

*Global Climate Change:
A Catholic Response Study Guide*

Movement Two
Reflecting Together

Movement Two: Reflecting Together allows you to reflect more deeply on your reactions and experiences -- and the relationship to justice issues related to global climate change. Reflect on why we behave as we do in our fossil-fueled world, and consider the likely or unintended consequences of our actions.

In exploring justice issues of global climate change, Movement Two uses an analysis process through which you will analyze the history of the situation, the major structures that influence the situation (economic, political, social, and cultural), the key values operative in this structure, and the future direction of the situation.

By conducting this analysis of the situation, you will be able to name the two or three "root" elements most responsible for the current situation. Most importantly, you will develop an understanding of how this critical analysis sheds light on your own personal lived experience. You will begin to understand the reasons underlying your opinions or actions that are reflected in your lived experience. Strive for self-knowledge as you move through this movement. Make the connections between global climate change and how we live.

Activity #2: Impacts on Relationships

How do you think the situation(s) you explored in Activity #1 could eventually affect people and their relationships with each other? How do you think it could affect people and their relationship with their environment?

As before, record your answers to these questions on a sheet of paper, or talk about them in your small group. To help you stay on course and stay focused, the following section provides the scientific details and evidence about global climate change. But as science, it cannot describe the how we might react and relate to one another as fellow human beings. Science cannot necessarily change our relationship to the environment – only that we must create new relationships in a world of global climate change.

After reading through the **Science of Global Climate Change** as follows, you will apply the knowledge gained from science and once again reflect on our relationships to one another and to the environment.

The Science of Global Climate Change

[The following is information drawn from scientific studies of the Intergovernmental Panel on Climate Change. Additional web-based information and references are shown at the end. Read as much as you able to from these reputable sources.]

The "greenhouse effect" is a natural phenomenon, but human-initiated addition of greenhouse gases has led to global warming and a global climate change. The "greenhouse effect" is a natural phenomenon whereby the earth draws and holds thermal energy from the sun.

Atmospheric (greenhouse) gases (carbon dioxide, methane, chlorofluorocarbons, tropospheric ozone, nitrous oxide) form a protective cover that makes our planet hospitable to life by moderating the escape of heat into space. However, the precise mix of these gases is quite delicate and changing that mix alters the atmosphere's properties. An increase in the relative abundance of the greenhouse gases causes the earth to trap more of the sun's heat, resulting in what is called global warming. Cities and industrial sites are the largest contributors of increased greenhouse gases, although other factors such as deforestation contribute. The Industrial Revolution was built on furnaces and engines burning fossil fuels: coal, natural gas, oil and products such as gasoline which emit carbon dioxide, the most common greenhouse gas emitted as a result of burning fossil fuels.

Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level. More than 2,000 scientists known as the [Intergovernmental Panel on Climate Change](http://www.ipcc.ch/) (IPCC) (<http://www.ipcc.ch/>) was established in 1988 by the [World Meteorological Organization](http://www.wmo.int/pages/index_en.html) (http://www.wmo.int/pages/index_en.html) and the [United Nations Environment Programme](http://www.unep.org/) (<http://www.unep.org/>) to determine the scope and extent of global climate change. The IPCC was also to seek a clear explanation of the causes and possible impacts of global climate change. Because of the large number of scientists involved in the IPCC and its process of consultation, its reports are considered widely as offering the most authoritative scientific perspectives on global climate change. The IPCC reaffirmed in 2007 that after 20 years of study:

1. Global greenhouse gas emissions due to human activities have grown since pre-industrial times, with an increase of 70% between 1970 and 2004. There is very high confidence (at least 9 out of 10) that the net effect of human activities since 1750 has been one of warming.
2. Global increases in carbon dioxide concentrations are due primarily to fossil fuel use, with land-use change (like deforestation) providing another significant but smaller contribution.
3. Most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in greenhouse gas concentrations resulting from human activity.
4. The annual emission of the most important greenhouse gas resulting from human behavior, carbon dioxide, has increased by about 80% between 1970 and 2004. Atmospheric concentration of carbon dioxide is now greater than the natural range over the past 650,000

years. Likewise, concentrations of methane and nitrous oxide have increased markedly as a result of human activities since 1750 and now far exceed pre-industrial values.

