Impact of the emission of greenhouse gases on climate change

Environment, Climate Change

Ever since the advent of industrialization, there has been an increase in the emission of several greenhouse gases (GHG) mainly due to the burning of fossil fuels. Carbon dioxide emissions account for 80% ofglobal warmingof GHG emission, as compared with 57% in the 1980s (Lashof & Ahuja, 1990). Panwar, Kaushik & Kothari (2011) also states that excessive fossil fuel consumption will have adverse impacts on theenvironment, and increase threat of globalclimate change. Fortunately, more and more countries are starting to be aware of climate change, which comes as a result of the increase of emission of GHG.

Therefore, various proposals to reduce emission of GHG have been drawn up to suggest possible solutions to reduce the impact of climate change. While all of these proposals are useful to reduce emission of GHG, some will be more practical and effective due to other problems, which may arise. One of these proposals includes developing more non-polluting renewable energy sources (RES). This is a practical way to reduce the impact of climate change as it directly reduces GHG emissions. Currently, RES supply 14% of the total world energy demand (Panwar et. l. , 2011). RES includes biomass, hydropower, geothermal, solar, wind and marine energies. By harnessing energy from RES, dependence on conventional energy sources that produce GHG will be reduced. For example, solar energy is the most abundant RES and is available as both direct and indirect form. Solar energy can be used directly in solar thermal applications, or indirectly in photovoltaic systems to generate electricity. Carbon dioxide (CO2) emission mitigation potential from 1. kWp solar pump is about 2085kg from diesel-operated pumps (Panwar et. al. , 2011). Therefore, by using RES, we can directly reduce the GHG emissions by moving away from energy sources that produce GHG. This is also the most practical solution as RES are readily available and abundant all around us. What needs to be done is to build the infrastructure required to harness RES so we can become less reliant on GHG-producing energy sources and thus reduce GHG emissions. Another such proposal involves reforestation to “ soak up” more CO_2.

Reforestation is the next most effective solution as it also deals with removing CO_2 emissions directly from the atmosphere. Trees have the ability to absorb CO_2 and convert it to stable carbon “ sinks” in the form of biomass stored in trunks, branches and organic matter in the soils (Moulton & Andrasko, 1990). This carbon “ sequestration” is important as it removes CO_2 in the atmosphere and locks it in wood that can be used for furniture and other construction applications. In addition, reforestation offers an opportunity for emission control investments (Niskanen, 1997).

However, it may not be as practical as developing more non-polluting RES as reforestation requires a large area of land and not many countries will be willing to give up land space, which could potentially bring economic benefit. Also, reforestation efforts are expensive. According to Moulton and Andrasko (1990), a budget of $65 million is proposed in the USA for the President’s proposed tree-planting initiative. This huge amount coupled with limited economic benefits the country will gain from reforestation may deter governments from supporting the proposal.

Thus, while reforestation provides a sink for CO_2, it may not be a practical solution due to economic and land concerns. Governments must be able to prioritise the long-term environmental benefits involved to make better decisions. The next proposal involves reducing energy use by conservation. By reducing energy use by conservation, the global energy demand will be reduced, and thus less non-renewable energy sources will be burnt at power plants, reducing GHG emissions. This is another possible solution to reduce GHG emissions.

For example, this can come by using solid-state lighting instead of incandescent bulbs. Government agencies have introduced policies to conserve energy usage through more efficient use of energy (Sen, Khazanov & Kishimoto, 2011). Incandescent light bulbs typically convert 5% of energy into visible light. Solid-state light-emitting semiconductors promise to offer conversion efficiencies of 50% or more (Sen et. al. , 2011). However, the success of this solution is dependent on the collective mindset of the community on a global scale.

This will require time andeducationto encourage reduced energy use through conservation. In addition, with an increasing number of countries becoming more affluent, the global energy demand will increase. Therefore, reduction of energy use by conservation is limited to the affluence of the country, and research can then be used to develop more efficienttechnologyto reduce energy use. This is harder to achieve, as it is more difficult to develop acultureto conserve energy, than to convince governments on reforestation.

The next proposal involves adding more nuclear power plants to replace current conventional coal-burning power plants. Nuclear energy provides carbon free production of electrical energy, and produces much more energy than conventional energy sources (Grandin, Jagers & Kullander, 2010). One uranium fuel pellet contains the same amount of energy as 1, 780 pounds of coal or 149 gallons of oil (Palliser, 2012). Thus, much more energy can be generated from a small amount of nuclear source. Nuclear waste is small in physical size compared to waste produced by other forms of energy (Palliser, 2012).

While this provides a clean source of energy and reduces the emission of GHG, it may not be the most practical idea due to the concerns of radioactivity. Nuclear waste has to be stored in steel-lined, concrete vaults filled with water or in aboveground steel or steel-reinforced concrete containers with steel inner canisters (EPA, 2010). In addition, uranium is a nonrenewable resource that cannot be replenished on a human timescale. Fossil fuel emissions are also associated with uranium mining and enrichment process and the transport of uranium fuel to the nuclear power plant (EPA, 2010).

Therefore while nuclear power plants produce zero GHG, the processes involved may still produce GHG. The radioactive risks involving the waste and storage could become another environmental problem. Hence, while adding more nuclear power plants will definitely reduce GHG emissions, it is not very practical as it will create numerous environmental problems as mentioned above. The last proposal involves removing carbon in fossil fuels before combustion and " sequestering" that carbon in underground reservoirs. This involves hydrogen production from fossil fuels that include steam reforming and water gas shift (Steinberg, 1999).

In order to suppress CO_2 emission from the steam reforming process, CO_2 must be sequestered underground. This removes CO_2 emission into the atmosphere, thereby reducing GHG emissions making it an effective solution to reduce GHG emissions. However, such a process involves higher cost and lower efficiency (Hetland, 2008) making this solution is the least practical as up to 40% of the energy is lost through " sequestering" in underground (Steinberg, 1999). Therefore the efficiency of such a solution is compromised, as it is not as efficient as conventional coal burning.

In addition, by " sequestering" carbon in underground reservoirs, these reservoirs are susceptible to leaks and this gas might be released again. Also, fossil fuels are considered non-renewable energy sources and therefore such a solution is only effective so long as there are such resources. Therefore, this is the least practical and least efficient solution available. In conclusion, even though there are many solutions to reduce GHG emissions, critical analysis of each proposal is required to determine which solution is the most practical and the most efficient, according to the local constraints and economic cost-benefit analysis.

Ultimately, the onus is on governments to recognise the impact of each possible proposal, and to decide which path to take in terms of reducing GHG emissions to reduce the impact of climate change. References Environmental Protection Agency (EPA) 2010. Nuclear energy, Environmental Protection Agency. Retrieved 29/03/2013 from http://www. epa. gov/cleanenergy/energy-and-you/affect/nuclear. html Grandin, K. , Jagers, P. , Kullander, S. (2010). Nuclear energy. A Journal of the Human Environment, 39, 26-30. Hetland, J. (2008).

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