

Current Climate Studies 6:

NATIONAL CLIMATE ASSESSMENT (NCA3): CLIMATE TRENDS

1. Print this file (and associated linked images if any). Also answer the "Concept of the Week" questions in the *Weekly Climate News* File. (Check for additional *News* updates during the week.)
2. Complete the Investigation by responding to the *Chapter Progress Questions* (*Study Guide*) and the Investigations 6A and 6B from the *Climate Studies Investigations Manual*, and this *Current Climate Study*.

Notice: A course requirement is to prepare a *Plan of Action* for your climate science resource teacher activities following the course completion. If you have not already, click to download the guidelines for that [Plan of Action](#). Consult your LIT leader or mentor if you have questions.

Introduction:

Assessing the social and environmental impacts of observed and anticipated climate change on global, regional, and local scales is a prerequisite to developing policies to respond to those impacts (an impact response shown facetiously in **Figure 1**).

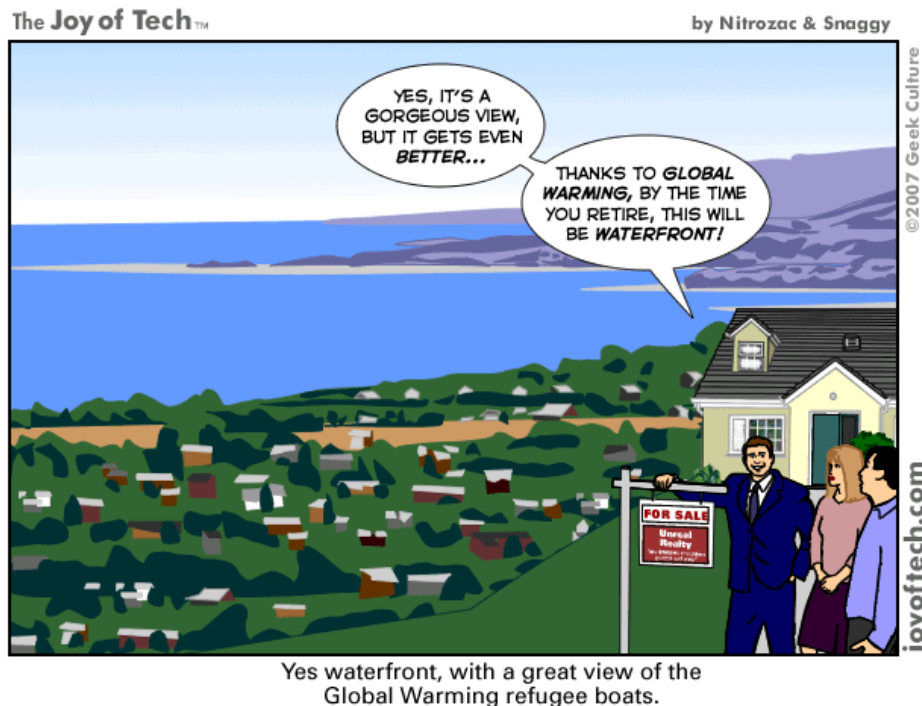


Figure 1. Addressing the issue of projected climate change [With Permission: <http://www.geekculture.com/joyoftech/joyarchives/989.html>]

The *Our Changing Climate* chapter of the Third National Climate Assessment (NCA3) : *Climate Change Impacts in the United States* focuses on three report findings, which are found in the *Overview* section of the *NCA3 Highlights* report. The findings are:

- Global climate is changing and this is apparent across a wide range of observations. Climate in the United States is changing. The global warming of the past 50 years is primarily due to human activities, predominantly the burning of fossil fuels.
- Some extreme weather and climate events have increased in recent decades, and new and stronger evidence confirms that some of these increases are related to human activities
- Human-induced climate change is projected to continue, and it will accelerate significantly if emissions of heat-trapping gases continue to increase.

Go to your bookmarked *Highlights* address, or go to the course website and click on “National Climate Assessment Highlights”, or go directly to the *Highlights* report at http://www.globalchange.gov/sites/globalchange/files/NCA3_Highlights_LowRes-small-FINAL_posting.pdf.

1. On *Highlights* pages 16-17, ten Key Messages from the *Our Changing Climate* chapter of the full report referring to the three report findings listed above are presented. While all of the Key Messages impact the U.S., _____ of them explicitly specify ways they impact our country or specific regions of our country.

- 2
- 4
- 6
- 9

2. In the Key Message about extreme weather, both national and regional trends are described. Heat waves have become more frequent and intense, especially in the _____. Heat waves everywhere are projected to become more intense.

- Northeast
- Southeast
- Midwest
- West

3. The severe-storm Key Message indicates that trends over the U.S. are uncertain for the following severe storms except _____, which have increased in frequency and intensity since the 1950s and have shifted northward.

