage bubble that threatened the U.S. and many other countries about two years ago. In the mortgage bubble, for decades the market has accepted bad mortgages which are collected and sold as securities. What recently occurred was that the market suddenly realized that securities with triple - A ratings are actually bad mortgages. In the

environmental bubble, people has not yet realized about the toxic assets behind their economic transactions (Gore 2009: 330). Repeatedly, we also have failed to calculate the full cost of using fossil fuels. For instance, the expenditures for the U.S. military guarding the Persian Gulf are not calculated in the price of oil.

Furthermore, Gore also points to the attitude of current markets that emphasized on short term interests. In the 1950s, people have the tendency to hold to their bonds for seven years. Today people only keep their bonds for about six months. Many experts explained that most of a corporation's true value is determined within five to seven years. Thus, the six months holding period today shows that investors have other motivations in mind than investing in a good company.

Lastly, vested interest by governments and oil companies have build opposition towards the development of renewable energies. The bloc of countries known as the Organization of the Petroleum Exporting Countries (OPEC) has the interest of controlling oil production and thus influencing a higher price of oil, and at the same time is also strategically utilizing their funds to influence decisions in the West that supports the development of technologies for renewable energies. Combined with the power of the oil lobby in each country, this interest group is quite powerful in influencing political decisions.

The second question is more complicated to answer, because what is expected from us is to reduce global emissions while at the same time maintaining the level of economic growth. The McKinsey Global Institute, the research arm of McKinsey the consulting company, is reaching the same conclusion as Gore. Both agreed that with a role from governments and businesses these dual goals are achievable. McKinsey in an earlier report recommends that governments must create incentives which reward energy efficiency. Governments must also cut energy subsidies that hamper efficiency (Farrell et.al, February 2008: 25). Still, this is easier said than done, since the popularity of an incumbent government often depends on the price of energy, especially on the price of oil.

Gore and McKinsey also have their differences. Being a politician Gore focuses more on policy measures and macro economics to counter climate change whereas McKinsey having the experience of consulting

companies also touched on the micro processes required to reduce CO2 such as innovations at the company level and consumer behavior.

The McKinsey report argues that in order to reduce emission and maintaining the level of economic growth we must improve carbon productivity, a concept that stresses on the amount of GDP produced per unit of CO2e (Beinhocker et.al, June 2008: 4). In our history, we have the experience of increasing productivity. During the Industrial Revolution, labor productivity in the U.S. increased ten times from 1830 to 1955. Carbon productivity is comparable to labor productivity if the instruments are in place.

What are the instruments? The first element for improving productivity is innovation. Henry's Ford innovation, the T - assembly line revolutionized the way people work and boosted productivity to a new level. The second component is the regulatory environment created through government policies. The U.S. government improved property rights, and thus enabled businesses to make long term planning. Consumer rights were also protected, ensuring people of the products they buy, and thus creating more demand (Beinhocker et.al, June 2008: 13).

Approaching the issue of climate change from the perspective of business, McKinsey also points to the behavior of managers of consumers. Though not seating at the negotiation table at UN international meetings, they are a key player in limiting global CO2 emissions. The report cites the case of laundry detergents which sales are determined by shelf - space and consumers' perception of the product's value. Detergent companies have therefore the motivation to mix detergents with "fillers", ingredients with no cleaning functions which increase the size and make the packaging look bigger. Concentrated detergents without fillers are predicted to have 20 percent lower CO2 emissions due to their reduced weight making transportation lighter thus saving gasoline and materials through a smaller packaging. Wall - Mart has made commitments to sell concentrated detergents only and will so save more than 400 gallons of water, 125 million pounds of cardboard, 95 million pounds of plastic resin and additional energies needed to transport and manufacture the materials (Beinhocker et.al, June 2008 : 36).

Consumer behavior merits a special attention because it has succeeded to some extent in keeping the environment at a balance. Naomi Klein

hinted at another strategy in enforcing environmental sensitivity, namely boycott. In 1995, Shell intended to sink its oil - storage platform known as Brent Spar in the bottom of the Atlantic Ocean near Scotland. However, boycotts of Shell products in Germany, Britain, Denmark and Austria forced Shell to finally dispose Brent Spar on land (Klein 2000: 380 - 382).

