PEOPLE WITHOUT

A PLAN

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Note: For those who are pragmatically-minded, go straight to Part 4.

INTRODUCTION

We live on a little rock floating in the sky. We have no other place to go.

We need to look after this place.

PART 1:

RECOGNITION

In a book by David Suzuki called “Time to Change”, he creates an analogy whereby monsters from outer space come to Earth and plunder its resources, kill the reefs, pollute the atmosphere, and decimate parts of the natural environment. If there were such monsters, Suzuki argues, we would do all we could to defend ourselves against them and fight them off. But the monsters don’t come from outer space – the monsters are us.

Before taking actions to change our lifestyles, we must make choices. To know which choices to make, we must be educated. Before being educated, we must understand *why* we need to be educated. We must recognise that the ways in which many of us live today in the modern world, and the values that we have, do not lend themselves to longevity.

That recognition, when every aspect of the lifestyle we take for granted in the developed world is put to the test, can be frightening. A little while ago I was in the supermarket buying frozen vegetables. I thought I was making a good choice by buying relatively unprocessed food. Then I looked at the packaging – the product was made many thousands of kilometres from where I lived. Those carrots and beans and broccoli had travelled an awful long way to reach my stomach. I picked up another packet – same story. Another packet – same story again. The resources and energy used to get those products to my local supermarket, and to keep them frozen the whole way, are not things that many of us consider when we shop for food and other items.

It made me realise how much I still take for granted and how important recognition is. I’d been eating frozen vegies for years and never really considered the impacts that my consumption had on the broader environment – and that’s just a pack of frozen vegies.

Everything we DO, everything we USE, everything we BUY, will have impacts upon the natural systems that exist around us. *Recognition* is about trying to understand what those impacts will be.

PART 2:

EDUCATION

CLIMATE

CHANGE

CLIMATE CHANGE

The impacts of Climate Change threaten to significantly alter the lives of many species, including our own. It has been well-documented that CO2 is the major pollutant that has created what has been termed the “Greenhouse Effect”. There is, however, another Greenhouse gas that has the potential to rapidly change the game in our fight against Climate Change. Its potential underlines exactly why we need to take drastic actions to reduce atmospheric pollution.

Methane released from melting permafrosts could rapidly increase the speed and severity of Climate Change.

Locked in the colder areas of the Northern hemisphere are **permafrosts** – soils that have been frozen for an extended period of time, in some cases for thousands of years. As permafrosts melt they release large quantities of methane, a Greenhouse gas 25-30 times stronger than CO2 over a 100-year period. Thawing has already started in Siberia and Alaska, where increases in temperature of 5-7 degrees Celsius have been observed since 1900. *(References A1, A2)*

Ice-like structures called **clathrates**, which are found in Arctic mud and under the seabed, contain MASSIVE amounts of methane, far more than currently exists in the atmosphere. An increase in global temperatures – at the extreme end of predictions – could cause temperatures to increase enough to release some of these locked-up gas deposits. *(A3)*

The thawing of permafrost has the potential to add significantly to already rising temperatures. The “clathrate-gun hypothesis” – the idea that increasing methane release from clathrates leads to increases in temperature, and therefore more releases of methane – is yet to be proven. What has been proven is that methane is a potent Greenhouse gas, and increasing temperatures will lead to an increased release of methane from Arctic permafrost, so in theory this will expedite the warming process. *(A4)*

Around 55 million years ago the Earth went through a period in its history known as the PETM (Palaeocene-Eocene Thermal Maximum). During this time many species became extinct, and the Earth's climate became unstable for around 100,000 years. It is thought that the destabilisation of clathrates, and the subsequent release of huge amounts of methane from under the seabed, was a major factor in this event. *(A5, A6, A35)*

It is believed that methane releases from clathrates played a significant role in the catastrophic event known as the 'Great Dying', which occurred around 251 million years ago.

A similar but far more catastrophic event occurred around 251 million years ago, when the Earth was damaged to such an extent that it took 20-30 million years for Coral Reefs and Forests to recover, and 100 million years for the broader ecosystems to re-establish themselves. An estimated **96% of marine species** and **70% of land species** were wiped out in this event, sometimes referred to as the "Great Dying". Whilst the trigger for this remains uncertain, it is believed that methane releases from clathrates played a significant role in the rapid shift in the Earth's climate. *(A7)*

PREDICTED IMPACTS OF CLIMATE CHANGE

According to the US Environmental Protection Agency, these are the predicted impacts of Climate Change. (Please note – time and again forecasted changes have occurred much quicker and on a larger scale than was originally anticipated, so these predictions may need to be revised in the coming years.)

