GOVERNMENT OF DUBAI

Trakhees

Guidelines – Climate Change

Issued by: Inspection Department – Operations Section

1.0 General

Climate change is any long term significant change in the “average weather” that a given region experiences. Average weather may include average temperature, precipitation and wind patterns. It involves changes in the variability or average state of the atmosphere over durations ranging from decades to millions of years. These changes can be caused by dynamic processes on Earth, external forces including variations in sunlight intensity, and more recently by human activities. In recent usage, especially in the context of environmental policy, the term "climate change" often refers to changes in modern climate.

2.0 Evidence for Climatic Change

Evidence for climatic change is taken from a variety of sources that can be used to reconstruct past climates. Most of the evidence is indirect—climatic changes are inferred from changes in indicators that reflect climate, such as vegetation, dendrochronology, ice cores, sea level change, and glacial retreat.

2.1 Pollen Analysis

Palynology is the science that studies contemporary and fossil palynomorphs, including pollen. Palynology is used to infer the geographical distribution of plant species, which vary under different climate conditions. Different groups of plants have pollen with distinctive shapes and surface textures, and since the outer surface of pollen is composed of a very resilient material, they resist decay. Changes in the type of pollen found in different sedimentation levels in lakes, bogs or river deltas indicate changes in plant communities; which are dependent on climate conditions.

2.2 Beetles

Remains of beetles are common in freshwater and land sediments. Different species of beetles tend to be found under different climatic conditions. Knowledge of the present climatic range of the different species, and of the age of the sediments in which remains are found, allows past climatic conditions to be inferred.

2.3 Glacial Geology

Advancing glaciers leave behind moraines and other features that often have datable material in them, recording the time when a glacier advanced and deposited a feature. Similarly, by tephrochronological techniques, the lack of glacier cover can be identified by the presence of

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datable soil or volcanic tephra horizons. Glaciers are considered one of the most sensitive climate indicators by the IPCC, and their recent observed variations provide a global signal of climate change.

3.0 Human Influences on Climate Change

Anthropogenic factors are human activities that change the environment and influence climate. In some cases the chain of causality is direct and unambiguous (e.g., by the effects of irrigation on temperature and humidity), while in others it is less clear. Various hypotheses for human-induced climate change have been debated for many years, though it is important to note that the scientific debate has moved on from skepticism, as there is scientific consensus on climate change that human activity is beyond reasonable doubt as the main explanation for the current rapid changes in the world's climate.

3.1 Fossil Fuels

It is known that carbon dioxide levels are substantially higher now than at any time in the last 750,000 years. Beginning with the industrial revolution in the 1880s and accelerating ever since, the human consumption of fossil fuels has elevated CO_2 levels from a concentration of ~280 ppm to ~387 ppm today. The concentrations are increasing at a rate of 2-3 ppm/year. If current rates of emission continue, these ever increasing concentrations are projected to reach a range of 535 to 983 ppm by the end of the 21st century. Along with rising methane levels, these changes are anticipated to cause an increase of 1.4 – 5.6 °C between 1990 and 2100. In the interest of averting drastic climate change, some scientists and international coalitions have set goals to limit concentrations to 450 or 500 ppm.

3.2 Aerosols

Anthropogenic aerosols, particularly sulphate aerosols from fossil fuel combustion, exert a cooling influence. This, together with natural variability, is believed to account for the relative "plateau" in the graph of 20th century temperatures in the middle of the century.

3.3 Cement Manufacture

Cement manufacture contributes CO_2 when calcium carbonate is heated, producing lime and carbon dioxide, and also as a result of burning fossil fuels. The cement industry produces 5% of global man-made CO_2 emissions, of which 50% is from the chemical process, and 40% from burning fuel. The amount of CO_2 emitted by the cement industry is nearly 900 kg of CO_2 for every 1000 kg of cement produced.

3.4 Land Use

Prior to widespread fossil fuel use, humanity's largest effect on local climate is likely to have resulted from land use. Irrigation, deforestation, and agriculture fundamentally change the environment.

3.5 Livestock

According to a 2006 United Nations report, Livestock's Long Shadow, livestock is responsible for 18% of the world's greenhouse gas emissions as measured in CO_2 equivalents. This however includes land usage change, meaning deforestation in order to create grazing land, as well as livestock natural gas emissions. In the Amazon Rainforest, 70% of deforestation is to make way for grazing land, so this is the major factor in the 2006 UN FAO report, which was the first agricultural report to include land usage change into the radiative forcing of livestock. In addition to CO_2 emissions, livestock produces 65% of human-induced nitrous oxide (which has 296 times the global warming potential of CO_2) and 37% of human-induced methane (which has 23 times the global warming potential of CO_2).

4.0 Climate Change and Biodiversity

The life cycles of many wild plants and animals are closely linked to the passing of the seasons; climatic changes can lead to interdependent pairs of species (e.g. a wild flower and its pollinating insect) losing synchronization, if, for example, one has a cycle dependent on day length and the other on temperature or precipitation. In principle, at least, this could lead to extinctions or changes in the distribution and abundance of species. One phenomenon is the movement of species northwards in Europe. A recent study by Butterfly Conservation in the UK has shown that relatively common species with a southerly distribution have moved north, whilst scarce upland species have become rarer and lost territory towards the south. This picture has been mirrored across several invertebrate groups. Drier summers could lead to more periods of drought, potentially affecting many species of animal and plant. For example, in the UK during the drought year of 2006 significant numbers of trees died or showed dieback on light sandy soils. In Australia, since the early 90s, tens of thousands of flying foxes (Pteropus) have died as a direct result of extreme heat. Wetter, milder winters might affect temperate mammals or insects by preventing them hibernating or entering torpor during periods when food is scarce. One predicted change is the ascendancy of 'weedy' or opportunistic species at the expense of scarcer species with narrower or more specialized ecological requirements. One example could be the expanses of bluebell seen in many types of woodland in the UK. These have an early growing and flowering season before competing weeds can develop and the tree canopy closes. Milder winters can allow weeds to over winter as adult plants or germinate sooner, whilst trees leaf earlier, reducing the length of the window for bluebells to complete their life cycle. Organizations such as Wildlife Trust, World Wide Fund for Nature, Birdlife International and the Audubon Society are actively monitoring and research the effects of climate change on biodiversity and advance policies in areas such as landscape scale conservation to promote adaptation to climate change.