Lastly, the carbon tax as well as the cap - and - trade system merit special attention because they have become the most well known economic tools for reducing CO2 emissions. The carbon tax is an instrument under which parties must pay a fixed fee to the government for each ton of disposed greenhouse gas. The cap - and - trade system is a scheme where the government issues a certain number of permits which are distributed among entities. These permits are tradable, and so more effective companies are able to sell their remaining permits to others. Support for these two instruments is divided into two camps. Environmental advocates usually prefer the cap - and - trade system since it gives a limit to the level of emission that a country can emit. Economists usually prefer the carbon tax since it would be easier for companies to integrate it into their planning (Pataki, Vilcak, Levy 2008: 35). Gore is the position that both measures must be implemented. Sweden, the most successful country in reducing CO2 emissions is currently implementing both approaches successfully. Yet, as will be seen on the section on forests, reducing CO2 emissions will be hard for developing countries because of the absence of the necessary infrastructure.

When in the past socialism saved capitalism from its demise by making the necessary revisions to the system, today the task falls on environmentally friendly technologies and approaches. As Gore puts it "we need to return to a more sustainable capitalism."

THE DOMESTIC AND INTERNATIONAL POLITICS OF CLIMATE CHANGE

Al Gore focuses on domestic politics and the efforts by the oil lobby in the U.S. to influence the policy process to their own benefit. However, international politics and competition among countries is another factor holding sway over international agreements. Therefore, this section will explore the domestic and international impediments for climate change.

In an interview with the CFR, Harvard environmental economist Robert Stavins points on the fact that until today the Obama administration lacks a climate bill. Climate change priorities are in conflict with energy security policy. Recently Obama has declared that in order to ensure energy security for the United States, he is going to support more offshore drilling and natural gas, a policy that is rational from an energy standpoint, but nonsensical from an environmental perspective. Stavins argues that under current circumstances the U.S. will not be able to meet its 17 percent reduction from 2005 levels in 2020 as is affirmed in the Copenhagen agreement (Stavins 2010).

National interests often trumps international agreements, and the examples are many. Clinton for instance signed the Kyoto Protocol in order to be able to sit on the negotiating table with other countries, but did not submit the Protocol to the Senate to be ratified. The U.S. argument was in the position that it did not want to agree on mandatory emission limits if India, China and other countries do not share the same responsibility (The New York Times 2009), because the Kyoto Protocol only stipulates emission targets for developed countries (known as Annex I countries in the Protocol).

In chapter 16 of Our Choice Al Gore mainly emphasizes the disinformation spread by the oil lobby on the scientific findings of climate change. The intensity of the oil lobby can be seen from the USD90 million that was spent in 2008 for climate lobbying. In addition, each member of the House and Senate must deal now with an average of four climate lobbyist. Similar to the tobacco industry in the past which was trying to spread confusion on the medical consensus that smoking is dangerous for health, the oil lobby now is trying to create the perception that climate change is not occurring, or even if it occurs, there is nothing to be done about it. In 2007, ExxonMobil offered USD10.000 for every paper that was able to dispute the findings of climate science. Yet, papers produced by the deniers are usually far from the truth because they are not published in peer reviewed journals. The Royal Society of London publicly requested ExxonMobil to stop their black campaign against climate science. A study by Dr. Naomi Oreskes at the University of California, San Diego reviewed all paper in the last 10 years on global warming. All of the 928 reviewed papers do not dispute the truth of climate science (Gore 2009: 360).

The oil lobby had a stark influence during the government of George W. Bush. Bringing in Philip A. Cooney, a climate science denier from the American Petroleum Institute to take care of climate policies in the White House, the administration managed to edit government reports in a way that were lenient towards the oil industry.

If domestic politics is hampered by vested interest, how does the debate look like at the international level? Discussions on climate change will only move forward if both China and the United States are willing to make concessions. China has been reluctant especially on the monitoring of emissions within their country, considering this as foreign intervention into their national sovereignties. China's reluctance is one of the impediments in finalizing the climate bill in the U.S. (Friedman 2010) since the U.S wants verifiable measures from China. The United States on the other hand, must also deal with its legacy of distrust since it has not signed a binding agreement that restricts its emissions for a long time.