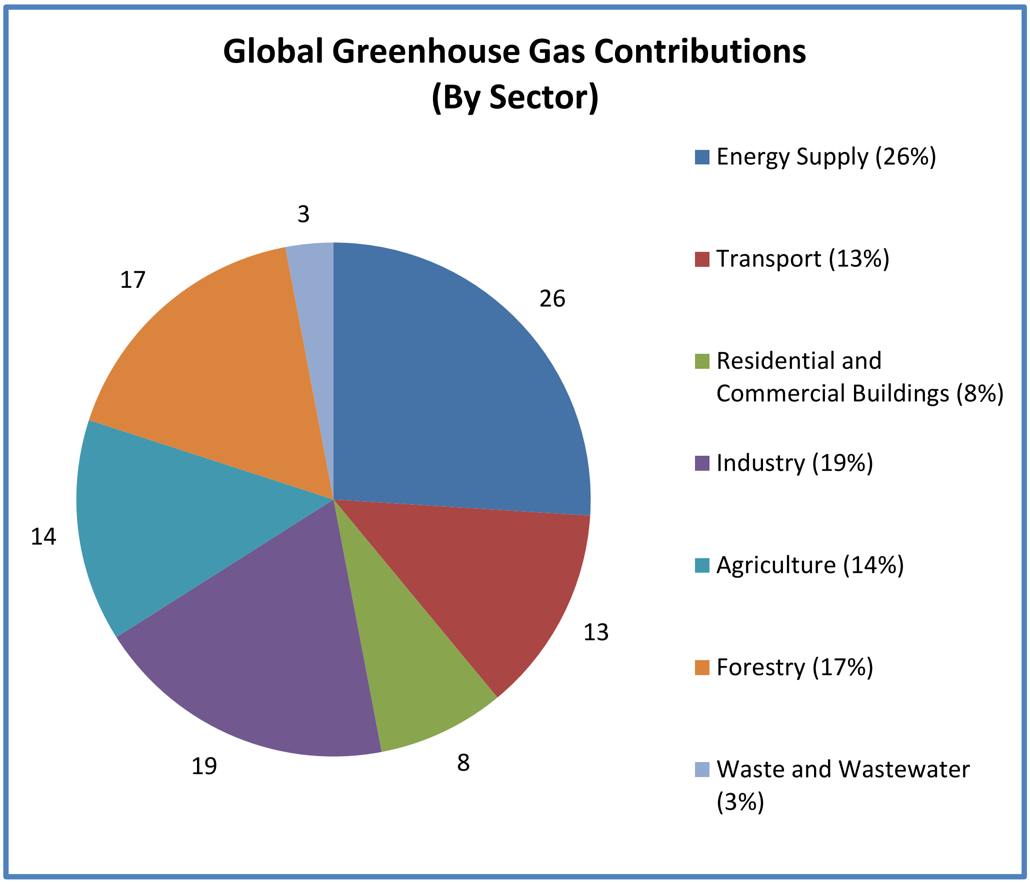
- Increased temperatures of an average of up to 3 degrees Celsius.
- Expected release of methane from melting permafrost.
- Changing ecosystems, migratory patterns and probable extinctions.
- Declining air quality in city areas and subsequent impacts on human health.

- Changes to food supply and costs – while a small rise in CO_2 may benefit some crops, a significant rise in temperatures is expected to have a negative impact on agriculture.
- Sea level rise, due to the expansion of warmer oceans and the melting of polar ice and land-based glaciers. Sea level rise is currently predicted to be up to 60cm, however if the West Antarctic Ice Sheet collapses **sea levels could rise up to 6 metres**.
- Predicted increases in heat waves, and in turn increases in coral bleaching, ecosystem damage and impacts on food production.
- Predicted increases in rainfall, and therefore flooding, due to increased evaporation as a result of warmer temperatures.
- Predicted increases in the severity of major storms and cyclones due to the warmer ocean temperatures that feed these weather systems.
- Increased coastal erosion and damage to coastal wetland areas as a result of rising sea levels.
- Increased sedimentation of Coral reefs and wetlands due to increased rainfall and flooding events. *(A8)*

As you can see, Climate Change could become more than a major problem.

