Global Environmental Changes and Health

**3**

*“Were the world a patient, we would be calling the cardiac arrest team just now”* (Montgomery, 2011).

**Introduction**

It is predicted that climate change will have the greatest consequences for those who have contributed the least to its causes – the poor; and that it will deepen health inequities through the negative effects it will have on the social determinants of health. These effects will be felt by the present generations, but will be far worse for the generations to come.

**Study sessions**

In Session 1 we discuss what climate change is and how it is to the global increase in the output of carbon emissions. We then examine the impact climate change has on populations and on human habitats. In Session 2 we consider the main impacts that global climate change has on human health

**There are two study sessions in Unit 3:**

Study Session 1 Climate change, globalisation and human habitats

Study Session 2 What health concerns arise as a result of climate change?

**Intended learning outcomes**

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| **By the end of this unit, you should be able to:** |
| * Critically appraise existing evidence of the links between climate change and the process and practices of globalisation. * Explain the relationship between global climate change and human health. |

**Unit 3–Session 1**

**Climate Change, Globalisation and Human Habitats**

*“… not only are the environment and globalization intrinsically linked, they are so deeply welded together that we simply cannot address the global environmental challenges facing us unless we are able to understand and harness the dynamics of globalization that influence them. By the same token, those who wish to capitalize on the potential of globalization will not be able to do so unless they are able to understand and address the great environmental challenges of our time, which are part of the context within which globalization takes place”* (Najam, Runnalls & Halle, 2007).

# Introduction

We begin this session by unpacking what is meant by global climate change and by discussing the main drivers of it. We then describe the relationship between climate change and globalisation; and we end by examining the impact of climate change on human habitats.

# Contents

1 Learning outcomes for this session

2 Readings

3 What is climate change?

4 What is the relationship between globalisation and climate change?

5 What is the impact of climate change on human habitats?

6 Session summary

7 References and further reading

# Timing of this session

There are six readings in this session and five tasks. It is likely to take you up to six hours to complete.

## 1 LEARNING OUTCOMES FOR THIS SESSION

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| **By the end of this session, you should be able to:** |
| * Explain the term ‘climate change’. * Explain on-going climate changes, and the main driver/s of these changes. * Describe the relationship between climate change, environmental degradation and globalisation. * Explain the impact of climate change on human habitats. |

## 2 READINGS

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| **Authors** | **References** |
| The Royal Society. | (2010). *Climate Change: A Summary of the Science*. The Royal Society: London: 1-16. |
| Intergovernmental Panel on Climate Change (IPCC). | (2007). Summary for Policymakers. In: S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor & H.L. Miller (eds.) *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the IPPC.* Cambridge University Press, Cambridge and New York: 1-18. |
| Birn, A., Pillay, Y. & Holtz, T. | (2009). Chapter 10: Health and the Environment. *Textbook of International Health: Global Health in a Dynamic World*. Oxford University Press: 470-474. |
| Najam, A., Runnalls, D. & Halle, M. | (2007). *Environment and Globalisation: Five Propositions.* International Institute for Sustainable Development: 10-28. |
| Satterthwaite, D. | (2009). *The implications of population growth and urbanization for climate change.* Human Settlements Group, International Institute for Environment and Development (IIED): 1-24. |
| Roberts, I. & Stott, B. | (2010). Doctors and climate change. *Lancet*, 376(9755):1801-1802. |

## 3 WHAT IS CLIMATE CHANGE?

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| **TASK 1- Define the terms**  What do you understand by the terms climate change and the carbon cycle. |

**FEEDBACK**

For feedback on Task 1 do the readings below and watch the two minute DVD.

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| **READING**  The Royal Society. (2010). *Climate Change: A Summary of the Science*. The Royal Society: London: 1-16.  Intergovernmental Panel on Climate Change (IPCC). (2007). Summary for Policymakers. In: S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor & H.L. Miller (eds.) *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the IPPC.* Cambridge University Press, Cambridge and New York: 1-18. |

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|  | **DVD Resource [See DVD Unit 3]**  *What is global warming?* Paramount Pictures. |

**A delicate temperature balance influences the climate**

The world’s natural environment is a complex system that encompasses all of its ecology, such as the sea, vegetation, and the weather. There exists a delicate temperature balance that affects weather patterns:

* The Sun heats the Earth, which in turn warms up the atmosphere – the thin layer of air surrounding the Earth made up of gases, such as oxygen and nitrogen, trace gases and water vapour.
* Some of the gases in the lower atmosphere – greenhouse gases – absorb the energy from the Sun, while the rest of these gases are reflected back into space.
* The absorption of the Sun’s energy insulates the Earth, like a greenhouse. This prevents the Earth from getting too cold at night or too hot during the day. Without this insulating greenhouse effect, the average surface temperature of the Earth would be 30°C lower than it is. In other words, the Earth would be a much colder place!

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| **GLOSSARY**  **Greenhouse gases:** The major greenhouses gases include water vapour, carbon dioxide, methane, ozone, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride. |

The problem arises because there has been a steady increase in greenhouse gas emissions, mainly due to the emission of carbon dioxide from the burning of fossil fuels that accelerated with the Industrial Revolution. More outgoing energy is now trapped via the greenhouse effect. The Earth’s atmosphere is taking up more heat than it is giving off; and at the same time the rate of evaporation has decreased – probably because less sunlight is reaching the Earth due to particulate pollution, such as soot, ash and dust. The steady increase in the average temperature of the Earth’s lower atmosphere and oceans is known as global warming. The consequences of global warming are:

* melting snow and ice at the poles and high in the mountains
* rising sea levels
* more extreme weather
* threat to ecosystems
* climate change – the long-term change in weather patterns.

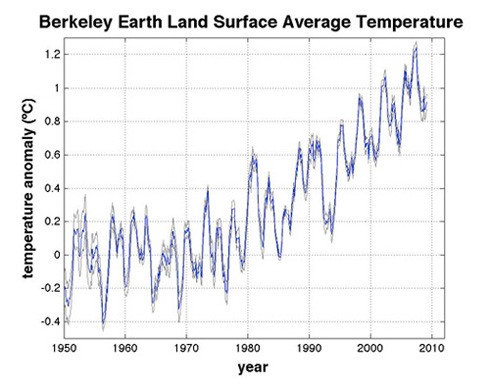
**Climate change**

Without human intervention, the Earth’s climate has constantly changed naturally over the course of its geological history – these are called abiotic changes. The climate changes as the amount of energy from the Sun received and absorbed by the Earth’s atmosphere changes; as the amount and type of energy released back into space changes; as the Earth’s orbit changes; as the continents drift; and as volcanoes erupt or asteroids hit. These changes, except for volcanic eruptions and large asteroid impacts, generally take millennia to affect the natural environment and climate.

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| **GLOSSARY**  **Abiotic**: Not related to human causes. All the non-living things which comprise the environment are known as abiotic factors, such as rock, water, mountains.  **Biotic**: Related to or caused by living organisms, e.g. people. |

Up until the Industrial Revolution, the climate was relatively stable, with changes occurring so slowly that animals and human beings managed to adapt. However, researchers at the Berkeley Earth Project have found that since the mid-1950s the global land temperature has increased by approximately 1°C (Rohde *et al*., 2011). Figure 3.1.1 shows the overall rise in temperature, as well as the large up and down fluctuations which have taken place every few years in global atmospheric land temperatures since 1950. This data is drawn from more than 39 000 temperature measurement stations across the globe.

**Figure 3.1.1 Berkeley Earth Project land surface average temperature**



***Source***: Berkeley Earth Project, Rohde *et al.* (2011)

The rise in overall global land temperature does not mean that there are hotter temperatures everywhere, all the time. Instead, it means that the Earth is failing to regulate its temperatures or failing to retain its temperature balance as well as it used to. This means that certain regions are more likely than before to experience extreme temperatures in shorter spaces of time.

