TTJ 14.1 (2011): 4-22 ISSN 1598-7140

The Challenges of a Changing Environment in the Asia Pacific Region

Les Fussell
Asia Pacific Baptist Aid, Australia

"Praise be to the God and Father of our Lord Jesus Christ, the Father of compassion and the God of all comfort, who comforts us in all our troubles, so that we can comfort those in any trouble with the comfort we ourselves have received from God." – 2 Corinthians 1:3

The challenges of a changing environment in the Asia Pacific Region are closely linked to the phenomena of climate change and the factors linked to it. Climate change, also known as global warming, is being monitored across the globe, and much scientific research has gone into determining what is contributing to it. While there is some conjecture around the extent that climate change is a natural occurrence versus that which is caused by human-induced changes to the environment, the global community is well aware that it must address the issue. The parties to the United Nations Framework Convention on Climate Change have met annually from 1995, in meetings called Conferences of the Parties (COP), to assess progress in dealing with climate change. In 1997, the Kyoto Protocol was produced at the COP meeting, establishing legally binding obligations until 2012 for developed countries to reduce their greenhouse gas (GHG) emissions. The COP meeting in Copenhagen in 2009 was an attempt to develop binding obligations for both developed and developing countries to fulfill for the years following 2012. The Copenhagen Accord, a non-binding agreement, was not formally adopted as part of the UN Framework Convention on Climate Change at that meeting but was signed by 139 countries. The political will at the policy level in many of the world governments lacked the fortitude in Copenhagen to adequately address the issue and the man-made causes of this environmental problem.

The COP meeting in Cancun in December 2010 was seen by many as an opportunity to progress the Copenhagen Accord with firmer commitments in the areas of reducing emissions, verification, climate change aid, sharing clean technology, forests, and adaption. The incremental,

non-legally binding Cancun Accord was signed by more than 190 countries. It includes making arrangements to protect rainforests and a plan of US$100 billion of green climate fund to help the most vulnerable nations cope with the effects of climate change, while providing assistance in adaptation strategies for the most vulnerable countries. In addition, the Cancun Accord includes steps to ensure transparency in emissions measurement and reporting - a key sticking point for China and the USA in the Copenhagen Accord. Unfortunately, although representatives from more than 190 countries agreed to seek ''deep cuts'' in emissions, the Cancun Accord falls short of setting targets significant enough to meet the goal of limiting the global temperature rise since industrialisation to 2 degrees. The emissions pledges in the Cancun Accord is estimated to set the world on course for 3.2 degrees warming; scientists claim that this is sufficient to cause droughts, crop failure, species extinction, and increased damage from floods and storms.

This paper seeks to outline some of the features of the global climate change phenomena and looks broadly at environmental difficulties that have been observed in the Asia Pacific in the last couple of decades. It summarizes what are the broad implications for the region and what will it mean, particularly for the vulnerable poor, if nothing is done to address underlying fundamental cause of these environmental difficulties. As a plenary paper, the scope of this paper does not extend to offering theological backgrounds, analyses, or perspectives regarding nature and the environment.

General Observations on Climate Change Globally

"The scientific evidence is overwhelming: climate change is a serious global threat, and it demands a global response," Sir Nicholas Stern warns in a report compiled for the UK government in 2006. Stern's report calculates a wide range of impacts of climate change, particularly economic costs as well as other risks (Stern, 2006). Global climate change poses a threat to the well-being of human and non-human environments through impacts on human health, lifestyles, biodiversity, productivity, and ecosystem functioning. It is not the intent of this paper to argue the veracity of climate change, or to argue the case of the extent that climate change is linked to human factors and/or natural climatic variations.

Nonetheless, national academies such as the Australian Academy of Science, the Royal Society in Britain, the US National Academy of Sciences and the French Academy of Sciences, and the Geological Society of London, to name a few, have all recently issued statements that show the extent of consensus about climate change science. Each mes-

sage contains consistent and urgent statements. They consist of the role of greenhouse gases in the atmosphere as being well understood, and that increasing the atmospheric concentration of the principal anthropogenic greenhouse gas, CO_2, leads to a higher mean of global surface temperatures. The reports also confirm that CO_2 has increased considerably during the past century, to the highest levels seen in 800,000 years, and that this rise is chiefly from human activity such as burning fossil fuels, with a lesser contribution from other activities such as the manufacture of cement and deforestation. The global warming observed over the past 150 years of about 0.7°C is due mainly to human-induced emissions of heat-trapping gases. This evidence links climate change to rise in atmospheric CO_2 levels, which are linked to growing levels of pollution (US Global Change Research Program, 2009).