SO WHAT HAS CAUSED CLIMATE CHANGE?

Are humans to blame for Climate Change? Yes, we are. The problem isn't just the amounts of Greenhouse Gases we are releasing today – the problem is that since the beginning of the Industrial Revolution, we have steadily increased our rate of pollution to the point where the Earth's natural systems are incapable of maintaining or restoring a balance. The increased Greenhouse Gas levels in the atmosphere today are the result of small but consistent amounts of excess GHGs emitted each year. If the Earth can't deal with it, the excess gases stay within the atmosphere, and this excess has built up steadily in recent decades.



(Source: IPCC fourth Assessment Report: Climate Change 2007)

DEALING WITH THE CARBON PROBLEM

As of the 5th September 2012, the level of CO_2 in the atmosphere was 392.41ppm (parts per million) *(A9)*. In 1750, just before the Industrial Revolution began, this number was around 280ppm. Accurate estimates show that our current rate of increase is around 2ppm per year – or 15.54 billion tonnes of excess CO_2 in the atmosphere (1ppm = 7.77 billion tonnes CO_2). *(A10)* **Note: The difference between September 2011 and September 2012 was more than 3ppm, showing an increase in the annual rate of CO_2 remaining as excess in the atmosphere. For the purposes of this book we will use the rate of 2ppm per year, however this may need to be revised should the annual CO_2 excess continue to increase.**

There are 2 issues that must be dealt with in regards to excess CO_2 – the current excess, and the future excess. If we were to set a target of 350ppm, which many scientists argue is the highest level of atmospheric CO_2 we can afford to have before serious climatic changes take place, then we would need to **reduce the amount of CO_2** in the atmosphere by 42.41ppm – or **329.53 billion tonnes**.

If we are to prevent excess CO_2 accumulating in the atmosphere in the future we need to stop producing excess emissions as soon as possible, which currently stand at 15.54 billion tonnes per year – or **49% of our current annual CO_2 emissions** (current global CO_2 emissions = 31.78 billion tonnes per year, as of 2010) *(A11)*. This means that around **51% of our current emissions are being dealt with by the Earth's natural systems**. The quicker we can reduce emissions beyond this point, the quicker the accumulated excess can be removed from the atmosphere.

So the problem we have is two-fold – the accumulated emissions that have built up over the last 100 years, and the need to prevent future excess emissions. **How do we get rid of the excess CO_2 in the atmosphere before Climate Change is out of control? And how will we cut our emissions in half as soon as possible?**

REDUCING THE CURRENT CARBON EXCESS

The Earth has several carbon 'sinks' – places that excess carbon in the atmosphere can be absorbed and stored for a period of time. These include the oceans, forests and soils. Already there have been significant signs of carbon saturation in the **oceanic** sink. One estimate is that oceans reduced their CO_2 absorption by 50% between the mid-1990's and 2005 – an indication that oceans may well be on their way towards CO_2 saturation. *(A13, A18)*

The oceanic sink is already showing signs of carbon saturation.

The capacity of soils to store carbon is greatly reduced when land is cleared.

Soils can store more than 3 times the amount of carbon that is in the atmosphere, however increased land clearing and development are reducing this potential. It is estimated that agricultural soils have lost up to **50%** of the carbon they stored originally before the land was cleared. *(A14)*

So we need to remove the excess CO_2 from the atmosphere. The oceanic carbon sink is already saturating, and we are steadily reducing the carbon storage in soils with increased land clearing and development. How can we increase the ability of the Earth to deal with all of the excess CO_2? **Plant trees.** Lots and lots and lots of trees. Ideally native trees. Forests are the only remaining sink that can – without doubt – soak up the atmospheric excess of CO_2.

On average, 1 tree will provide a net carbon storage of around 1 tonne over its lifetime. We will therefore need to plant many trees to soak up the existing atmospheric excess in order to bring it down to safe levels.

Over its lifetime an average tree will sequester (absorb) around 1 tonne of CO_2 over and above the amount it gives out – a mere 2.5% gain. *(A15, A16)* We currently have an excess of 329.53 billion tonnes of CO_2 in the atmosphere – does that mean we need to plant 329.53 billion trees? At least. In general, only 1 in 5 planted trees will reach maturity and be able to absorb the extra 1 tonne of carbon over its life-cycle. *(A17)* So we are talking here about **1.648 TRILLION TREES** to be planted in order to remove the existing excess carbon from the atmosphere. Such a monstrous number sounds frightening, but it has to be done if we are to prevent the catastrophic impacts of Climate Change in full-swing.