What we have seen in the past few decades have been changes in the global climate that previously took millions of years to occur – more frequent extreme weather incidents and major natural disasters, like unseasonal rains, floods, hurricanes, higher global temperatures, earthquakes, volcanoes, tsunamis and wildfires. Changing temperatures accelerate transmission rates of diseases and can also allow the resurgence of previously eradicated organisms in certain areas, such as Malaria mosquitoes. We will discuss this in more detail in Session 2.

Unless much stronger climate change mitigation efforts are introduced, it is highly likely that severe droughts will occur during the 21st century over most of Africa, southern Europe and the Middle East, and most of the Americas, Australia, and South East Asia (Dai, 2010). In addition to the effect of drought on agriculture and food production, the increase in temperature during the growing season causes additional serious problems for agricultural productivity, farm incomes and food security. In moderate or temperate regions, the hottest seasons on record will represent the future norm.

Studies have also shown increases in the average ocean temperature since the 1950s, which impacts on sea surface temperature as well as on the average sea level and currents. Since the 1960s, ice sheets on Greenland and West Antarctica have been melting at a rapid rate and this has also contributed to the observed rise in average sea levels. Over the past 20 years, the ocean has also become more acidic due to increased levels of carbon dioxide in the water.

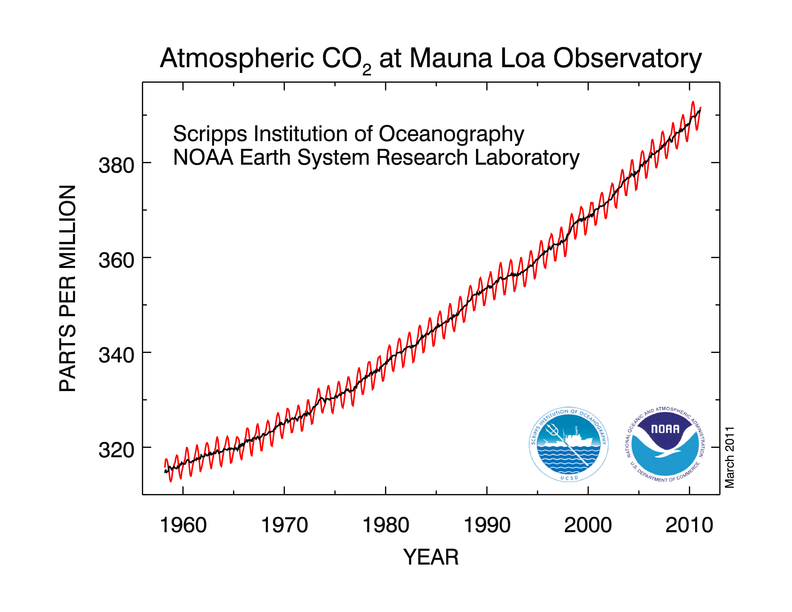
The rising sea levels will have a profound effect on coastal ecosystems and communities. In 2012, approximately 60 million people live within 1 metre of sea level and are already vulnerable to threats from storm surges. By the end of this century the number of people who live within 1 metre of sea level will have increased to 130 million.

***Reasons for climate change***

The dominant cause of global warming and climate change is the increase in the high concentrations of greenhouse gases (particularly carbon dioxide (CO2) due to various human activities, particularly the burning of fossil fuel and deforestation (IPCC, 2007).

The curve in Figure 3.1.2 shows the increase in atmospheric carbon dioxide from the Mauna Loa observatory in Hawaii from 1960 to 2010. During recent years an increase of approximately 2 ppm (part per million) per year has been observed. According to well-known climate scientist, James Hansen, carbon dioxide needs to stabilise below 350 ppm in order to avoid a global temperature increase of more the 1,5ºC. To have a reasonable chance of achieving this, a rapid reduction in carbon dioxide emissions must take place (in the order of 5% per year from 2015).

**Figure 3.1.2 Atmospheric carbon dioxide (CO2) at Mauna Loa Observatory**



The Mauna Loa data are being obtained at an altitude of 3400 m in the northern subtropics, and may not be the same as the globally averaged CO2 concentration at the surface.

***Source***: <http://www.esrl.noaa.gov/gmd/ccgg/trends/-->

4 WHAT IS THE RELATIONSHIP BETWEEN CLIMATE CHANGE AND GLOBALISATION?

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| **TASK 2- Reflect on your experience of climate change**  **READING**  Birn, A., Pillay, Y. & Holtz, T. (2009). Chapter 10: Health and the Environment. *Textbook of International Health: Global Health in a Dynamic World*. Oxford University Press: 470-474.  Read the above chapter, and then answer the questions which follow.   1. How do you experience climate change in your own country, for example, do you experience more extreme temperatures, more frequent extreme weather incidents and major natural disasters? 2. What are the most urgent issues to do with the natural environment, including climate patterns in your country or in the community in which you live or work? 3. What do you think are the causes of these issues? What is worsening them? |

There is a reciprocal and dynamic relationship between the natural environment and contemporary globalisation. For example, the natural environment provides the natural resources needed for economic activities and economic growth across the globe; and in the process of exploiting these resources, we change the environment. However, the environment also impacts on and drives globalisation, for example, a scarcity of natural resources stimulates supply and demand forces in global markets.

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| **TASK 3- Take notes on how the natural environment and globalisation are linked**  **READING**  Najam, A., Runnalls, D. & Halle, M. (2007). *Environment and Globalisation: Five Propositions.* International Institute for Sustainable Development: 10─28.  As you read the above publication, summarise the five propositions which show how the environment and globalisation are intrinsically linked and interact. |

**FEEDBACK**

The five propositions put forward by the authors are:

1. The rapid acceleration in global economic activity and our increased demands for limited natural resources will ultimately undermine the pursuit of continued economic prosperity.
2. Together the processes of globalisation and environmental degradation pose new security threats to an already insecure world. They impact on already vulnerable ecosystems and put the poorest communities most at risk.
3. The wealthy will have to come to terms with the limitations of the ecological space in which everyone operates, and also with the needs and rights of those who are poor.
4. Consumption—in both the North and South—is the central challenge to the future of globalisation as well as to the environment.
5. Economic globalisation and the environment will become increasingly dependent on each other.

**How economic activities impact on the environment**

Global economic expansion has changed the natural environment in both direct and indirect ways; and it has affected the ability of people to control these changes.