From the time of the industrial revolution, atmospheric concentrations of carbon dioxide (CO_2), the chief heat-trapping GHG, have escalated 35%, from about 280 to 377 parts per million. Over the last two centuries, atmospheric concentrations of methane, the second leading GHG, have more than doubled. Since 1900, these and other GHG increases have contributed to a 0.6°C increase in the global average surface temperature. From 1995 to 2006, temperatures have been the warmest since recording of global surface temperatures began in 1850. Moreover, according to the UN's World Meteorological Organisation (WMO) and the US National Climate Change Centre, the years 2010, 2005, and 1998 were in the top three warmest years on record since the recording keeping began. A new record of the warmest decade was set from 2001 to 2010 since temperatures were recorded.

Unless current emissions trends are curved, global temperatures are expected to rise up to 5.8°C by 2100, according to the Intergovernmental Panel on Climate Change (IPCC) (2007). In order to prevent the global average temperature from rising more than 2°C above pre-industrial levels, worldwide emissions would need to peak around 2015 and subsequently decline by 40% to 45% by 2050 compared to 1990 levels (Baumert et al., 2005). This would mean reducing annual carbon dioxide emissions to the equivalent of 22 billion tonnes by 2050, compared with 56 billion tonnes emitted now.

General Global Impact of Climate Change

Climate change through rising air temperatures has contributed to a loss of biodiversity, arctic ice, glacial and snowfields disappearance, rising sea levels, reduced food yields, increased climatic variability, and increased economic challenges (Simiyu, 2009). Climate change has been shown to impact ecosystems in many ways: modifying the distribution

of species in population sizes; changing in the timing of reproduction or migration events; increasing the occurrence of pest and disease outbreaks; damaging in coral reefs through "bleaching episodes" because of the rise in local sea surface temperatures (Simiyu, 2009).

Annual climate change is projected to contribute toward 300,000 deaths of people (roughly equivalent to the 2004 Asian tsunami annually); deaths are from weather-related disasters and gradual environmental degradation (Climate Change Human Impact [CCHI] Report, 2009). Over 90% of this death toll relates to the gradual onset of climate change from the deterioration in environmental quality, such as the reduction in arable land, desertification, and sea level rise. Furthermore, CCHI (2009) states that "every year climate change leaves 325 million people seriously affected, and economic losses of US$125 billion. Four billion people are vulnerable to the effects of climate change, and 500 million people are at extreme risk."

CCHI (2009) reported the findings of IPCC in its Fourth Assessment Report that found world weather patterns to have become more extreme, with more intense heat waves, prolonged droughts, frequent and intense rainfall events. The changes in timing and location of rainfall have been linked to the more unpredictable weather rhythms. Moreover, the number of weather-related disasters (storms, hurricanes, floods, heat waves, droughts) has doubled during the last two decades. There are 400 weather-related disasters per year, resulting in almost 90 million people requiring immediate assistance.

Notwithstanding such immediate impacts of extreme weather, climate change is gradual. The CCHI Report (2009) summarizes these gradual changes as "rising earth surface temperatures, rising sea levels, desertification, changes in local rainfall and river run-off patterns with increased precipitation in high latitudes and decreased precipitation in sub-tropical latitudes, salinisation of river deltas, accelerated species extinction rates, loss of biodiversity and a weakening of ecosystems." The impacts of these gradual changes are substantive:

- Reduction in access to fresh and safe drinking water, negatively affects health;
- Threats to food security due to limiting crop choices and decreasing yields resulting in famines;
- Forced migration, possibly leading to conflict, due to poverty, famine, desertification, land degradation, and rising sea levels (leading to permanent displace on small island Pacific nations such as Kiribati and Tuvalu);

- Increased insect-borne diseases such as malaria, and other health problems such as diarrhoea and respiratory illnesses (CCHI Report, 2009)

Global Impact of Climate Change on the Poor

While the threat of climate change is global, the prospects are worst for the poorer developing countries. The Stern report concluded that if temperatures rise by 5°C, up to 10% of global output could be lost (Stern, 2006). This means the poorest countries would lose at least 10% of their output. However, poverty increases a vulnerability to climate change, resulting in a disproportionate burden on the poorest countries. Margareta Wahlstrom, the United Nations Assistant Secretary General, stated that "the countries least responsible for global warming—the poorest developing nations—will be the most affected by its consequences. In the cruel calculus of disasters, the poorer the community, the greater is its vulnerability to natural hazards and the more difficult its recovery" (CCHI Report, 2009).

This is grossly unjust given the largest consumers. Thus, polluters are not the poor but the rich. The poorest 20% of the world consume only 1.6% of the world's resources, whereas the richest 20% of the world consume 76% of the world's resources (World Bank Development Indicators, 2008). "It is a grave global justice concern that those who suffer most from climate change have done the least to cause it. Developing countries bear over nine-tenths of the climate change burden: 98% of the seriously affected and 99% of all deaths from weather-related disasters, along with over 90% of the total economic losses. The 50 Least Developed Countries contribute less than 1% of global carbon emissions" (CCHI Report, 2009).