5. Following is a list of estimated shares of greenhouse gas emissions contributed by each global economic sector: energy supply, 25.9%; industry, 19.4%; forestry, 17.4%; agriculture, 13.5%; transport, 13.1%; residential and commercial buildings, 7.9%; and waste and wastewater, 2.8%.

The results of this warming will alter God's creation and affect God's children in serious, perhaps profound ways. Whatever the extent, severity or geographical distribution of global warming impacts, the problem is expected to disproportionately affect the poor, the vulnerable, and generations yet unborn. Projected sea level rises could impact low-lying coastal areas in densely populated nations of the developing world. Storms are most likely to strain the fragile housing infrastructure of the poorest nations. The migration of diseases could further challenge the presently inadequate health care system of these same nations. Drought or floods, it is feared, will afflict regions already too often hit by famine, hunger, and malnutrition. Because the number of days with high heat and humidity are likely to increase, heat stress impacts will also increase, especially among the elderly, the sick, children, and the poor.

Observed consequences of global warming include...

1. Thirteen of the last 14 years (1995-2008) rank among the 14 warmest years in the instrumental record of global surface temperature (since 1850). The 100-year linear trend (1906-2005) shows a average annual global temperature increase of 1.3⁰ F. This increase is widespread over the globe and is greater at higher northern latitudes. Land regions have warmed faster than the oceans.
2. There is high agreement and much evidence that with current climate change mitigation policies and related sustainable development practices, global greenhouse gas emissions will continue to grow over the next few decades.
3. Global average sea level has risen since 1961 at an average rate of 1.8 mm/year and since 1993 at 3.1 mm/year, with contributions from thermal expansion, melting glaciers and ice caps, and the polar ice sheets.
4. From 1900 to 2005, precipitation increased significantly in eastern parts of North and South America, northern Europe and northern and central Asia but declined in the Sahel, the Mediterranean, southern Africa and parts of southern Asia. Globally, the area affected by drought has likely increased since the 1970s.
5. It is very likely that over the past 50 years: cold days, cold nights and frosts have become less frequent over most land areas, and hot days and hot nights have become more frequent. It is likely that: heave waves have become more frequent over most land areas, the frequency of heavy precipitation events have increased over most areas, and since 1975 the incidence of extreme high sea level has increased worldwide.
6. There is observational evidence of an increase in intense tropical cyclone (hurricane) activity in the North Atlantic since about 1970, with limited evidence of increases elsewhere. There is no clear trend in the annual numbers of tropical cyclones.
7. Average Northern Hemisphere temperatures during the second half of the 20th century were very likely higher than during any other 50-year period in the last 500 years and likely the highest in at least the past 1300 years.
8. Changes in snow, ice and frozen ground have with high confidence (8 out of 10) increased ground instability in mountain and other permafrost regions and led to changes in some Arctic and Antarctic ecosystems.

9. There is high confidence (8 out of 10) that some hydrological systems have also been affected through increased runoff and earlier spring peak discharge in many glacier- and snow-fed rivers and through effects on thermal structure and water quality of warming rivers and lakes.
10. In terrestrial ecosystems, earlier timing of spring events and pole-ward and upward shifts in plant and animal ranges are with very high confidence (9 out of 10) linked to recent warming. In some marine and freshwater systems, shifts in ranges and changes in algal, plankton and fish abundance are with high confidence (8 out of 10) associated with rising water temperatures.