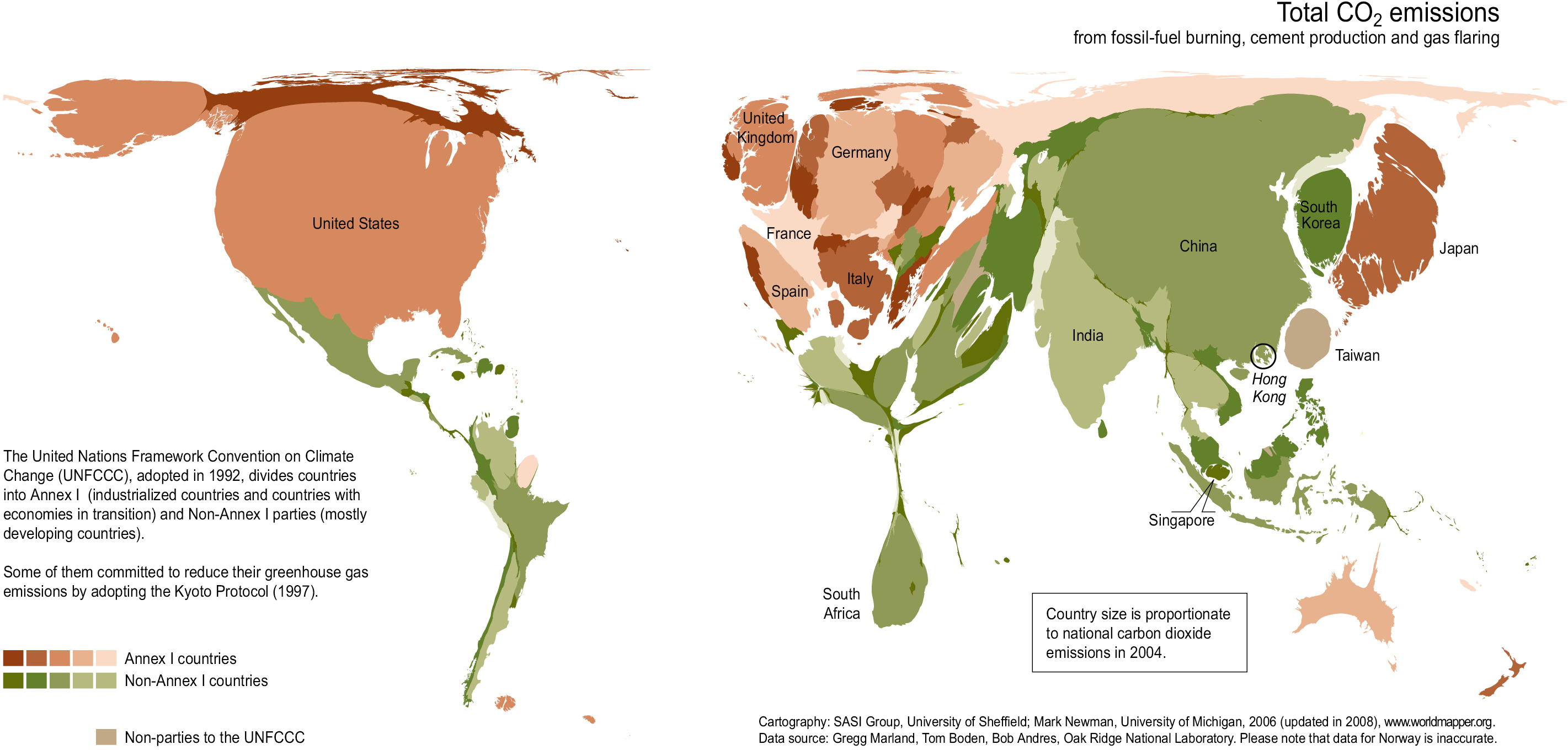
The *direct* changes to the Earth’s environment have occurred via some of the following human activities and processes:

* The consumption and use of fossil fuels in the form of gas, coal and oil in industrial processes or by vehicles, have resulted in high concentrations of greenhouse gases being emitted into the atmosphere. At the same time, fossil fuels are a non-renewable resource which is being used up at a far greater rate than it can be replaced; and as a scarce resource, it will continue to influence the direction of the global market until alternative resources are found.
* A change in land-use, for example for agribusiness has resulted in deforestation, land cover change, and the loss of certain species – affecting ecosystem and biodiversity.
* The greater concentration on monoculture where a single crop is cultivated at a time over a wide area, again and again, has had an adverse impact on the environment as well as on agriculture. Monoculture leads to extensive soil erosion and loss of soil fertility. In addition, when this crop fails due to changing weather patterns which bring droughts or floods, farmers cannot easily change to another mode of production.
* The depletion and contamination of our natural resources, such as our freshwater systems, has resulted in water shortages for humans, plants and animals.
* The extraction and exploitation of natural resources in mining processes have resulted in desertification and land degradation.
* Coal mining for the production of energy, disturbs large areas of land, resulting in soil erosion, dust, noise and water pollution, and impacts on local biodiversity. Coal mining operations also release methane and carbon dioxide into the atmosphere. Methane has a global warming potential 23 times that of carbon dioxide.

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| **GLOSSARY**  **Deforestation:** The destruction of huge forests from an area of land.  **Monoculture**: A single crop is cultivated at a time over a wide area, again and again. This has an adverse impact on the environment as well as on agriculture.  **Desertification**: A process by which land becomes increasingly dry until almost no vegetation grows on it, making it a desert. |

The world map in Figure 3.1.3 depicts country sizes in proportion to their national carbon dioxide emissions in 2004. Note how large South Africa’s emissions are in relation to the rest of Africa, and in relation to more developed countries, like Spain.

**Figure 3.1.3 Total carbon dioxide emissions from fossil-fuel burning, cement production and gas flaring (2004)**



***Source***: SASI Group, University of Sheffield; Mark Newman, University of Michigan, 2006 (updated in 2008), www.worldmapper.org. Data source: Gregg Marland, Tom Boden, Bob Andres, Oak Ridge National Laboratory. Please note that data for Norway is inaccurate.

We already know that the build-up of greenhouse gases enhances the natural insulating greenhouse effect and results in global warming, a consequence of which is climate change. The map in Figure 3.1.4 and the case study of Namibia which follows illustrate some of the direct impacts of climate change in Africa.

**Figure 3.1.4 Climate change vulnerability in Africa**



***Source****:* Ballance, A. (2002). Climate change vulnarability in Africa. UNEP, GRID.

***Climate change vulnerability in Africa****. Multiple stresses make most of Africa highly vulnerable to environmental changes, and climate change is likely to increase this vulnerability. This graphic shows which of the regions of Africa (North Africa, West Africa, Central Africa, East Africa, Southern Africa and the Western Indian Ocean Islands) are most vulnerable to specific impacts of climate change. These impacts include desertification, sea level rise, reduced freshwater availability, cyclones, coastal erosion, deforestation, loss of forest quality, woodland degradation, coral bleaching, the spread of Malaria and impacts on food security.* ***Source***: Ballance, 2002.

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| **CASE STUDY: Climate change in Namibia** |
| **Background** Scientists have demonstrated that since 1960 there have been noticeable changes in climate extremes and rainfall seasonality in the observed historic climate trends in Namibia. These changes are mostly seen in extreme increases and decreases in daily temperatures, as well as in the frequency of days with temperatures above 25°C and 35°C, and days with minimum temperatures below 5°C.  Rainfall changes are seen in the increased length of the dry season, the decreased number of consecutive wet days, and a concomitant later start and earlier cessation of the rainy season in the north (Desert Research Foundation of Namibia & Climate Systems Analysis Group, 2008). These changes have important implications for the seasonality of regional rainfall and together suggest a shorter, but more intense rainfall season.  **Recent flooding**  In early 2011, Namibia declared a state of emergency in response to wide-scale flooding in the north. News outlets reported that approximately 20 people drowned, 10 000 were displaced, and another 228 500 were affected due to floods cutting of road access (Van den Bosch, 2011). Preliminary assessments showed that the priority requirements were food, shelter, transport and education. Over 100 000 learners in 324 schools were affected by flooding – 163 of these schools had to be closed in this time. Twenty-two health clinics were either submerged or completely surrounded by water (Van den Bosch, 2011). Fields were also under water, leaving little grazing land for animals and no harvest for the year (Van den Bosch, 2011). The floods are expected to cause millions of dollars in damage, as happened after the floods in 2009, and there is concern that they will increase incidences of Cholera and Malaria in the region.  The residents of the area are becoming more and more accustomed to the annual floods that disrupt normal life for months.  *"When I was growing up, floods like this were something that happened every 10 or 20 years,"* says Mbala who is now 63. *"Situations like the one we have now, happened in 1961, 1968, 1978 and then in 2003. Since 2003, however, we have had large floods every single year.”*  The change in flood patterns has been attributed to the natural cycle of El Niño Southern Oscillation (ENSO). However, there is much debate about the effects of climate change on the frequency of ENSO occurrences.  **Part of a larger issue**  Namibia is heavily reliant on climate-sensitive sectors, such as agriculture and fishing; and it has been estimated that up to 30% of its GDP is reliant on natural resources. Therefore climate change has had a particularly devastating effect on this poor nation and on its capacity to cope with, and recover from, climate shocks due to limited financial resources, skills and technologies, among other things.  Importantly, Namibia is not the only southern African country to be plagued with disastrous floods. Flooding in Angola caused the deaths of 113 people in 2011, displaced about 35 000 people and destroyed nearly 5 000 homes. Floods in South Africa killed 91 people, and 34 died in Madagascar, mainly in the flooding caused by Cyclone Bingiza, which struck the Indian Ocean Island on 14 February 2011. In contrast, parts of Zimbabwe suffered an unseasonal dry spell that had a severe impact on the food insecure country's main harvest, which starts in April (Van den Bosch, 2011). |