The poor, who are most susceptible to the human impact of climate change, are exposed to both the physical changes and the socio-economic implications. The poor are less able to adapt to environmental changes because they live without access to basic social development and infrastructure such as health care, water, electricity, and paved roads. The CCHI Report (2009) estimates that 2.8 billion poor people are most vulnerable to physical changes "such as weather-related disasters and gradual environmental degradation, which are already occurring faster and more intensely in developing countries than in developed countries because of warmer starting temperatures and increased proximity to the Equator, where many of the poorer countries are geographically located." Unfortunately, 60% of the world's population or 4 billion people, who live on less than US$10 a day, are actually the ones subject to socio-economic vulnerability due to climate change (CCHI Report, 2009).

Environmental Difficulties in the Asia Pacific

There are a range of environmental difficulties in the Asia Pacific region, of which some may be linked to climate change, while others appear to have no linkage.

1. Earthquakes/tsunamis

In the past two decades, the Asia Pacific region has seen the impact of devastating earthquakes, with some followed by equally devastating tsunamis. Some of these earthquakes have flattened whole cities and regions (e.g. Gujarat, 2001; Nth Pakistan, 2008; multiple locations in Indonesia - Nias, 2005; Aceh, 2004; Yogyakarta , 2006; Padang, 2009), causing significant loss of life. Indonesia is the most disaster-prone country in the world, according to the UN Office for the Coordination of Humanitarian Affairs. In 2009 alone, it experienced 469 earthquakes with a magnitude of five or higher – more than any other nation (Integrated Regional Information Networks, 2010).

Earthquakes, when they have occurred in the ocean floor, can cause large tsunamis. Once they reach land, they wash all before them. The earthquake off the coast of Indonesia on December 26, 2004 produced a tsunami that caused a huge loss of life (more than 300,000) across multiple countries (Indonesia, Thailand, Malaysia, Burma, Sri Lanka, and India). In the last decade or so, small though devastating tsunamis have also occurred along the coasts of Papua New Guinea (1998), the Solomon Islands (2007 & 2010), and the Samoan islands (2009).

More recently, the Mentawais islands of Indonesia were pummelled by a 3m-high tsunami triggered by a 7.7 magnitude earthquake off the coast of western Sumatra on October 25, 2010. More than 500 people lost their lives. Approximately 27 villages in coastal areas were ruined, leaving nearly 15,000 people in emergency shelters.

2. Volcanoes

While volcanic eruptions have been much less prolific than earthquakes in the Asia Pacific region, the recent volcanic eruptions of Mount Merapi are an indication of the presence of active volcanoes in the region, particularly in Indonesia and the Philippines. Mount Merapi's recent eruptions began on October 26, 2010 in Indonesia's central Java displacing at least 278,000 people from their homes, claimed more than 240 lives, and injuring 453 people. A devastating mud volcano in Indonesia has been linked to drilling at a gas exploration well. The hot mud started spewing from the East Java drilling site in 2006 and has now displaced nearly 60,000 people.

3. Floods

A near daily reading of the newspapers of the Asia Pacific region records floods in one country or another in the region. In the last decade, flooding has been reported in the Philippines, China, Cambodia, Vietnam, Nepal, Indonesia, India, Bangladesh, Australia, Pakistan, to name just a few countries. Some of these floods are very large, such as the floods in Pakistan at the end of 2010. The Pakastani floods affected the lives of 20 million people, who lost their homes and livelihoods, with more than 1760 people, who lost their lives. They also found it difficult to protect themselves against either malaria or dengue - both potentially deadly diseases of flood-hit areas. In August 2010, floods in China saw 1470 lives lost. In late 2010 and early 2011, Australia has experienced floods across five of its seven states. The Bureau of Meteorology's annual Australian climate statement released showed 2010 year was Australia's wettest year since 2000 and the third-wettest since records began to be kept in 1900. The three weeks from Christmas 2010 in Queensland has seen one of the wettest periods on record. Flooding in Queensland has affected an area equivalent to the size of Germany and Belgium combined. Brisbane and surrounding towns, on January 11, 2011 and following, saw more than 30,000 homes and businesses inundated by flood waters.

Some floods in the Asia Pacific region have been much smaller, such as in the highlands of the provenance of West Papua of Indonesia in February 2009. While the loss of life was small, devastation to the subsistence agriculture of the area caused famine and diseases. Some localised flooding and landslide are linked to deforestation in those areas.

Other flooding occurs annually in some countries situated on flood plains, like Bangladesh and parts of Myanmar and India. However, this flooding has been intensified by unusually severe monsoonal rains. Compounded flooding is caused when these monsoonal floods are combined with extended and greater flows from rapidly melting glaciers of the Himalayas, cause by higher air temperatures. These flows come down the Ganges and into the river systems of Bangladesh and India. In fact, the Himalayas feeds into six major rivers (Ganges, Brahmaputra, Indus, Mekong, Yellow, and Yangtze) that run through China, India, Pakistan, Bangladesh, Tibet, Nepal, Burma, Thailand, Laos, Cambodia, and Vietnam. The changed glacial flows alter rain patterns and will eventually reduce water in rivers as well as food supply to nearby communities.