The situation at the international level is at best mixed. Experts have expressed disappointments towards the Copenhagen accord. "The expectation went from sky high to rock bottom", CFR's Michael Levy asserts (Levy 2010). On the deadline of January 31, only 55 out of 194 countries have submitted the national action plans to curb global warming. Is a sustainable future beyond our grips?

Fortunately, there are some delightful developments. According to the Forest Transition Theory (CIFOR 2008: 104) only countries in their initial stages of developments have a declining forest level. Industrializing countries like China and India are increasing their level of forests. China has also received a significant amount of Clean Development Mechanisms (CDM) projects from developed countries. China is currently in the forefront of aforestation and reforestation programs. It has planted 2.5 times more trees in the past years than the rest of the world combined. Moreover, China is also investing USD440 billion in clean energy technology. The Obama - Hu meetings in Washington this year seems to have created an atmosphere for more constructive discussions (Friedman 2010).

The recent economic crisis was suspected to create a "climate change realism" (Haas 2009) where the U.S. and developing countries were

going to cling on to their economic growths at the expense of reducing global warming. Yet, the picture looks much better for us. The economic stimulus given by the United States, for instance, was targeted to create "green jobs" (Gore 2009: 319). We can conclude auspiciously that the picture is not as bleak as some of us would think.

INDONESIA: HOLDING ON TO THE PRESIDENT'S WORDS

Nusa Dua, Bali, December 2007. Discussions on the Bali Road Map met a deadlock and President Yudhoyono gave a speech that was appreciated with a standing ovation by the international audience. "The world is watching. I beg you: DO NOT let them down", he concluded (Djalal 2008: 361). Hopefully, Indonesia is not letting the world down.

Chapter 9 of Our Choice speaks about forests and deforestation. If I have to cherry - pick one chapter in this book that is most useful for Indonesia, this chapter would be it. Sixty percent of deforestation in the world is occurring in two countries, Brazil and Indonesia. Chief amongst the cause for deforestation is slash - and - burn agriculture (Gore 2009: 172) that converts forest into areas for plantation agricultures, cattle ranches and subsistence farming. Gore warns that deforestation in Indonesia can even be more treacherous than the other one occurring in Brazil, because despite the faster pace of deforestation in Brazil, Indonesian forests have carbon - rich peatlands that emit huge numbers of CO2 when put on fire, causing Indonesia to emit twice as much CO2.

Forests have two main functions, sequestrating CO2 and preserving biodiversity. These "ecosystem services" that forest are providing us have the effects of reducing extreme temperatures, reduce soil erosions, supply clean water, prevent desertification, provide a habitat for wild life, and many more. Gore asserts that protecting and increasing the percentage of forests would depend on governance issues such as tackling corruption and improving law enforcements to reduce the degree of illegal logging and land clearing.

Gore elucidates that criticisms from developing countries today are based on the fact that North America and Europe already had their chances in deforesting their own territories in order to feed energy into the economic growth. Yet, they are demanding today that developing countries maintain their forest. Some sort of compensation must be hammered out to bridge the diverging interests. In the long run,

compensating countries for maintaining their forests areas to reduce global emissions can be done by linking their carbon abatement level to global carbon markets like the European Union Carbon Trading Schemes or to the U.S. carbon market. Though the problem is quite clear cut, compensating developing countries to maintain their forests face some technical impediments as Indonesia's experience shows.

Should Indonesia receive compensations from other parties for reducing the world's CO2 level, then buyers would like to know about the level of abatement received. The mechanism for this process is known as Reductions of Emissions from Deforestation and Forest Degradation - plus (REDD +) and is stipulated in the Copenhagen accord. The + sign designates the "enhancement of forest carbon stock" (Angelsen, ed. 2009: 2) which is not emphasized very much by Gore, but luckily is the central research competence of the Bogor based Center for International Forestry Research (CIFOR). The problem is that the monitoring, reporting and verification (MRV) process which determines the level of CO2 abatement turns out to be quite complicated.

The first impediment is the cost. Experts agreed that to reduce deforestation up to 50 percent of its current level would require funding for compensation between USD17.2 billion USD28 billion annually (Angelsen, ed. 2008: 25) which can be provided from private sources as well as government aid. Current official development assistance (ODA) level for REDD + however is only USD2 billion.