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| **GLOSSARY**  **El Niño/La Niña:** An abnormal warming (El Niño) or cooling (La Niña) of surface ocean waters in the eastern tropical Pacific Ocean, and air surface pressure in the tropical western Pacific Ocean – the Southern Oscillation. The warm El Nino phase is accompanied by high air surface pressure in the western Pacific. The cool La Nina phase is accompanied by low air surface pressure in the western Pacific. Either phase causes extreme weather, such as flood and droughts. |

The table below shows the predicted impact that climate change will have on Uganda.

**Table 3.1.1 Hidden heat – the predicted impacts of climate change in Uganda**

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| **Impact** | | **Mechanism** |
| Water | Change in river flow regimes | Higher temperatures and melting of glaciers temporarily increasing and then reducing flows in the rivers downstream. |
|  | Water scarcity | Higher temperatures, evaporation and recurrent drought leading to stress, higher demands for water, conflict and biodiversity loss. Partially implemented water resource regulation system hands legal access to water to the powerful. |
|  | Flooding | Higher means and increased intensity rainfall, coupled with land degradation and encroachment raises risks of loss of life and property and damage to the infrastructure via flooding. |
|  | Malaria | Extension into higher or once cooler areas with temperature increases where resistance may be low. |
|  | Water borne diseases | Flooding is associated with diarrhoeal disease, including cholera epidemics, particularly where sanitation is poor and in slum areas. |
| Health | Respiratory disease | Associated with prolonged dry spells. |
|  | Malnutrition and famine | Associated with lower food production and insecurity, particularly with widespread damage brought by floods and droughts. |
|  | Seasonal rainfall change | Erratic onset and cessation of the rainfall seasons. Shorter rains. Crop failure or lower yields of staple foods, reduction in traditional varieties, and more crop disease. |
| Agriculture and food security | Higher average rainfall, high intensity events | Crop damage and soil erosion. |
|  | Pastoralists | Increase in rainfall in semi-arid areas could be beneficial, give mobile to take advantage of the rains. Droughts reduce viability of cattle corridor and precipitate conflict. |
|  |  | Lower milk production. |
|  | Fisheries | Changes in nutrient cycling and loss of spawning brought by temperature and water level change reduce productivity. |
| Environment | Land degradation and deforestation | Higher forest fire risks in dry periods, pressure on forests when other livelihood assets collapse, salination and soil erosion. |
|  | Species extinctions | As niches are closed out by shifts in climate regime |

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| **TASK 4 – Discuss the implications of flooding disasters**   1. What are the implications of classifying flooding disasters as ‘natural occurrences’? 2. What are health implications of the Namibian floods? 3. Why are the floods in Namibia not just a local problem, but also a global problem? |

**FEEDBACK**

1. Classifying flooding disasters as ‘natural occurrences’ lessens international attention (demonstrated in the lack of reporting on Namibian floods by international news sources). Less attention means less international aid. While at times the cause may be ‘natural’, the effect is unnatural and dependent on the context. This was clearly seen in the difference between the effect and response to the earthquake in Japan (a high-income country) in 2011 versus the on-going devastation after the earthquake in Haiti in 2010 (a poor country).
2. Short term health implications:

* limited access to healthcare facilities or providers
* deaths from drownings.

Long term health implications:

* Economic impact: Rebuilding of health care facilities, loss of livelihoods (crops) leads to food insecurity with possible malnutrition and starvation.
* Possible increase in cholera and malaria.
* Large allocation of national resources to flood preparedness, reducing funding to other possible development and healthcare initiatives.
* Increased urbanisation due to loss of livelihoods, growth of informal settlements/slums with health risks.

1. Richer countries contribute more to climate change, e.g. via carbon dioxide emissions; while poorer countries are faced with the consequences of climate change and find it harder to recover from climate disasters.

“*Climate change affects us all, but it does not affect us all equally. The poorest and most vulnerable ─ those who have done the least to contribute to global warming are bearing the brunt of the impact today”* (Ban Ki-Moon, 2009).

So far we have studied the direct ways in which global economic activities have changed the natural environment. Global economic expansion also has *indirect* consequences for the environments in which people live. For example, changing weather patterns mean that people cannot use past experience to predict when rains will come and even if they will come at all. This changes the life and livelihoods of people. It pushes changes in population patterns and concentrates people in particular places, such as in large cities. We will now focus on this last point in more detail.

## 5 CHANGING HUMAN HABITATS: URBANISATION

Economic and industrial activities which impact on the natural environment affect population movement, lead to urbanisation, and ultimately to the formation of informal settlements which become breeding grounds for the on-going cycle of poverty and ill-health.

Human movement or migration is not a new phenomenon. What is new is the volume, speed and geographical range of movement. Most people move in search of a better life, job, livelihood, or to escape an insecure situation, such as economic insecurity, political instability, war and conflict, or environmental degradation and loss of livelihood. Consider the typical scenarios below.

**Globalisation of agriculture**

In Unit 2, Session 2 we studied some of the effects of the globalisation on agriculture and the global food trade on human health. We looked at how farmers are encouraged to focus on monoculture, which relies on expensive bioengineered seeds, chemical fertilisers and toxic pesticides; and which is also highly water-dependent. In Southern Africa, for example maize has displaced millet.

What happens when climate change leads to changes in weather patterns, making rain no longer predictable? Crops either do not grow when expected or they die, there is also a loss of arable land. Small farmers cannot diversify to other crops. The global economic regime means that many countries are bound by IMF strictures, which often mean that there is no support available from the government for farmers, especially those in Sub-Saharan Africa, when they face a bad crop. Farmers rely on the goodwill of friends and family (who are usually facing the same situation), and many are eventually forced to leave their farms and migrate to an urban area in search of work.

**The growth of informal settlements in the cities**

In the city there is little financial support from the government and new migrants are forced to live in informal settlements that receive no or few government services, such as sanitation or housing assistance. In such situations the local drinking water supplies are often polluted by sewage, and diseases of overcrowding are rife.

**Increasing our carbon footprint**

Urbanisation increases the demand for transport to bring in produce from elsewhere that people cannot grow or manufacture themselves, especially processed foods (which as you know contribute to the obseogenic environment and to the high incidence of NCDs – see Unit 2, Session 2). Transportation of food over long distances in turn produces millions of tons of carbon dioxide, increasing our carbon footprint, adding to the greenhouse gases which are responsible for global warming and climate change.

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| **GLOSSARY**  **Obesogenic environment:** An environment that actively promotes a lifestyle that encourages obesity. |

Increased pollution

Waste disposal becomes an ever-larger issue in the urban areas. With global consumption patterns, it is cheaper to throw away waste, food by-products, packaging and discarded goods, than to reuse or recycle them.

Buildings are designed to accommodate more people and face challenges in heating or cooling. Air pollution from transport, cooking and heating or cooling in large cities is often visible to the naked eye (the brown or yellow smog that hangs over a large city when the winds are still).