Jerome Robles from Malaysia witnesses changing rainfall patterns resulting in flooding and landslides, destroying homes, lives, and livelihoods:

> There does not seem to be a distinct monsoon season anymore. The rain is more frequently random and certainly more intense. I wonder whether the more intense rains could be a result of global warming. Long gone are the days when children are able to play in the rain like I used to. Now we are afraid of flash floods and strong winds which normally accompany the intense rains. (CCHI Report, 2009).

4. Cyclones/Typhoons

Cyclones and typhoons are a regular feature of yearly weather patterns of the Asia Pacific region, causing devastation in countries such as the Philippines, Vietnam, Cambodia, China, Taiwan, Myanmar, Bangladesh, India, and Australia, to name just a few. However, it would appear from such occurrences in the last few decades that their number and severity have been increasing. Their impact on impoverished and vulnerable communities has been devastating. Their frequencies are such that only a couple of examples are given below.

A particular example of the severity of the impact of a single cyclone in the region was the impact of Cyclone Nargis. It devastated Myanmar›s Ayeyarwady Delta in May 2008, leaving more than 140,000 dead and affecting 2 million people. The storm and the tidal surge that occurred in the delta not only caused many deaths but overwhelming devastation to housing and subsistence agriculture in the low lying communities. Rice fields and drinking wells were flooded with salty water. More recently, Cyclone Giri inundated the western coast of Myanmar on October 22, 2010 affecting an approximately 200,000 people, destroying more than 75,000 homes and 320 schools. The death count (45), fortunately, was much lower than Nargis.

Bangladesh, situated in the frontline of the climate change crisis, is the highest risk nation in the world to tropical cyclones and the sixth most vulnerable to floods. In 2007, for example, Cyclone Sidr struck Bangladesh, causing a death toll of 3,400 and economic damages of $1.6 billion (USD). The CCHI Report (2009) shows how this country is on the frontline of the climate change crisis:

> More than 68 million people in Bangladesh have been directly affected over the last eight years, and millions of lives and livelihoods are threatened by frequent weather-related disasters. With low-lying lands, coastline areas and floodplains occupying 80% of the country, Bangladesh is highly exposed to weather related disasters and the sea level rising. Of its 155 million inhabitants, half live below the poverty line and over a third suffers from malnutrition and hunger. Since 2000 the country has experienced more than 70 major disasters. Tropical cyclones, local storms, floods and droughts, have killed 9,000 people and caused damages of

> more than $5 billion. One-fifth of the country is flooded every year, and in extreme years, two-thirds of the country has been inundated. To demonstrate the magnitude of the problem, agricultural production losses due to flooding in 2007 were estimated at 1.3 million tons. Although agriculture accounts for only 20% of GDP, over 60% of the country's people depend on its products. Losses of both food and cash crops are common occurrences, which seriously disrupt the economy. In addition to food security, weather-related disasters due to climate change cause outbreak of disease such as diarrhoea and dengue fever. Poverty and environmental degradation have caused migration from rural to urban areas (migration into urban areas is increasing by over 2 million people each year).

Nonetheless, it must be noted that Bangladesh has taken steps over the past few years to be better prepared and less vulnerable to the vagaries of the weather. The CCHI Report (2009) suggests that "these steps helped reduce mortality in Bangladesh during Cyclone Sidr in 2007 which killed approximately forty times fewer people than a similar scale cyclone in same country in 1991 (3,400 deaths versus 143,000)," and fewer than the similar scale cyclone Nargis that resulted in more than 140,000 deaths in Myanmar in 2008.

5. Drought/Famines

While droughts and famines have been a common occurrence globally since biblical times (e.g. the story of Joseph and the famine in Egypt), it is the occurrence of drought in areas that have not known before that is particularly worrying. For example, in recent times, rice crops have not been able to be planted in parts of Nepal because of late monsoons, or in some areas rice crops have failed due to drought, as in the example given for Indonesia below.

Often it is difficult to determine if a drought is just a normal part of cyclic weather patterns that occur in some countries. Australia has just gone through a devastating ten-year drought. Lengthy droughts have occurred in the past in this continent, but it appears this drought was intensified by climate change. Even wealthy nations such as Australia are not immune to the human and environmental effect of heat waves, floods, storms, and forest fires. The CCHI Report (2009) states that Australia, among the developed nation, "is most vulnerable to the direct impacts of climate change and also to the indirect impact from neighbouring countries that are stressed by climate change."

Famine can follow the devastation caused by cyclones and floods, particularly where subsistence crops have been wiped out and cannot be replanted in time to get a yield. This appears to be a common occurrence in a country such as Cambodia. As already mentioned, floods in

the West Papuan highlands meant that food supplies had to be flown or trucked in. In 1997, Papua New Guinea, normally regarded as a high rainfall country, went through an unexpected drought period where the staple food crop, sweet potato, was unable to sustain many subsistence farmers and their families. This affected more than 40% of the population. In the high hills of Assam, India, minimum temperatures have risen by a degree and rainfall fallen over the last 60 years, resulted in lower and poorer quality tea yields.