This financing gap can be reduced once all the MRV mechanisms are in place and Indonesia is integrated into the world's carbon market. This leads us to the second barrier for REDD +, namely the upfront costs for MRVs which include among others cost for training, for estimating the total carbon cost, and ensuring that there are as little leakages as possible from REDD +. Leakages can occur for instance when plot A is compensated for delivering REDD + purposes but plot B which was a forest area is converted for farming purposes. Preventing global leakage is even a harder challenge. The Ecuadorian government once made a proposal known as the Yasuni proposal where the international community was requested to provide an annual sum of USD350 million over a 20 years period to compensate Ecuador for not utilizing the oil reserves below their Yasuni national park. Though realistic at first glance, it is unlikely that global CO2 emission is significantly reduced

from this effort, because global demand for energy is highly inelastic and oil will be extracted elsewhere to compensate for that demand (Angelsen, ed. 2008: 71). Looking at the litany of literatures on REDD +, I am clearly simplifying the complexities.

In addition, REDD + cannot be separated from good governance and anti - corruption measures. In a country where the level of corruption is low, REDD + is more likely to succeed. Indonesia had a Reforestation Fund established in 1989 under the New Order. The main idea is to provide funds for reforestation activities and rehabilitating forests affected by timbering activities. However, in practice, the funds were distributed by the Ministry of Forestry to logging companies with political connections. They in turn marked up costs and overstated replanted areas to secure more funding from the government. Usually they then provided kick backs to government officials for their services (Barr, Dermawan, Purnomo, Komarrudin 2010).

The overall problem for Indonesia is reduced but not solved entirely after the funds were transferred to the Ministry of Finance. Indonesia is still dealing with conflicting policies. On one hand, Indonesia calls for the tripling of plant oil plantations by 2020 (Gore 2009: 175); on the other hand, President Yudhoyono submittend a letter to the UN last January, stating that Indonesia is willing to cut emissions by 26 percent in 2020 (The Jakarta Post, 6 March 2010). Therefore, the seriousness of the President's applauded pledges three years ago in Bali remain to be seen.

CONCLUSION

Gore's reflection and technical understanding of the issue is the main strength of the book. Combined with marvelous photographs, pictures, and data, the book will significantly contribute to the climate change debate. Beginners will enjoy an introduction to the various aspects of climate change, while experts will have the chance to dispute the data and arguments of the book. If there is a weakness to the book, perhaps it is the lifestyle of the author himself. Critics have emphasized on Gore's electricity spending reaching $30,000 in 2006. His 20 room house in Nashville, Tennessee consumed more than 20 times the average electricity used by a US citizen (ABC, 2007).

Gore

Back to the book, Gore concludes that the greatest achievement in all efforts preventing global warming is the change of minds occurring, especially among the young generation. Transferring the courage and knowledge to change current patterns that are detrimental to our environment is the main goal of this book. The recent economic crisis did not slow endeavors in fighting the climate crisis. Contrary, new chances for jobs are created in the fields of environmentally friendly technologies. In international relations, the U.S. - China tensions abates at some level.

The pundits of climate deniers will continue conducting their concerted efforts in spreading wrong information about climate science. But the current Zeitgeist is on the environment's side. As architects begin developing zero - carbon buildings and consumers pick environmentally friendly products, we are giving the next generation a chance to enjoy the state of nature we are enjoying today.

From an academic perspective, there is also much hope. Climate change has gone beyond the disciplines of biology or environmental engineering. It has become an object of analysis in many other disciplines such as economics or international affairs. Recently, climate change has entered the field of anthropology. Human adaptations with climate change will concern much cultural factors and this is the intersection between anthropology and climate change (Create & Nuttall, eds, 2009).

Sometimes global warming is positively affecting our culture. Supermarkets in Indonesia today are asking buyers whether they need a plastic bag or whether they need the bill to be printed. Communities such as bike to work are reducing traffic jams in our cities, and our president President has made international pledges of reducing CO2. In other words we are not escaping this Zeitgeist. The change of minds that Gore wants to achieve is already taking place. Currently our commitments are still being tested, but no worries Mr. Vice President, we are half way there. Hopefully you are with us.

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