**‘Heat islands’**

Cities are centres of industrialisation and sources of emissions and global warming. They are ‘heat islands’, significantly warmer than the surrounding countryside. The primary cause of this is the way the land surface is modified by urban development. A secondary cause is waste heat from energy use.

But cities are also a source of solutions as more and more local structures are harnessing wind, solar and geothermal energy. These local efforts however need to be supported by national, regional and international initiatives – something we will pick up on in Unit 5.

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| **TASK 5 ─ Discuss whether urbanisation and population growth are drivers of climate change**  **READINGS**  Satterthwaite, D. (2009). *The implications of population growth and urbanization for climate change.* Human Settlements Group, International Institute for Environment and Development (IIED): 1-24.  Roberts, I. & Stott, B. (2010). Doctors and climate change. *Lancet*, 376(9755):1801─1802.  Read the above articles and listen to the interview with Stott (see below). Then answer these questions.   1. Explain Satterthwaite’s argument that the real driver of climate change is the number of consumers on the planet and their high consumption levels, rather than rapid population growth or urbanisation. 2. Explain Stott’s statement, “The planet is getting hotter, its people are getting fatter, and the use of fossil fuel energy is the cause of both.” |

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|  | **DVD Resource [See DVD Unit 3]**  Discussing health and climate changewith Robin Stott, co-chair Climate and Health Council. (mp3, 10:23 mins, 9.5Mb) |

**FEEDBACK**

Read the notes below for feedback on Task 5.

Satterthwaite (2009) challenges the assumptions that urbanisation is responsible for or enhances human-induced climate change; and that population growth is a major cause of increased greenhouse gas emissions and of global warming. Having analysed changes in population and in greenhouse gas emissions globally, Satterthwaite (2009) found that between 1980 and 2005:

* Low-income nations with the highest population growth rates (52,1%), had low growth rates for greenhouse gas emissions (12,8%).
* High-income nations with the lowest population growth rates (7%) had high growth rates for greenhouse gas emissions (29%).

Put another way: poor households contribute very little to greenhouse gas emissions; and if most of the world’s population growth is among the poor, then population growth is not the problem (Satterthwaite, 2009).

**Table 3.1.2 Growth in carbon dioxide emissions by region**

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| **Country/ region** | **% of the world’s population** | **% growth in carbon dioxide emissions** |
| Sub-Saharan Africa | 18,5% | 2,4% |
| China | 15,3% | 44,5% |
| United States | 3,4% | 12,6% |

***Source***: *Environment and Urbanization*, 28th September, 2009.

*“A child born into a very poor African household who during their life never escapes from poverty contributes very little to climate change, especially if they die young, as many do. A child born into a wealthy household in North America or Europe and enjoys a full life and a high-consumption lifestyle contributes far more ─ thousands or even tens of thousands of times more. Of course, not all the world’s greatest consumers are in high income countries. The many millionaires from Mexico, China or South Africa may have just as large and damaging a carbon footprint as millionaires from Europe or North America. But, globally, most of the world’s high-consumers are in Europe and North America”* (Satterthwaite, 2009).

**Production, consumption and waste generation patterns**

In order to determine the link between climate change, urbanisation and population growth we need to look at production as well as consumption and waste generation patterns – all aspects of globalisation. Satterthwaite (2009) argues that it is misleading to attribute greenhouse gas emission to nations, because this obscures the large differences in greenhouse gas emissions between population groups within nations, especially between those in the high- and low-income groups.

It is more accurate to assign responsibility to individuals and households, based on their consumption of goods or services which cause greenhouse gas emissions, such as the use of coal for energy. In South Africa, for example, 87% of electricity used by households, business and industry is from conventional energy sources which rely on the burning of fossil fuels. This high percentage means that *everyone* – urban and rural, rich and poor – has a disproportionately large carbon footprint and is responsible for the high levels of greenhouse gas emissions.

According to Satterthwaite (2009) the underlying cause of climate change is the consumption of those goods and services which draw on resources that generate greenhouse gas emissions in their manufacture, distribution, transport, sale, use and disposal. By buying these goods, consumers contribute to global warming. But, these consumption patterns can only be associated with urbanisation where, “an increasing proportion of consumption takes place in urban areas” (Satterthwatie, 2009). Satterthwaite however does acknowledge that globalised production systems which encourage high consumption also hold responsibility for global warming and climate change.

Stott (2010) agrees that the underlying cause of climate change is the consumption of goods and services which rely on the burning of fossil fuels. His concern is with the increased consumption of energy-dense foods, together with the increased use of cars and the reduced levels of physical activities, which have all led to obesity and its health consequences.

**6** **SESSION SUMMARY**

Since the Industrial Revolution about 150 years ago, with the invention of machines, the motor car, electricity, air travel and increased food production, human activities have significantly increased the presence of greenhouse gases in the atmosphere. These have enhanced the natural insulating greenhouse effect – the mechanism which regulates temperature on Earth. Modern-day globalisation, with its reliance on technology, depends to a large extent on the consumption of fossil fuels which contribute to the build-up of greenhouse gases, to global warming and to climate change.

Global economic expansion has directly and indirectly impacted on the environment and changed the habitats in which people live. Almost everything we produce and consume emits greenhouse gases and reinforces their increased accumulation in the atmosphere. The health-related consequences of on-going climate changes will be discussed in the next session.

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**Unit 3 – Session 2**

**What Health Concerns Arise as a Result of Climate Change?**

# Introduction

# “*Human actions are changing many of the world’s natural environmental systems, including the climate system. These systems are intrinsic to life processes and fundamental to human health, and their disruption and depletion make it more difficult to tackle health inequalities”* (McMichael & colleagues, 2008).

In the previous session we examined climate change linked to human activities within the context of globalisation and economic expansion. Climate change impacts on people directly – through temperature, rain patterns, rise in sea level and frequent extreme events. It also impacts on people indirectly through, for example, human migration, urbanisation and changes in water, air and food quality. Those with the least access to power and resources feel the adverse effects of climate change more harshly than those with greater access; and find it more difficult to adapt or recover from the consequences of these events.

In this session we identify some of the health risks that arise as a result of climate change, and examine their impact on the urban poor, elderly, children, subsistence farmers and coastal populations.

# Contents

1 Learning outcomes for this session

2 Readings

3 Risks to human health

4 The pathways from global climate change to ill health

5 Who pays the price?

6 Session summary

7 References and further reading

# Timing of this session

There are five readings in this session, and there are four tasks. It is likely to take you up to five hours to complete.

## 1 LEARNING OUTCOMES FOR THIS SESSION

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| **By the end of this session, you should be able to:** |
| * Provide examples of how climate change affects health and health patterns. * Explain how the impact of climate change on health will exacerbate inequities between rich and poor. |

## 2 READINGS

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## 3 RISKS TO HUMAN HEALTH

Climate change creates direct and indirect risks to human health, well-being and security, especially for those with the fewest resources, but ultimately for everyone. In 2000, for example, it was estimated that approximately 150 000 deaths were as a result of climate change, with almost all these deaths being amongst the world’s poorest populations, even though they contribute the least to the world’s total carbon footprint (Friel *et al*, 2008).

Figure 3.2.1 shows the main pathways by which global climate change affects human health. According to WHO (2003), these pathways are, “of varying complexity, scale and directness and with different timing”, and the health impacts would vary unequally across geographical regions and populations. The health effects to food and water shortages are likely to be the most severe consequences.