Continued greenhouse gas emissions at or above current (2007) rates would cause further warming and induce many changes in the global climate system during the 21st century that would very likely be larger than those observed during the 20th century. It is difficult to project future impacts because it is not known what action humans and nations will take to reduce greenhouse gas emissions. IPCC documents present a range of scenarios, which cannot be reported here because of space limitations. However, some general projected climate change and its impacts include:

1. Warming of about 0.36°F per decade. Even if the concentrations of all greenhouse gases have been kept constant at year 2000 levels, a further warming of about 0.18°F per decade would be expected.
2. Warming will be greatest over land and at most high northern latitudes and least over Southern oceans and parts of the North Atlantic Ocean, continuing recent observed trends.
3. Contraction of snow covered areas, increases in thaw depth over most permafrost regions and decrease in sea ice extent. In some projections, Arctic late-summer sea ice disappears almost entirely by the latter part of the 21st century.
4. Very likely increase in frequency of hot extremes, heat waves and heavy precipitation.
5. Likely increase in tropical cyclone (hurricane) intensity.
6. Very likely precipitation increases in high latitudes and likely decreases in most subtropical land regions, continuing observed trends.
7. High confidence (8 out of 10) that by mid-century, annual river-runoff and water availability will increase at high latitudes and decrease in some dry regions in the mid-latitudes and tropics. There is also high confidence that many semi-arid areas (e.g. Mediterranean Basin, western U.S., southern Africa and north-eastern Brazil) will suffer a decrease in water resources.
8. Decreased snowpack in western mountains of the U.S., more winter flooding and reduced summer flows, exacerbating competition for over-allocated water resources.
9. Increased aggregate yields of rain-fed agriculture by 5-20% in the early decades of the century, with important variability among regions. Major challenges are projected for crops that are near the warm end of their suitable range or which depend on highly utilized water resources.
10. Increased number, intensity and duration of heat waves throughout the century in those cities that currently experience them with potential for adverse health impacts.
11. Increasingly stressed coastal communities and habitats due to rising sea levels and increased intensity hurricanes.
12. Continued human-induced warming and sea level rise for centuries even if greenhouse gas concentrations were to be stabilized.

For additional information:

Climate Change 2007: The Physical Science Basis: Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change,

http://www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_wg1_report_the_physical_science_basis.htm

Climate Change 2007: Impacts, Adaptation and Vulnerability: Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change,

http://www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_wg2_report_impacts_adaptation_and_vulnerability.htm

Other web resources concerning global climate change:

- [Canadian Institute for Climate Studies](http://www.cics.uvic.ca/index.htm) (<http://www.cics.uvic.ca/index.htm>)
- [Carbon Dioxide Information Analysis Center](http://cdiac.esd.ornl.gov/) (<http://cdiac.esd.ornl.gov/>)
- [Encyclopedia of Atmospheric Environment](http://www.ace.mmu.ac.uk/eae/english.html) (<http://www.ace.mmu.ac.uk/eae/english.html>)
- [Government of Canada Climate Change](http://www.ec.gc.ca/cc/default.asp?lang=En&n=E584B5CF-1)
(<http://www.ec.gc.ca/cc/default.asp?lang=En&n=E584B5CF-1>)
- [U.N. Food and Agriculture Organization](http://www.fao.org/climatechange/home/en/) (<http://www.fao.org/climatechange/home/en/>)
- [U.S. Department of Energy](http://csite.esd.ornl.gov/) (<http://csite.esd.ornl.gov/>)
- [U.S. Environmental Protection Agency](http://www.epa.gov/ebtpages/airairpoglobalwarming.html)
(<http://www.epa.gov/ebtpages/airairpoglobalwarming.html>)
- [U.S. Geological Survey Global Change Research](http://geochange.er.usgs.gov/) (<http://geochange.er.usgs.gov/>)
- [U.S. Global Change Research Program](http://www.globalchange.gov/) (<http://www.globalchange.gov/>)
- [U.S. National Oceanic & Atmospheric Administration](http://www.education.noaa.gov/cclimate.html)
(<http://www.education.noaa.gov/cclimate.html>)
- [World Resources Institute](http://www.wri.org/wri/climate/) (<http://www.wri.org/wri/climate/>)