Indonesia is used by the CCHI Report (2009) as a case study of the impact of seasonal change in rainfall resulting in widespread hunger:

> It reported that food insecurity is nothing new to the 4 million residents of the Indonesian province of East Nusa Tengarra, but climate change and rising food prices are making the situation even worse. Climate experts have linked the recent effects of El Niño Southern Oscillation to increased seasonal variation in rainfall, which leads to increased drought frequency and reduced rice yields. More than 115 million poor Indonesians rely predominantly on rice production for their food and income. An estimated 13 million children suffered from malnutrition in Indonesia in 2009 as many residents faced failed crops due to drought and were unable to afford to buy food. While climate change is predicted to lead to a 2-3% increase in annual rainfall, the additional rains come at the least favourable times. In fact, there are drier conditions and delayed monsoon rainfall for most of the year, followed by a condensed and even wetter three month rainy season in all of Indonesia. In 2008, severe drought reduced food supply and food prices increased by as much as half. In East Nusa Tengarra, the number of deaths from malnutrition doubled compared to 2007 and more than half of all children under five years of age showed signs of stunted growth, a 15% increase from 2007.

6. Deforestation

Deforestation also plays a major role in CO_2 emissions, accounting for over 25% of global emissions in the 1990s with the CCHI Report (2009) estimating that "a majority of deforestation is carried out by slashing and burning (54%) and the remainder by cattle raising (5%), heavy-logging (19%) and the growing palm oil industry (22%), an industry projected to grow due to its use in biofuel production." The deforestation rate of primary forests (2000-2005) reported by the Food and Agricultural Organisation (Food and Agricultural Organisation [FAO], 2005) showed Vietnam second (54.5%), Cambodia third (29.4%), Sri Lanka fourth (15.2%), Indonesia sixth (12.9%) and Nepal eighth (9.1%).

In the Asia Pacific region, the majority of remaining forests are located in high growth nations such as Indonesia and China. Deforestation drains natural resources permanently and leaves the land vulnerable to environmental disasters, including those associated with climate change (e.g. erosion, mudslides, floods, etc.). Without doubt, the abounding deforestation in many of the Asia Pacific countries is contributing to the factors bringing about climate change. Forests are rapidly disappearing, often though not always through illegal logging, in countries like Indonesia, the Solomon Islands, Myanmar, and Papua New Guinea. This combined with deforestation in earlier centuries in countries like Australia, Malaysia, and India means that important sinks for CO_2 capture are being lost, as well as to contributing to CO_2 emissions.

7. Pollution

Developed nations bear the most responsibility for climate change, through their human activities and contribution to pollution, as well as past exploitation of natural resources such as forests. However, there are an increasing number of cases where low and middle income countries also contribute significantly to climate change (CCHI Report, 2009). The top ten emitting countries by total fossil-fuel CO_2 emissions for 2007 included first China (22.3%), third India (5.5%), fifth Japan (5.4%) and ninth South Korea (1.7%) (cf. second USA [19.91%]) (Carbon Dioxide Information and Analysis Center, 2007). Some of these countries have rich natural resources and are experiencing fast economic growth. Many of these rapidly industrializing nations rely on coal to drive their power hungry economies. Fossil fuel usage is the largest single contributor to global carbon emissions producing climate change (coal alone accounts for roughly 20% of global emissions). It should also be noted Australia is one of the largest coal exporters in the world, thereby contributing to the CO_2 problem through the mining of this resource.

China emits more GHG emissions than any other country, due in large part to its reliance on coal to fuel its expanding economy. In 2009, China derived 70% of its primary energy from coal, and this heavy dependence is expected to double again by 2030, with major implications for emissions of GHGs. On a per capita basis, however, China emits much less per person than the United States or other developed countries (e.g. Americans emit 7.5 times more CO_2 than the average Chinese on a per capita basis) (Seligsohn *et al.,* 2010).

The CCHI Report (2009) points out that poverty can drive practices that contribute to climate change, and give the release of black carbon (soot) released from under-ventilated fireplaces and primitive cooking stoves, of which many are found in the Asia Pacific region amongst

poor communities. Black carbon from soot contributes as much as 18% of global warming, compared to 40% by carbon dioxide. As soot only remains in the atmosphere for a few weeks, providing affordable alternatives for cooking would by an easy, fast way to curb global warming.