**Figure 3.2.1 The pathways by which climate change affects human health**



***Source***: WHO 2003 report, *Climate change and human health: Risks and response.*

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| **TASK 1 ─ Identify local health risks caused by global climate change**  **READINGS**  McMichael, A.J. (2008). Environmental change, climate and population health: a challenge for inter-disciplinary research, *Environmental Health and Preventive Medicine,* 13:183–186.  Birn, A., Pillay, Y. & Holtz, T. (2009). *Textbook of International Health: Global Health in a Dynamic World*. New York: Oxford University Press: 470-474.  Read the above articles. Then answer the questions.   1. What is the difference between global environmental changes (including climate change) and local environmental hazards or degradation? 2. Refer to Figure 3.2.1. Trace the pathway from regional weather changes through to the health effects, relating the diagram to your own context: a. How has climate change affected your regional weather patterns? b. Give examples of how the weather patterns have impacted on microbial contamination pathways; on agricultural and water systems; and on social and economic factors, e.g. its impact on food production, population migration, and human settlements. c. Provide examples of the health effects related to each pathway. |

**FEEDBACK**

Global environmental change refers to long-term (i.e. over millennia, centuries and decades) and wide-spread systemic changes to the global atmosphere and environment – directly or indirectly attributable to human activities. It may include climate change, ozone depletion, freshwater depletion, soil degradation and loss of biodiversity, damage to marine and coastal ecosystems, pollutants and urbanisation. Global environmental change has far-reaching consequences for population health within and across national borders, and the solutions require "a different approach from that used for the more familiar challenges presented by time limited and reversible local environmental contamination” (McMichael, 2008).

Local environmental hazards generally refer to more domestic or local conditions (which may also be attributable to human activities). They may, for example, include the traditional hazards of poor sanitation and shelter associated with poverty, as well as agricultural and industrial contamination of air, water, food and land. They may be biological, chemical, physical, biomechanical or psychosocial in nature. Generally the health consequences are on a more local level and therefore more contained. This however, does not make them less serious or significant for the population in question.

Most research into climate change and health risks have focused on infectious diseases. According to WHO (2009), in 2004, 3% of deaths from diarrhoea worldwide; 3% of malaria deaths worldwide; and 3.8% of dengue fever deaths worldwide were attributed to climate change. The total attributable mortality was about 0,2%, and of these 85% were child deaths. Other deaths related to climate change are those which result from thermal extremes and deaths and injuries related to weather disasters and conflict over depleted natural resources, such as water.

Even if the average global warming is restricted to less than 2ºC above preindustrial levels, the predicted future consequences are very serious, especially in relation to increased severity of droughts and water shortages. These will influence food security and increase the risk of hunger catastrophes, leading to high mortality from malnutrition in many areas.

### Important relationships between global warming and health

There is a relationship between global warming and changes in infectious disease patterns, food security and malnutrition, water-borne diseases, diseases of overcrowding, circumstances and conditions which arise as a result of extreme weather events, population growth and migration, and Non-Communicable Diseases (NCDs).

***Changes in temperature and rainfall changes in disease patterns***

Changes in precipitation and temperature will influence the spread of vector-borne infections and zoonotic diseases. For example, due to rising temperatures, there are new areas in which mosquitoes can breed, and we are now also seeing the resurgence of Malaria in areas in which it had been previously eradicated. With every +1ºC increase in temperature in East Africa, the incidence of people living in poverty in new Malaria areas increases ten-fold. In addition, there is the probability of increases in other vector-borne diseases such as dengue, schistosomiasis, leishmaniasis, tick-borne encephalitis, Hantavirus infections, and new diseases such as Ebola and West Nile virus. However, as many other factors also influence the prevalence of these diseases, it is difficult to predict the scale of any change.

Waterborne pathogens are also likely to proliferate. For example, in 2010 in Nigeria and Cameroon the heavier-than-usual seasonal rainfall, together with poor sanitation, uncovered wells and the lack of treated water, accelerated the transmission of Cholera bacteria.

***Extreme weather events higher risk of disease***

Floods, drought, storms and heat waves are expected to increase in the years ahead, with major health impacts as a direct effect. These events will also entail a long term higher risk of disease as a result of the destruction of homes, infrastructure, and water and food resources.

***Food security malnutrition and disease***

The prospect of drought coupled with a global rise in temperature poses a serious threat to agriculture and food security in many areas, particularly in parts of Africa and Asia, where there is already a high risk of starvation. The loss of arable land and reduced agricultural production has resulted in declines in food yields, resulting in malnutrition and increased susceptibility to disease (impacting particularly on child health and survival).

***Water, housing and sanitation diarrhoea and infectious diseases***

Climate change will affect water supplies and sanitary conditions, resulting in a higher risk of diarrhoea and infectious diseases. Global urbanisation is taking place in parallel with incipient climate changes. Growing populations who live in densely populated impoverished urban areas will be particularly vulnerable to these health hazards.

***Population growth and migration food, living conditions, fresh water***

One of the most dramatic consequences of climate change will be an escalating number of climate refugees. There is a real danger of some 200 million people having to move away from coastal areas. The interplay between population growth, migration and climate change will have a mutually reinforcing effect on problems associated with food supply, living conditions and access to fresh water.

***Air quality and air pollution Non-Communicable Diseases (NCDs)***

The National Institutes of Health (NIH) in the US identified the following NCDs related to climate change: asthma, respiratory allergies and airway diseases; cancer; cardiovascular disease and stroke; mental health and stress-related disorders, neurological diseases and disorders. (This is further explained in Task 3 of this session.) The reading by Friel *et al* (2011) provides more detailed information about how climate change is likely to exacerbate the incidence of NCDs.

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| **READING**  Friel, S., Bowen, K., Campbell-Lendrum, D., Frumkin, H., McMichael, A.J. and Rasanathan, K. (2011). Climate Change, Non-communicable Diseases, and Development: The Relationships and Common Policy Opportunities. *Annual Review Public Health 2011,* 32:133─47. |

According to the WHO (2009), in the long term, the greatest health risks:

“…*may not be from acute shocks such as natural disasters or epidemics, but from the gradual build-up of pressures on the natural, economic and social systems that sustain health and which are already under stress in much of the developing world*.”

This ‘build-up of pressure’ includes, for example, changes in the availability of fresh water and food. In addition these stresses have the potential to increase population displacement as well as conflict over dwindling resources.

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| **READINGS**  McMichael, T. (2005). Global environmental changes, climate change and human health. In: K. Lee & J. Collin (eds.) *Global Change and Health*. Open University Press: 126-145.  This reading gives more general information about health problems arising from environmental conditions. |

**4 THE PATHWAYS FROM GLOBAL CLIMATE CHANGE TO ILL- HEALTH**

Our globalised production and consumption patterns impact on the high rate of carbon dioxide emissions, which contributes to global warming (IPCC, 2001). This in turn impacts on human health or exacerbates ill-health, in direct and indirect ways.

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| **TASK 2 ─ Identify the relationship between the public health challenges, climate change and globalisation**  In the pages that follow there are three examples of challenges to public health as a result of globalisation processes and environmental changes.  As you read each example:   1. Identify the relationship between the aspect/s of globalisation illustrated in the example, climate change, and the risks to human health. 2. Identify the benefits and costs in each example. Who benefits? Who is most at risk? 3. Identify similar examples in your own country. |

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| **CASE EXAMPLE: The South African coal industry** |
| South Africa is currently the fifth largest coal producing country in the world, producing on average, around 224 million tons of marketable coal each year and exporting 25% of its production. Approximately 77% of South Africa’s primary energy needs are provided by coal – for electricity generation, and in a variety of sectors, including iron and steel production, cement manufacturing and as liquid fuel. Due to the relative lack of suitable alternatives to coal, this situation is unlikely to change over the next 10 years (MBendi, 2010).  **Figure 3.2.3 Impact and contaminants from coal affect our land, water and air**  ***Source***: Clean air task force. (2001). Cradle to grave: the environmental impacts from coal  During coal mining operations, large areas of land are broken down in order to remove the Earth’s surface. This ultimately results in complete environmental degradation, the depletion of natural resources, the destruction of ecosystems, and the extinction of plant and animal species.  In the coal formation process, carbon dioxide and methane are released into the environment, and waste products such as uranium, thorium and other radioactive and heavy metal contaminants are released into the air, land and water. Mine dust, containing a variety of toxic compounds including aluminium, arsenic, copper, iron, manganese, lead, zinc, uranium and cyanide, is released into the  air, land and water, and can cause asthma and other respiratory problems for miners and nearby communities.  When coal is burnt at the fossil fuel power station, solid waste is released in the form of ash, which contains a variety of toxic compounds causing asthma and other respiratory problems. Ash also seeps into and contaminates groundwater, which has serious long-term health risks, including cancer and skin infections. The burning of coal is also the main cause for the increase of nitrous oxide and sulphur dioxide into the atmosphere which results in acid rain which falls to the Earth’s surface as very weak acid, in precipitation in the form of rain, snow, vapour or fog. Very strong acids can burn skin and even destroy metals. |

