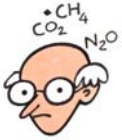

CHAPTER 2

UNDERSTANDING GLOBAL WARMING

We have a brief window of opportunity to deal with climate change…no longer than a decade at the most

- Scientist at NASA, Dr James Hansen

To fully understand what is meant by global warming and climate change the greenhouse effect must first be understood. The greenhouse effect is the process where solar radiation (short wavelength radiation) from the sun reaches the earth's surface where it's converted to heat energy (long wavelength radiation). The majority of sunlight is absorbed by the earth's surface (landmass and water) and warms it, whilst the rest is reflected by the earth back into space. Polar ice reflects 90% of solar radiation back into space, whereas water absorbs 90% of the energy it receives. In addition, the warm surface of the earth emits long wavelength radiation (infrared) and this is absorbed by the greenhouse gases (a natural as well as manmade part of the earth's atmosphere which have the ability to trap and retain heat) in the atmosphere and re-emitted back to the earth.

Before the industrial revolution in the 18th century, the earth had achieved a fine balance between the energy coming in and the energy transmitted back into outer space. This balance has kept the temperature at an average of 14 degrees Celsius for the past 10,000 years and is responsible for sustaining life on Earth as we know it today.

With the onset of the industrial revolution, humans started to burn increased amounts of fossil fuels such as oil, coal and natural gas to generate heat for transportation, electricity and other energy requirements. This was and still is problematic since a waste product of fossil fuel combustion is carbon dioxide (CO_2). CO_2 lasts for decades to centuries in the atmosphere. Increasingly large amounts of greenhouse gases were and still are being pumped into the atmosphere. New, exceedingly powerful greenhouses gases such as chlorofluorocarbons (CFCs) were also introduced.

All of these factors have resulted in increased atmospheric concentrations of greenhouse gases. Scientists studying tree rings, corals and ice-cores have been able to precisely calculate the exact percentage of greenhouse gases in the atmosphere over time.

Findings reveal that the main greenhouse gas, CO_2, has been rising faster than at any other time over the past 20,000 years. CO_2 has increased from 280 parts per million (ppm) in 1750 to the present day level of 380 ppm (most of which has occurred in the last 50 years). 380 ppm is higher than any other time in the past 650,000 years. Concentrations of the second most abundant greenhouse gas, methane (CH_4), have also increased since the pre-industrial era by 150%. Consequently, these increased concentrations have trapped more heat, thereby creating an enhanced greenhouse effect, which has caused the earth's surface temperature to rise.

Due to scientists growing concerns about global warming and climate change, the Intergovernmental Panel on Climate Change (IPCC) was created in 1988 by the United Nations Environmental Program (UNEP) and World Meteorological Organization (WMO). The role of the IPCC is to write two reports every decade on the issue of climate change and it

does so in a rigorous, peer-reviewed fashion (this means the information is reviewed and approved thoroughly by other experts in the author's field before being published). Any controversial research such as the melting of Greenland's ice sheet has been excluded from the reports, which leaves little room for skeptics. Approximately 2,500 scientists appointed by 130 countries participated in compiling the latest IPCC report that concluded the world is warming fast and humans are the cause of this.