8. Rising Sea Levels

Jyotsna Giri of India, provides a human face to the impact of sea level rises caused by climate change. Jyotsna had a small farm on Lohachara Island in West Bengal. Fifteen years ago, she had to move to a refugee colony on a neighbouring island when the sea claimed her home and farm:

> I still remember that fateful day, when I lost everything. When we approached Lohachara Island, I suddenly noticed that my sheep were all drifting in the river. I found that half of my house was washed away by the river. Slowly the entire island got submerged. (CCHI Report, 2009)

Small islands are especially vulnerable to a rise in sea-level and storm surge, particularly islands such as Tuvalu, Kiribati, and the Maldives. Tuvalu, in the South Pacific Ocean, is less than 4.5 meters above sea level. Daily challenges include frequent saltwater flooding, faster coastal erosion, and growing difficulty in farming vegetables and plants. The people of Tuvalu started to relocate to New Zealand, directed by a negotiated migration scheme. Similarly, evacuations have occurred from Papua New Guinea's low-lying Carteret Islands due to climate change.

What is going on?

It may well be asked what is going on, when this list of environmental difficulties are considered from the Asia Pacific region. While earthquakes, tsunamis, and volcanic eruptions cannot be attributed to the changing climate, most of the other environmental difficulties listed are in some way linked. Certainly, those directly being impact by climate change and the vagaries of the environment are asking what is going on. For example, hear the voice of Tulsi Khara, from India, who has lived her 70 years of life in the world's largest delta, where the Brahmaputra and Ganges rivers meet and flow into the Bay of Bengal:

> We are not educated people, but I can sense something grave is happening around us. I couldn't believe my eyes—the land that I had tilled for years, that fed me and my family for generations, has vanished. We have lost our livelihood. All our belongings and cattle were swept away by cyclones. We have moved to Sagar Island and are trying to rebuild our lives from scratch. It wasn't like this when I was young. Storms have become

> more intense than ever. Displacement and death are everywhere here. The land is shrinking and salty water gets into our fields, making them useless. We feel very insecure now. (CCHI Report, 2009).

Scientists indicate that if climate change is not effectively and urgently addressed, by keeping the temperature rise to less than 2°C, then not only will sea levels rise and threaten tens of millions of people and their homes, but tropical diseases like malaria and dengue fever will also continue to spread. Floods like those recently experienced in Pakistan will become more frequent, and storms and cyclones, like those experienced last year in the Philippines or in Myanmar with Cyclone Nargis and Giri, will become more frequent and more intense. Devastation in coastal areas will become more common with these more extreme weather patterns, particularly when combined with increased sea levels. Moreover, hundreds of thousands of species of plants and animals will be pushed to extinction. Droughts will increase and rainfall will become less predictable which will see an increase in crop failure.

The impacts of climate change globally are apparent in what can be seen happening in the Asia Pacific region. Climate change is impacting human health, livelihoods, safety, and society in the Asia Pacific region. In a similar way, it is impacting the rest of the globe. Generalized, CCHI Report (2009) summarizes this by stating that "climate changes impacts people in the following ways:

- Food security: More poor people, especially children, suffer from hunger due to reduced agricultural yield, livestock, and fish supply as a result of environmental degradation.
- Health: Health threats like diarrhoea, malaria, asthma, and stroke affect more people as temperatures rise.
- Poverty: Livelihoods are destroyed when income from agriculture, livestock, tourism. and fishing is lost due to weather-related disasters and desertification.
- Water: Increased water scarcity results from a decline in the overall supply of clean water and more frequent and severe floods and droughts.
- Displacement: More climate-displaced people are expected due to sea level rise, desertification, and floods (60 million expected in Bangladesh alone).
- Security: More people live under the continuous threat of potential conflict and institutional break down due to migration, weather-related disaster, and water scarcity."

What has God given to us?

In Genesis God created the universe through purposeful and careful labour. He filled His creation with beauty and abundance, stopping at each stage of its development to declare that it was good. He appointed humankind as vice-regents over creation; granting dominion over all He had created. In this act, God made humankind stewards of His earth, with the power to be its protectors.

Nonetheless, it is easy to encounter scepticism among Christians who doubt that humans could have any substantive impact on the Earth's environment. "How can we be causing the earth's climate to change?" they wonder, and "how can we do anything to stop it changing? After all, is it not God's sovereignty alone that regulates the rains, the oceans, the winds, and the sun? Does not the Bible say that, 'The earth is the Lord's and everything in it' (Psalm 24:1)?"

It is not hard to find instances in the Asia Pacific region to see where humankind has moved from being protectors of God's creation to its destroyers. Each attendee at this colloquium could recount localised instances from the communities and countries we come from. For example, in Australia, the over-allocation of available water from the Murray-Darling basin rivers system to irrigate food and cotton production has destroyed the river system and changed its ecology to the detriment of the wildlife, plants, and people. Similarly, China is now discovering, just as the developed world did, that the pollution caused by unregulated coal-fired power stations is devastating for the local environment. Sulphur-dioxide creates acid rain that affects waterways and crops; nitrogen oxide contributes to carcinogenic smog; and mercury causes neurological damage in children. In contrast to these localised issues, the global nature of climate change combined with the relatively long time-lag between action and consequence has meant that climate change remains a problem too large and too distant for many to claim any responsibility of being the perpetrators or destroyers.