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|  | **DVD Resource [See DVD Unit 3]**  Carmageddon: The hidden war between people and the motorcar, Louis Reynolds. |

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| **CASE EXAMPLE: Water wars in Eastern Africa** |
| In 2011, the Horn of Africa experienced its worst drought in half a century, affecting more than 11 million people. The most severely affected areas were southern Somalia, as well as parts of Kenya, Ethiopia, Tanzania and Uganda. The border between Kenya, Somalia and Ethiopia had not experienced rain since 2009. According to scientists climate change is responsible for the dramatic change in weather patterns in this region, the receding of the ice caps on Mount Kenya and Kilimanjaro, and the loss of 80% of water in Lake Chad (which extends over Chad, Niger, Cameroon and Nigeria) since 1980.  The drought has compounded the challenges faced by people in this already arid region. In northern Kenya, the increasing temperatures and recurrent droughts have resulted in a scarcity of freshwater sources (for humans, animals and crops), dwindling grazing land for cattle, the land yielding no crops, and the living conditions of local people becoming more and more difficult. The result is people competing with each other over what little resources there are in the region – water and food.  Tribal warfare has a long history in Eastern Africa, which is usually over cattle and land. Now, drought and scarce water sources have become the leading causes of the conflict, which has spread across Kenya, Uganda and Somalia, leading to ‘water wars’ (Blackwell 2010).  According to World Food Program (WFP), 3,5 million people were affected by the drought in 2011, dying from starvation as well as from conflict. As people migrate this puts pressure on the resources in other areas, and the conflict spreads. The conflict is exacerbated by the easy access people have to arms and weapons along border regions. It is believed that 95% of small nomadic villages in Kenya have access to guns, which people need for the protection of their community and livelihood in these remote regions far from regular state protection (Wander, 2011).  **Figure 3.2.4 The link between drought, conflict and poverty for pastoralists**  ***Source***: Blackwell, P.J. (2010).  According to Wander (2011) of Aljazeera, by the middle of 2011:   * In South Sudan, an estimated 350 000 people have been displaced by inter-ethnic conflict, due in part to tensions over scarce resources such as water, as well as an increase in cattle raiding. * 160 000 Somalis in the refugee camp in Dadaab, Kenya were forced to flee their homes because of water scarcity. * Due to the drought, there were large losses in basic food staples. Projections in East Africa were that there would be potential losses of up to 33% in maize, more than 20% for sorghum and 18% for millet, putting a further 75–125 million people at risk of hunger. * Almost half of humanity will face water scarcity by 2030 as global warming changes weather patterns. According to the Organisation for Economic Co-operation and Development’s (OECD) report *Environmental Outlook to 2030*, 47% of the world’s population will be living in areas of high water stress by 2030. * Some analysts believe that wars of the future will be fought over ‘blue gold’, as thirsty people, opportunistic politicians and powerful corporations battle for dwindling resources. Basically these are issues of poverty and inequality. However the prevalence of arms heightens the risk of conflict.   According to the UNDP (2007), “If you live in a slum in Manila, you pay more for your water than people living in London.”  **Figure 3.2.5 Who pays the most?**  ***Source***: UNDP (2007) *Water rights and wrongs: A young people’s summary of the United Nations Human Development Report 2006, Beyond scarcity: Power, poverty and the global water crisis*, UNDP.  As shown in Figure 3.2.4, the poor pay the most out of the five countries surveyed per cubic metre of water; with the richest countries paying the least in both direct and indirect costs. To get water, the poor generally have to walk great distances, wait hours, and compete with other equally desperate people. Women and girls bear more than their fair share of the costs as in most places they are responsible for finding and fetching water for their families. This means lost opportunities to go to school, learn skills and fully participate in their communities. People living in close proximity to each other in areas with little infrastructure, often use the same water sources for washing, drinking, cooking, and waste disposal. |

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| **SUPPLEMENTARY READING**  Blackwell, P.J. (2010). East Africa's Pastoralist Emergency: is climate change the straw that breaks the camel's back? *Third World Quarterly*, 31:8, pages 1321─1338. [See DVD Unit 3].  The above article examines the livelihood options of East Africa’s traditional pastoralists given the link between climate change, drought, disease, conflict and poverty due to diminishing natural resources. |

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| **CASE EXAMPLE: Epidemiological change in Malaria patterns in Kenya** |
| Nairobi has long been considered a non-malarial zone, with Malaria having been effectively controlled in the 1950s and 60s. However, health workers now say that it is the most common disease in Nairobi’s largest slum, Kibera (<http://www.irinnews.org>). This is unusual due to the high altitude in the area and health workers are concerned about a possible larger outbreak in Nairobi.  The *Third Assessment Report* published in 2001, by the Intergovernmental Panel on Climate Change (IPCC), paid special attention to the resurgence of Malaria in the African highlands. It is believed that this resurgence is due to factors such as reduced funding for Malaria control programmes, insecticide and drug resistance, human population growth and movement, land-use change, deteriorating public health infrastructure, and changes in temperatures, rainfall and humidity.  The report states that due to the life-cycle of the mosquito and its role as host of the Malaria parasite, "at low temperatures, a small increase in temperature can greatly increase the risk of Malaria transmission" and "future climate change may increase transmission in some highland regions, such as in East Africa" (IPCC, 2001).  Malaria is described as a ‘travelling disease’ – because people move between the more malaria prone areas to urban areas and back again; and because the Malaria mosquito itself moves more easily, often trapped in trains and cars. |

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| **TASK 3 ─ Identify the multiple causes of the increasing health risks due to global climate change**  Use one of the conceptual frameworks of causality used in this Module to show the direct and indirect pathways from global climate change to one of the categories of causes of disease and injury, death, and burden of disease:  Group 1: Nutritional deficiencies, infectious diseases and problems associated with pregnancy and childbirth  Group 2: HIV/AIDS, TB and malaria  Group 3: Non-Communicable Diseases (NCDs)  Group 4: Injuries |

**FEEDBACK**

Below is an example showing the pathways from global climate change to NCDs, as presented by Friel *et al* (2011). The authors argue that as the Earth’s surface temperature rises (as a result of processes and practices involved in economic globalisation) and as there are more extreme and severe weather events, risks to human survival are heightened and the incidence of major NCDs in local population groups are exacerbated.

As an example, they show that climate change may directly and indirectly increase the risk of cardiovascular disease (CVD) in the following ways:

* Directly: Through exposure to air pollution (e.g. through increased ground-level ozone pollutants, airborne pollens and spores) and extreme temperatures (e.g. through increased exposure to solar UVR – heat-related mortality and morbidity arise from overloading the cardiovascular and respiratory systems).
* Indirectly: Through changes to people’s diets (e.g. damaged crops, reduced yields, changes to livelihoods), which can result in people relying on imported energy-dense processed foods, most of which leads to poor general health.



***Source:*** Friel *et al*, 2011

Here is another example using the framework explained in Units 1 and 2 to show the effects of climate change on respiratory problems.