- winter storms
- damaging thunderstorm winds
- hail
- tornadoes

4. The heavy-downpour Key Message indicates heavy downpours are increasing nationally with the largest increases in the _____.
- Southeast and Northwest
 - Midwest and Northwest
 - Midwest and Northeast
 - Southwest and Southeast
5. The ice-melt Key Message points out the reduction of ice volume and surface extent due to warmer temperatures that is projected to continue. It also indicates the Arctic Ocean is expected to become essentially ice free in summer before _____.
- 2050
 - 2070
 - 2090
 - none of these
6. The sea-level Key Message reports a rising sea level that is projected to rise another _____ by the end of this century.
- 6 to 10 in.
 - 1 to 2 ft.
 - 1 to 4 ft.
 - 4 to 7 ft.
7. From page 18 to 31 of the *Highlights* report, detailed evidence is presented in support of the three findings stated above. The graph at the bottom of page 18 compares global annual average temperatures and atmospheric CO₂ concentration. While there is considerable variability in annual average temperature values from year to year due to natural processes as described in the graph's caption, the overall trend of temperature over the most recent half-century _____ generally consistent with the change in CO₂ concentration. This temperature increase is unequivocally partially due to the increase in the amount of heat energy in Earth's climate system because of the heat-trapping property of greater concentrations of atmospheric CO₂ and other greenhouse gases.
- is
 - is not
8. Examine the map appearing on page 20, that show temperature changes during a recent 22-year time period (1991-2012). The color-coded map shows a general warming trend, but shows that the changes in temperature are not uniform. At the same time, the graph demonstrates that while the national average temperatures were rising, some places were not. Parts of _____ experienced a decrease in average temperature.

- Alaska
- Hawaii
- Minnesota
- Alabama

9. As indicated on pages 20-21, change in the length of the growing season has a number of significant negative and positive impacts on ecosystems. The upper map on page 21 shows that the frost-free season length (which corresponds to similar increases in growing season length) has increased everywhere in the contiguous U.S., with the greatest lengthening occurring in the _____.

- Northeast
- Midwest
- Northwest
- Great Plains
- Southwest
- Southeast

10. On pages 22-23, the roles of natural factors and human activities on global warming are described in terms of contributing to global climate change. It is concluded that human activity has been increasingly affecting the global climate and is the primary cause of recent and projected global warming. According to the caption with the lower graph on page 22, the burning of fossil fuels and cement making now account for about _____ % of the total heat-trapping carbon emissions to the atmosphere due to human activity while land-use changes (e.g., clearing of forests) account for the rest.

- 20
- 40
- 60
- 80

11. Floods are considered on page 26 as major extreme weather events in terms of deaths and property and crop damage. Floods are caused or amplified by weather- and human-related factors. In addition to direct human factors (e.g., expanded development, land-use changes), humanity is adding to weather-related factors through human-induced warming increasing heavy downpours and more extensive storm surges due to sea level rise. All flood types are affected by climate-related factors. Most flood-related deaths in the U.S. are associated with _____.

- flash floods
- urban flooding
- river flooding
- coastal flooding

12. We are already committed to a hotter future because of the heat-trapping gases already in the atmosphere due to human activity. On page 28, the upper figure shows projected

temperature increases from the later part of the last century to the later part of the 21st century under two scenarios. The map to the left shows anticipated temperature changes that assume a global reduction in the emission of heat-trapping gases. The map to the right assumes continued increases in emissions. It appears that most of the country would experience at least a 4 F degree rise in temperature in the Lower emissions (B1) scenario, while experiencing at least a _____ F degree rise in the Higher Emissions (A2) scenario.

- 7
- 10
- 15

13. Another window into the future is the projected rise in global sea level, as shown in the lower figure on p. 30. The projection is based on lines of evidence other than climate model simulations. The large projected range of possible sea level values reflects uncertainty for reasons stated. Assuming the mid-value of the 2100 range is actually reached, it would show an increase in sea level of about _____ ft. during the 21st century.

- 1.0
- 2.5
- 4.0

Summary:

The *Our Changing Climate* section in the *Overview* portion of the *Highlights* report ends on page 31. Under the heading, *Where we are heading*, it states that, “Both voluntary activities and a variety of policies and measures that lower emissions are currently in place at federal, state and local levels in the U.S., even though there is no comprehensive national climate legislation. Over the remainder of this century, aggressive and sustained greenhouse gas emission reductions by the U.S. and by other nations would be needed to reduce global emissions to a level consistent with the lower scenario (B1) analyzed in this assessment.”

The year 2015 saw a dramatic resurgence in public and governmental concern and action regarding global warming at local, state, national and international levels. COP21 (Conference of the Parties to the United Nations Convention on Climate), held 30 November to 11 December 2015 negotiated the *Paris Agreement*, which will likely prove to be of great historical significance in mitigating climate change. Not insignificant in promoting public awareness has been the publication of Pope Francis’ Climate Encyclical *On Care for our Common Home*. [<https://www.washingtonpost.com/news/acts-of-faith/wp/2015/06/18/read-pope-franciss-full-document-on-climate-change/>]

Additionally, governments at all levels in the U.S. are moving forward, especially focusing on adaptation to climate change. In particular, federal agencies under NOAA leadership, have been very active in building the *U.S. Climate Resilience Toolkit*.

[\[https://toolkit.climate.gov/\]](https://toolkit.climate.gov/). This *Toolkit* has special emphasis on adapting to climate change at the local level.

Instructions for Communications with Mentor:

Transmit this week's work to your LIT mentor by Monday, 10 October 2016, or as coordinated with your mentor. Include:

- **Chapter Progress Response Form** from the *Study Guide* or the *RealTime Climate Portal* website.
- **Investigations Answer Form** for 6A and 6B from the *Study Guide* or *RealTime Climate Portal* website.
- **Current Climate Studies Answer Form** from *RealTime Climate Portal* website.

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