

## Topic 5 – What are the Impacts of Past and Projected Future Climate Change?

From 1906 to 2005, global average temperature rose 1.3°F, resulting in measurable effects. The temperature rise projected for the next century would have many effects, some of which are fairly certain, others of which are the subject of scientific debate.

- The most certain effect of rising temperature is rising sea level. Sea level rises because warmer temperatures will melt glaciers and ice sheets adding water to the oceans, and also because as the oceans warm, the water in them will expand. Glaciers around the world have been retreating because they lose more ice to melting in the summer than they gain from snowfall in the winter. There is evidence of large losses of ice from Greenland, but not from Antarctica, which is much colder. Globally sea level rose 7 inches in the last 100 years. Estimates of sea level rise to 2100 range from 7 to 23 inches, assuming that the polar ice sheets do not melt faster than they have been melting over the past few decades. Some scientists argue that further warming will dramatically increase the rate at which polar ice will melt. In his movie, *An Inconvenient Truth*, Al Gore highlighted faster melting of the polar ice sheets as one of the risks of climate change. Locally sea level can rise by more or less than the global average because the land under coast lines is rising or falling because of tectonic shifts.

As with temperature, sea level will continue to rise for many centuries after greenhouse gas emissions are reduced to very low levels. If temperatures are high enough, the Greenland ice sheet could melt completely over the course of many centuries. This would raise sea level by up to 20 feet. Complete melting of the Antarctic ice sheet is very unlikely, but some parts of the Antarctic ice sheet could melt, creating additional sea level rise. Even a few feet of sea level rise would inundate parts of Florida's Everglades, southern Louisiana and the Texas coast.

- A highly certain result of warming is more hot spells and fewer cold spells. The definition of a hot spell is local and typically involves exceed a maximum daily temperature for a number of days. Maximum daily temperatures of 90°F or more for a week would be a hot spell in New England, but typical summer weather in the desert southwest. As average temperature increases, the chance of experiencing hot spells increases. Conversely, the chance of experiencing cold spells in the winter decreases.
- Another highly certain effect of rising temperatures is changes in the amount, location, timing and intensity of rain and snowfall. Warmer temperatures will decrease the amount of precipitation falling as snow and increase the amount falling as rain. They also mean that more water is evaporated and held in the atmosphere as humidity. This in turn, means when it

Warming can change weather patterns. While rainfall is likely to increase globally, some areas will get more rainfall, while others will get less. The warming of the 20<sup>th</sup> century brought more rainfall to the eastern U.S., but less to the Mediterranean area. Future warming is likely to exacerbate these trends. Generally, wet areas of the world will get more rainfall while dry areas of the world get less.

Even areas which receive more rainfall will have increased chance of drought. Since more of the rain is likely to fall as intense rain, it will run off more quickly, possibly as a flood. Also, higher temperature means more evaporation, leaving the land drier.

- Warming temperatures and changing precipitation patterns will lead to changes in habitats which will cause some species to disappear from certain areas and others to appear. Some of the species that lose their habitat will become extinct, though how quickly and extensively this will happen is uncertain. Some studies indicate that the climate change projected for the next century could put 40-70 percent of species at greater risk of extinction. Concern is greatest for species whose habitats disappear completely, who cannot migrate, or whose migration paths are blocked by human development. Ecosystem interactions are also important; a species might be able to migrate, but still face the threat of extinction if its food source cannot migrate along with it.
- Hurricanes draw their energy from warm ocean water, and warmer ocean water could lead to more intense hurricanes. However, other factors also affect hurricane intensity. Whether the warming since 1970 has led to more intense hurricanes in the North Atlantic is currently a subject of scientific debate.
- Climate change could have a large impact on human society. Humans are unique in their ability to adapt to different climates. Clothing, houses, food storage, and heating and air conditioning are just a few of the ways in which humans have adapted to climate. We will adapt to future climate. The questions are how smoothly and at what cost. Climate change will change the distribution of insect-borne diseases such as malaria and dengue. It will require farmers to plant different crops, and could require abandoning some areas of coastline. It may also create water shortages, change recreational (no snow for skiing) and tourism opportunities, and have a host of other predictable and unpredictable consequences.