11 Climate Change

Introduction

Climate change poses a major threat to almost all forms of human activity on earth, including tourism. As Holden (2016: 227) argues:

> Of all the challenges facing tourism's relationship with nature, it is not an exaggeration to state that climate change represents the greatest.

Holden gives as his rationale for this statement that it is the stability and predictability of climate that is vital for the environments and ecosystems that are required for the continuation of current types of tourism, whether these are the traditional form of mass tourism, in terms of 'sun, sea and sand' holidays, or a niche activity which involves visiting a tropical rain forest with rare flora and fauna as the main attraction.

Climate change also presents opportunities for tourism. If areas currently experiencing cool winters and mild summers get warmer, then new types of tourism may be possible including beach-based holidays where at present these are of little importance. Climate change is likely to lead to modifications in the weather at different times of the year so 'seasonality' which is currently a very important dimension to many forms of tourism will be affected, probably to the extent that seasons when there is high tourism activity will get longer in some parts of the world.

Although tourism is likely to be significantly affected by climate change, it has also contributed to climate change through for example the burning of fossil fuels in transport for tourism as well through the use of power in hotel accommodation.

Global warming

When we discuss climate change in relation to tourism and many other economic and social activities, most often the discussion is concerned with *global warming*. It is important to be aware that the process of regular daily and seasonal global warming is a natural occurrence and without it there would not be life on earth as we currently know it. However, when discussing global warming, we are usually talking about an unbalanced situation where global warming is occurring more quickly, on an annual basis, than previously.

The regular process of global warming is a result of natural processes. In Chapter 4, we saw that the earth is warmed by the heat from the sun, and discussed what happens in terms of the amount of heat available at different places on the earth's surface (the effects of latitude), the effects on temperature of increasing or decreasing altitude, and also the impacts of seasonality on temperature.

However, it is important to be aware of what happens to solar radiation when it reaches the earth's surface. As noted in Chapter 4, the atmosphere around the earth is not heated directly by the solar radiation – the gases that make up the atmosphere cannot absorb the short wave radiation from the sun. Instead, the short wave radiation hits the surface of the earth, warms the solid or liquid (if it is an ocean, sea or river) surface and is converted to long wave radiation which can heat the gases that make up the atmosphere. This means that the atmosphere is heated from below.

However, not all heat from the sun is available to heat the earth's surface and the atmosphere. This is because when the sun rays strike the earth, some rays are bounced back by reflectivity of the earth's surface. The term for reflectivity is *albedo*. The albedo varies, largely in relation to the nature of the surface of the earth. For example, a white, snow covered surface reflects a lot of solar radiation, so the albedo is high. A dark brown, ploughed field absorbs much more solar radiation, so the albedo is low. A liquid (water) surface reflects a significant amount of radiation and usually has a higher albedo than a solid surface.

On average, about 30% of the solar radiation is reflected back into space as a result of the albedo effect. This means, however, that about 70% of the sun's energy remains and is absorbed into the atmosphere by what we call the *Greenhouse Gases* (GHGs). The main GHGs are as follows: CO_2 (carbon dioxide), N_2O (nitrous oxide), CH_4 (methane) and O_3 (ozone). There is also water vapour in the atmosphere, which absorbs heat. The greenhouse gases make up only approximately 1% of the earth's atmosphere, but they have a high capacity to absorb and release energy.

To understand the effects being discussed here, it is important to understand what is meant by a *Greenhouse Gas*. A greenhouse is in reality a glasshouse and this allows the sun's energy (the short wave radiation) through, but traps heat generated inside, because the short wave radiation has been converted, when it passes through the glass inside the greenhouse, to long wave radiation, once it reaches solid surfaces such as growing plants. The long wave radiation is then able to warm the air (the mixture of gases) inside the greenhouse, but is not able to pass back through the glass, and is trapped inside. So the temperature of a greenhouse will be higher (assuming the sun is shining) than outside the greenhouse. Gardeners and farmers have known this for a long time, so in winter greenhouses, or glasshouses, are warmer during the day when the sun shines and can be used to grow crops that will not grow outside at that time of the year.

We use the analogy of the greenhouse to explain what happens in terms of global warming. However, it is important to remember that the daily and seasonal warming of the lower atmosphere is a regular process and allows plants

and animals (including us) to live on earth. Without this warming effect, the earth would be 30°C cooler and life on earth would be very difficult and, if it existed at all, very different from what it is now. However, the greenhouse gases act in the same way as a greenhouse in that they trap the heat from the sun and keep the atmosphere much warmer than it would be without them.

As just indicated, the warming is natural, but in the last 250 years, particularly since industrialisation began, humans have added to the amount of greenhouse gases in the atmosphere and so that average global temperatures have been rising. Hence, in the 20th century temperatures rose by an average 0.6°C and the predictions are that the rise by 2100, will be by another 1.4°C. This may not appear to be a very significant change but it is an average figure, and according to most scientists, enough to melt more snow and ice, which are found at the poles and high mountain ranges, than ever before. The melting of the ice and snow means there is more water in liquid form and this water will find its way into the seas and oceans causing seal levels to rise. In addition, the melting of snow changes the earth's albedo. Hence, if enough melts, this lowers the albedo which then raises the earth's temperature and this in turn causes more snow and ice to melt.

The evidence that climate change is occurring

It is relatively easy for an individual to be aware and comment on what they consider to be unusual weather, be it extreme heat, stronger winds, bigger storms, more rain or heavier snowfall. But this is not climate change, this is merely unusual weather and could be occurring for many reasons and, within any time period, unusual weather will not be that unusual! In fact, deviations from average weather conditions are to be expected. However as we saw in Chapter 4, weather and climate are not the same. In brief, climate is average weather. What this means is that climate is weather over a relatively long period. The period of time for discussion of climate is at least 30 years and is frequently 50 years.

Collins (2004) when discussing the meaning of climate change in relation to weather and climate, summarises this relationship in the following way:

> *Change in the climate of an area or the whole world over an appreciable period of time. That is, a single winter that is colder than average, does not signal climate change. It is the change in average weather conditions from one period of time (30-50 years) to the next (Collins, 2004:75)*

The evidence for climate change is summarised below:

1. As humans have only been around for a relatively short period of time and have kept records of historical events for even less time, accurate written records of past climatic conditions do not exist. However, one source of information is ice. Because there is circulation of air masses between tropical and high latitude regions, tiny particles including seeds and volcanic dust, as well as air bubbles containing evidence of ancient gases frozen inside ice, are found in ice which dates back thousands of years. This ancient ice is obtained