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| **BIOLOGICAL/ PHYSICAL (immediate causes)** | **SOCIETAL**  **(underlying causes)** | **STRUCTURAL – ECONOMIC AND POLITICAL (basic causes)** | **NATIONAL AND GLOBAL STRUCTURES AND PROCESSES (basic causes)** |
| * Inhalation of fine particles affects small airways, causing bronchitis and increasing the likelihood of pneumonia. * Health effects include minor irritation of eyes and the upper respiratory system to chronic respiratory disease, heart disease, lung cancer, and death. * Air pollution can cause acute respiratory infections in children and chronic bronchitis in adults. It can also worsen the condition of people with pre-existing heart or lung disease. * Air pollution can aggravate the frequency and severity of asthma attacks. * Both short-term and long-term exposures have been linked with premature mortality and reduced life expectancy. | * Badly constructed buildings which are not energy-efficient, or allow for sufficient circulation of fresh air, are difficult to heat and cool and require inefficient use of fossil fuels. That air pollution causes ill health and death is well recognised. * Major human-made sources of ambient air pollution include industries, automobiles, and power generation. In indoor environments, tobacco smoke and combustion of solid fuels for cooking and heating are the most significant sources. | * The poorest households rely on inefficient fossil fuels for their domestic usage, contributing alongside the burning of fossil fuels in industrial and agricultural production, to regional climate change. * However, the indoor air pollution problem is many orders of magnitude greater in poor, rural homes of developing countries, where half of the world population relies on unprocessed solid fuels for cooking and heating and is exposed to very high levels of many air pollutants on a daily basis. | * Burning of fossil fuels in industrial and agricultural production, distribution and transportation has contributed to climate change/ global warming; as well as the increased exposure of people to air pollutants. * Outdoor pollution primarily results from the combustion of fossil fuels by industrial plants and vehicles. This releases carbon monoxide, sulphur dioxide, particulate matter, nitrogen oxides, hydrocarbons and other pollutants. |

**5 WHO PAYS THE PRICE?**

Some theorists have linked the growing global scarcity of resources to the world’s increasing population. Others argue that scarcity is more about our patterns of production and consumption, and the ways in which these affect the use of resources as well as forced environmental changes. For example, the UNDP argues (2007):

*“We reject this [Malthusian perspective that global water problems are a problem of scarcity and population growth]. The availability of water is a concern for some countries. But the scarcity at the heart of the global water crisis is rooted in power, poverty and inequality, not in physical availability”* (UNDP, 2007).

All people and regions of the world are vulnerable to the health risks associated with climate change, but some are more at risk than others; and some are vulnerable in different ways, depending on where and how they live. For example, people who live along the coast are more at risk of rising sea levels and temperatures than those who live in the mountains; and those who live in megacities are exposed to health risks, which those who live in rural areas may not be exposed to.

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| **TASK 4 ─ Explain why climate change will aggravate the health inequities**  **READING**  Costello A, Abbas M, Allen, A. *et al.* (2009). Managing the health effects of climate change. *The* *Lancet*, 373:1693─1733.   1. a. Skim through the above article. 2. List five questions that you want to find answers to about the relationship between globalisation, climate change and threats to global health. (Try to relate the questions to your own context.) 3. Use your questions to direct your reading. 4. Read the Executive summary (pages 1693─1697). As you read, list (e.g. on a mind-map) the main ideas in the article with regard to: 5. The main direct and indirect threats to global health. 6. Why the poorest communities will be affected the most. 7. The suggestions for managing the health effects of climate change. 8. Read from pages 1697─1708. As you read, add notes and important points to your above lists/mind-map. Try to find answers to your questions. |

**FEEDBACK**

You might have included the following points in your summary.

**Main direct and indirect threats to global health from climate change**

***Direct threats:***

* Extreme climatic events: Health effects of heat and cold, storms, floods and drought.
* Changing patterns of disease and mortality: Vector-borne, rodent-born, and other infectious diseases; occupational health and ultraviolet radiation.
* Food and water insecurity, and air pollution: Threat to food security and food safety, water security and safety (spread of water-borne diseases), threat to air quality, aeroallergens and disease. In addition, the increased use of food for biofuel production by developed countries to offset greenhouse gas emissions, has contributed to higher food prices and food insecurity in developing countries.
* Vulnerable shelter and human settlements: Mass environmental displacement and migration, which will disrupt the lives of millions of people and exacerbate challenges associated with urbanisation. Urban population in developing countries is expected to increase from 2-3 billion in 2005, to 4 billion by 2030. Health threats will be compounded by urban slums and poor housing.

***Indirect threats:***

* Economic crises together with climate change affect food availability and affordability, ultimately affecting the nutritional well-being of poor populations with devastating effects on global health and development.
* Population growth and migration: Mass environmental displacement, resettlement and forced migration, which will disrupt lives of millions of people and exacerbate challenges associated with urbanisation. May also give rise or worsen conflict resulting from resource scarcity.

**Why climate change will affect the health of the poorest communities the most**

* Climate change will have the greatest effect on poorest societies with few natural resources, inadequate technology and weak infrastructures. It will increase health inequity through negative effects on the SDH and the added pressure will widen the social gradient of health.
* Climate change has economic consequences – impacting on a household’s earnings and ability to buy enough high quality food, which in turn impacts on nutritional status and health, particularly of children, pregnant women and the elderly.
* The carbon footprint of the poorest 1 billion people is around 3% of the world’s total carbon footprint, yet these communities will be most affected by climate change due to existing economic, social and health inequities which affect:
* regional variations in predicted rates and types of climate change
* different existing vulnerabilities to poor health
* differing capacities to adapt to changing conditions
* health system and resources of countries with already weakened infrastructures.
* Climate change raises the issue of intergenerational injustice in that future generations will have to deal the consequences of the scarcity of natural resources and the effect that this has on their health and development.

**Managing the health effects of climate change**

Many of the predicted health effects of climate change will be very difficult to manage, especially for poorer communities and countries. A rapid reduction in greenhouse gas emissions, through reductions in our use of fossil fuels is the only way to prevent the more serious consequences. This will require behavioural/ lifestyle changes by the richer parts of the population of the world, as current practices are not sustainable or equitable.

Other measures to manage the health effects of climate change can be summarised as follows:

* *Informational*: There is a need to generate reliable, relevant and up-to-date information and comprehensive assessments on the effect of climate change on health in LMICs and differences in vulnerability within and between populations.
* *Poverty and equity-related*: There is a need to reduce poverty and health inequities. Poor populations are at greatest risk of exposure but have the least capacity to cope or adapt.
* *Technology*: There is a need to share the technological know-how needed to boost food output, maintain integrity of ecosystems, improve agricultural and food system practices, improve systems for safely storing and treating water, use alternative water supplies, and create energy-efficient buildings.
* *Institutional*: There is a need to improve coordination and accountability of local, national and global governance.

Failure to address poverty and the underlying inequities threatens global environmental health, as well as individual, community, regional, and global well-being.

**6 SESSION SUMMARY**

Since the Industrial Revolution in the 19th century, global production and consumption patterns have increasingly disrupted the natural environment, affected global climate patterns, water, land, soil, air, and ecosystems, and have had devastating consequences for human health. In different regions, different diseases and conditions have been linked to different types and rates of climate change. Health consequences also depend on existing vulnerabilities to poor health and to existing social determinants of ill-health and of inequality. What is clear is that the consequences will be greatest for the poorest societies with the fewest resources and the weakest capacity to adapt.

Therefore, stronger preventive measures, policies and programmes are needed, e.g. to reduce the emission of greenhouse gases, to recover small-scale agriculture for nutrition (not for profit), and for better urban planning; as are actions to address unequal access to the social determinants of health so that all populations groups are equally able to adapt to current climate change and prevent further damage.

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