What is likely to happen if we do nothing or change what we do?

Even when acknowledged that God has given humankind power over His earth, it is understandably hard to conceptualise how our actions could fundamentally reshape the entire planet. However, consider that since 1750 there has been a tenfold increase in the world's population and an equivalent per person increase in consumption: humankind is effectively drawing upon 100 times more of the earth's resources than prior to industrialisation. The Nobel Prize winning atmospheric chemist Paul Crutzen argues that this has been enough to throw every life

sustaining system on the planet off kilter, including the climate (Sachs, 2008).

Stern (2006) suggests that the effects of global warming could shrink the global economy by 20%. Whatever be the scale, climate change is a reality. The non-binding pledges made in Copenhagen and Cancun put the world on track for a catastrophic temperature rise of 3-4ºC. If nothing is done, air temperature will continue to rise, sea levels will continue to go up, more extreme climate conditions will happen and become more frequent. The most vulnerable and least able to cope and adapt, the poor, will suffer, and loss of life due to climate change will increase.

It is argued that aggressive and immediate policy action is needed to stabilize and reduce total emissions in the coming decades and hold global warming to below 2ºC. To lower carbon emissions, the world community must cut back the use of fossil fuels and take steps to substitute other energy sources. However, there is common but differential responsibility in the action to be taken. When the United Nations Framework Convention on Climate Change was framed and then signed and ratified at the Rio Earth Summit (1992) by most of the world's countries (including the United States), the principle of "common but differentiated responsibilities" was recognized. They are:

1) The largest share of historical and current global emissions of GHGs has originated in developed countries;

2) Per capita emissions in developing countries are still relatively low; and

3) The share of global emissions originating in developing countries will grow to meet their social and development needs. (United Nations Framework Convention on Climate Change, 1992)

Similarly, the World Resources Institute highlights that the industrialized countries are the biggest polluters (Baumert *et al.,* 2005). In terms of historical emissions over the last 100 years, industrialized nations make up 65% of the carbon dioxide build-up in the atmosphere presently. In same period, China and India's cumulative shares were 7.6% and 2.2%, respectively. The environmental consequences of the policies of industrialized nations have created a detrimental and exorbitant effect on developing countries—especially considering the fact that the impoverished in those nations are already laden with debt and poverty.

Stern, in his report (2006), argues that by 2050 the richer countries should take responsibility for 60% and 80% of reductions in emissions since the observed level from 1990. However, rapid development in the Asia Pacific region is bringing hundreds of millions of people out of

poverty, but the very same issues of pollution attributed to the richer nations go unmonitored. Along with this economic expansion a rise in environmental pollution including GHG emissions has been observed. The developing countries in Asia now account for one-third of global emissions brought about by energy consumption, deforestation, and land use (Gnanakan, 2009).

While annual emissions of carbon dioxide (CO2) from the burning of oil, gas and coal fell by 1.3% in 2009 compared with 2008, a record year, the picture for the Asia Pacific was mixed. Emissions fell by 11.8% in Japan, compared to 6.9% in the United States, by 8.6% in Britain, by 7% in Germany and by 8.4% in Russia. In contrast, emissions rose by 8% in China, by 6.2% in India and 1.4% in South Korea. Consequently, China fortified its unenvied position as the world's number one emitter of fossil-fuel CO2, totalling up to 24%l. The United States remained second with 17% (Global Carbon Project, 2009).

According to scientific observations made thus far, it is unquestionable that climate change threatens sustainable development and achievement of all eight Millennium Development Goals. Although the leading nations around the world has agreed at the beginning of the new millennium to eradicate extreme hunger and poverty by 2015, climate change is already driving some 50 million additional people to go hungry and over 10 million additional people into extreme poverty (CCHI Report 2009). If the current rate of climate change is not decelerated to reduce the resulting damage, more people will be forced to suffer from hunger and poverty. Asian Pacific houses many of the countries that are most susceptible to climate change; they are defenceless to the effects of the melting Himalayan ice sheets, droughts, floods, and storms. The most affected countries include India, Pakistan, Bangladesh, southern and eastern China, Myanmar, Vietnam, Philippines, and Indonesia. In addition, a number of the small island developing states at risk to sea level rise and cyclones are in the region (Comoros islands, Kiribati, Tuvalu, and the Maldives).

If nothing is done in the next twenty years, the CCHI Report (2009) postulates the following:

1) "Those seriously affected by climate change are expected to more than double to 310 million within 20 years, and lives lost every year are expected to increase by at least two thirds."

2) "Economic losses due to climate change are expected to more than double to US$340 billion in the next 20 years."

3) "By 2030, the number of hungry people because of climate change is expected to grow by more than two thirds to 75 million."

4) "Climate change threatens to slow, halt or reverse progress towards reducing the spread of diseases and aggravates already enormous health problems, especially in the poorest parts of the world."