There is a growing trend in tree-planting for the sequestration of carbon. In Australia, one organisation plants native trees for carbon off-setting at a cost of $AU3.35 per tree. This covers the costs of planting materials, labour, land purchases, administrative costs, and ongoing monitoring and management. Based on this price we will estimate how much it would cost to plant all of these trees.

Perhaps the fairest way to divide up the cost responsibilities would be to base it around emissions per capita for each country. For example, according to 2008 figures, Australia was responsible for 1.28% of total global CO2 emissions – therefore Australia's share of the 1.648 trillion trees to be planted would be 21.09 billion trees, or around 917 per person. Using this method the cost would be around $AU3071.95 per person. China – the world's biggest emitter by volume – would have a share of only 324 trees per person costing $AU1085.40, due to its lower per capita emissions. This does not take into account economies of scale (reduced costs per unit resulting from larger production), and **therefore it could be suggested that costs per tree might be significantly reduced**. One planting organisation claims to be planting at a cost of just $US0.10 per tree. *(A15)*

Dividing costs to meet per capita usage would ensure that we have somewhat of a 'user-pays' system in place. It would be a one-off payment to put the trees in the ground that will remove enough excess CO2 from the atmosphere over around 40 years to get the CO2 concentration down to 350ppm. A cost like this should be manageable, whether it is paid for by governments and recovered through taxes and budget savings, or paid for by individuals via payment plans. In reality it may take 20 years to plant all of these trees, and therefore costs would be spread over this period of time.

Is it fair that today's citizens have to clean up the pollution of people's past emissions? No. Does it have to be done? Yes. There will no doubt be an economic return on this investment, as well as an imperative environmental benefit. **Delays in action will not put us in a better position.**

There is a school of thought amongst some ecologists that trees planted outside of the tropics may increase, rather than decrease, global surface temperatures. This is due to increased heat uptake through the absorption of heat from the sun by forests, as they tend to be dark in colour and therefore reflect less sunlight back into the atmosphere. In tropical areas, forests create their own localised weather systems, which keep them cool and counter the heating effects from this sunlight absorption. More research needs to be conducted in this area to inform us of how to best select planting areas and plant species for re-forestation. *(A19, A20)*

THE PRACTICALITIES OF PLANTING 1.648 TRILLION TREES

So *where* are we going to plant all of these trees? **Wherever we can.** We are now in an emergency situation. In emergency situations, such as earthquakes and car accidents, you get the job done first and argue about money and the like afterwards.

We need to start getting the trees in the ground.

Let's look at the practicalities of planting 1.648 trillion trees. It is estimated that tree plantation companies currently plant around 1.5 billion trees per year in the United States. *(A21, A22)* Following the 'user-pays' method outlined earlier, the US would be responsible for planting 291 billion trees. This sounds like a number that would far exceed our capacity for planting. If planted over a 20-year period, it would be around 14.55 billion trees per year – nearly 10 times the amount currently being planted.

An experienced tree planter can plant in excess of 2,500 trees per day.

An average tree planter can plant around 2,500 trees per day. Experienced planters can double this amount, depending on conditions. *(A23, A24, A25)* So if we look at planting for 5 days per week, 26 weeks per year (a total of 130 days as planting is generally unproductive in summer and winter), how many people would be required to plant 14.55 billion trees each year in the United States?

14,550,000,000 trees ÷ 2,500 trees per day ÷ 130 planting days = 44,769 people

From a population of over 300 million in the US, surely this is possible.

The process of planting will need to be well-managed. Monitoring by an independent, central organisation may be required to ensure that the integrity of the process is not corrupted. A register will need to be kept, including debits for any trees cleared for development – that means replacing cleared trees with new trees. Companies contracted to plant will need to be independently audited. Countries of vast land areas (such as Australia or the United States) may need to plant on behalf of other countries (such as Kiribati or Monaco) that may not have the land available to plant the number of trees according to their population. Economic incentives may need to be provided for tree plantations when other land uses, such as ruminant livestock agriculture, are more profitable.