5) "By 2030, climate change is expected to increase the number of people suffering from the health consequence climate change by more than one third and lives lost by more than one half."

6) "Climate change is expected to increase poverty, doubling the number by 2030 already pushed into poverty by the changing environment (in 2009 this was 12 million), many who are in India and South East Asia."

7) "Climate change will exacerbate already shrinking fresh water availability, where 1.3 billion people world-wide are water stressed."

8) "Continued climate change will increase the number of people displaced due to rising sea levels, desertification and loss of livelihoods. Currently there are 26 million climate displaced persons and this is projected triple within 20 years, with many coming from China, India, Bangladesh, and the delta areas, coastal zones and islands of a number of countries."

Is nothing being done? The answer is "No." In 2009, CO_2 emissions from deforestation fell sharply because of efforts to slow down forest loss in tropical countries and to a pickup in reforestation in Europe, temperate zones of Asia, and North America. Emissions from deforestation were more than 25% of the global total in the 1990s but it dropped to 12% in 2009 (Global Carbon Project, 2009). Some nations are actively pursuing the CO_2 emissions. For example, China has ordered to shutdown inefficient and high-emitting coal-fired power stations and replaced them with high efficiency coal-fired generators. This is just one of a range of measures being undertaken by one country. Unless much more active actions to address climate change and effectively curtail the factors contributing to global warming are done, they will have devastating consequences for future generations, particularly for the poor.

Conclusion

The challenges of a changing environment globally, and therefore, in the Asia Pacific region, are many. Climate change is a reality. As God's vice-regents given the task of being good stewards of His creation, and particularly as dedicated followers of Christ Jesus, we need to take an active role in both mitigating the effects of climate change and helping communities, particularly the vulnerable and poorer, to adapt to the changes in the environment. In a similar way, help is needed for those affected by earthquakes, tsunamis, volcanoes, and what might be considered other environmental disasters. Disaster risk reduction and climate change mitigation and adaptation share a mutual concern: decreasing the vulnerability to adapt to the new environmental conditions. This is a task for all the members of the global community, and particularly, Christians (see 2 Cor 1:3).

Christians need to work to uncover a substantive and compelling theology that leaves in no doubt that God's people are to be at the forefront of the global society as it works together to overcome the challenge of a climate in flux and an environment that leaves the vulnerable particularly exposed. God's heart for the poor runs deep throughout his revelation—the Bible—as it must also run deep through our theology.

Works Cited

Baumert, K. A., Herzog, T., & Pershing, J. (2005). *Navigating the numbers greenhouse gas data and international climate policy.* Washington, DC: World Resources Institute.

Carbon Dioxide Information and Analysis Center. (2007). *Top 20 emitting countries by total fossil-fuel CO_2 emissions for 2007.* Retrieved from http://cdiac.ornl.gov/trends/ emis/tre_tp20.html.

Climate Change Human Impact Report. (2009). *The anatomy of a silent crisis.* Geneva: Global Humanitarian Forum.

Food and Agricultural Organisation. (2005). *The global forest resources assessment 2005*. Rome: Food and Agriculture Organization of the United Nations.

Global Carbon Project. (2009). *Carbon budget: Highlights (full).* Retrieved from http://www.globalcarbonproject.org/carbonbudget/09/hl-full.htm

Gnanakan, K. (2009, July). *Climate change and global economics.* Paper presented at the Micah Network 4th Triennial Global Consultation on Creation, Stewardship and Climate Change, Nairobi, Kenya.

Integrated Regional Information Networks (IRIN), Indonesia. (2011,

March 3). *Indonesia: Small-scale disasters take their toll.* Retrieved from http://www.unhcr.org/refworld/docid/4b960e3e1e.html.

Sachs, J. (2008). *Common wealth: Economics for a crowded planet.* New York: Penguin Press.

Simiyu, S. (2009, July). *The 21st century challenge: Climate change & biodiversity depletion.* Paper presented at the Micah Network 4th Triennial Global Consultation on Creation, Stewardship and Climate Change, Nairobi, Kenya.

Stern, N. (2006). *Stern review on the economics of climate change*. Cambridge: Cambridge University Press.

Seligsohn, D., Liu, Y., Forbes, S., Dongjie, Z., & Wes, L. (2010). *CCS in China: Toward an environmental, health, and safety regulatory framework.* Washington, DC: World Resources Institute.

Pachauri, R.K., & Reisinger, A. (Eds.). (2007). *The fourth assessment report of the intergovernmental panel on climate change.* Geneva: IPCC.

United Nations Framework Convention on Climate Change. (1992). *United Nations framework convention on climate change.* Retrieved from http://unfccc.int/resource/docs/convkp/conveng.pdf.

U.S. Global Change Research Program. (2009). *Global climate change impacts in the United States.* Retrieved from http://www.globalchange.gov/what-we-do/assessment/previous-assessments/global-climate-change-impacts-in-the-us-2009.