

THE CENTER FOR INQUIRY



Textbook Accuracy Report

An Analysis of James Q. Wilson and John J. DiIulio, Jr.'s
American Government: Institutions and Policies

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INTRODUCTION

The Center for Inquiry recently learned of certain factual errors and omissions in the textbook *American Government Institutions and Policies*, by James Q. Wilson and John J. DiIulio, Jr. The Center for Inquiry obtained a copy of the 10th edition of the “advanced” version of the textbook (Boston: Houghton Mifflin Company, 2006). Having reviewed the textbook, the Center for Inquiry concludes that the errors and omissions are sufficiently egregious to warrant immediate correction, either in a new edition of the textbook or in a separately distributed table of errata.¹

This paper outlines the Center for Inquiry’s analysis and recommended corrections related to six areas, each of which is discussed in detail below: the science of global warming; the legality of school prayer; analysis and evaluation of the Supreme Court’s decision in *Lawrence v. Texas*; the alleged influence of the religious concept of “original sin” on the structure of the Constitution; the history and meaning of the First Amendment’s Establishment Clause; and the significance of the Supreme Court’s denial of a writ of certiorari.

The presence of these errors and omissions seriously risks undermining the student reader’s understanding of basic facts and principles relevant to the study of American government. In the interests of serving the educational needs of American government students and sparing the authors and publishers needless embarrassment, the errors and omissions should be corrected immediately. The Center for Inquiry stands ready to offer further guidance to that end.

¹ The publishers recently issued an 11th edition of the textbook. See page 26 of this report for a table comparing the text in the 10th and 11th editions. Although some of the problematic text in the 10th edition has been altered or removed, the text remains largely unchanged in the 11th edition, while new problematic text appears. The Center for Inquiry recommends that the 11th edition be corrected immediately. Because many school districts are likely to possess copies of the older edition, the Center for Inquiry recommends that the publishers separately distribute a table of errata for the 10th edition.

ANALYSIS

I. Global Warming

The discussion of global warming contained in Chapter 21 (“Environmental Policy”) suffers from egregious flaws and clear factual errors. The textbook wrongly portrays the settled, firmly-established science of global warming as a product of “activist scientists” and the source of “profound disagreement” within the scientific community.² The textbook levels the outrageous charge that global warming “has resulted in a conflict among elites who often base their arguments as much on ideology as on facts.”³ Astonishingly, the textbook questions whether the greenhouse effect itself “exists at all.”⁴

The textbook’s discussion of the science of global warming is devastatingly inaccurate. As explained below, the overwhelming weight of scientific evidence establishes that global climate change caused by global warming is already underway and requires immediate attention. The international scientific community is united in recognizing the extremely high probability that human generated greenhouse gases, with carbon dioxide as the major offender, are the primary cause of global warming and that this global warming will produce harmful climate change.

The textbook grossly misinforms students about one of most important policy issues facing American government and society. In its current form, the textbook can only feed

² James Q. Wilson and John J. DiIulio, Jr., *American Government*, Advanced Placement 10th ed. (New York: Houghton Mifflin Company, 2006): 563.

³ *Id.*

⁴ *Id.* at 569.

the existing ignorance and confusion about global warming. Its factually erroneous treatment of global warming should be corrected immediately.

A. The Textbook Repeatedly Casts Doubt on the Fact of Global Warming

The textbook uniformly misstates the science of global warming. Every passage addressing the issue attempts to cast doubt on the relevant facts and science by inaccurately portraying global warming as a topic of ongoing, heated debate within the scientific community.

The following passages are examples of the textbook's numerous false and misleading statements:

- Page 560: “[M]any environmental issues are enmeshed in scientific uncertainty: the experts either do not know or they disagree about what is happening and how to change it. For example . . . scientists do not know how large the greenhouse effect is, whether it will lead to a harmful amount of global warming, or (if it will) what should be done about it.”
- Page 563: “Some politicians say that ‘all’ or ‘almost all’ scientists know that global warming will occur in ways that hurt humankind. In fact neither all nor almost all scientists believe this theory. The scientific community is divided over the issue. Most scientists agree that the earth has gotten a bit warmer over the past century. But from there on profound disagreements exist. Activist scientists say that the earth is getting warmer; skeptical ones note that the earth’s atmosphere has been getting cooler. Activists say that fossil-fuel gases are making the earth warmer; skeptics rejoin that the earth’s temperature regularly changes from natural causes, such as changes in the sun’s production of heat. Activists say that the sea will rise because of melting ice caps; skeptics respond that the ice caps are not melting. Activists say that their computer models prove that the earth will get warmer in the future; skeptics rejoin that these models can’t even explain temperature changes that have occurred in the past. Activists say that a warmer earth will be bad for humankind; skeptics say that a warmer earth will make it easier to grow crops and feed people. Activists say that we should act now, despite scientific doubts; skeptics say that we should learn more before doing anything.”
- Page 563-64: “As with most kinds of entrepreneurial politics, global warming has resulted in a conflict among elites who often base their arguments on ideology as much as facts. Environmental activists raise money with scary statements about the harm global warming will cause; conservatives raise money with scary statements about the economic pain an American cut in greenhouse gases will cause. But given

the popularity of ‘the environment’ as an issue, the activists dominate the discussion, and politicians can only with great difficulty criticize their claims.”

- Page 569 [under the heading “The Environmental Uncertainties”]: “Science doesn’t know whether we are experiencing a dangerous level of global warming or how bad the greenhouse effect is, if it exists at all.”
- Page 572: “*Entrepreneurial politics: an unorganized public is to benefit at the expense of a well-organized group.* An example is the effort to reduce what some think is global warming.” [emphasis in the original].
- Page 573: “Many environmental issues, including such major concerns as global warming [*sic*], are enmeshed in scientific uncertainty.”

The textbook generally portrays global warming as an emotionally-charged, overstated issue that is not “equally deserving of support”⁵ when compared to other environmental issues. The heading of the textbook’s section on global warming reads “Entrepreneurial Politics,”⁶ which the textbook describes as “mobilizing decision-makers with strong, often emotional appeals in order to overcome political advantages of the client groups that oppose a change. To make these appeals, people who want change must stir up controversy and find villains.”⁷

B. Firmly-Established Science Contradicts the Textbook’s Assertions

The international scientific community has established overwhelming evidence that flatly contradicts the textbook’s statements about global warming. Convincing evidence that the earth’s climate is undergoing significant, and in some cases alarming, changes has accumulated rapidly in recent years, especially during the most recent decades. The conclusion that there is significant warming of the earth’s surface is not based primarily on theoretical models, although these models do succeed in replicating the existing database with growing

⁵ Wilson and DiJulio at 563.

⁶ *Id.*

⁷ *Id.* at 560.

success. Instead, global warming is a fact confirmed by an enormous body of observations from many different sources. Indeed, the focus of research has now shifted from attempts to establish the existence of global warming to efforts to determine how rapidly it will occur.

In brief, debate within the scientific community over the existence and cause of global warming has closed. The most respected scientific bodies have stated unequivocally that global warming is occurring and that human generated greenhouse gases, with carbon dioxide as the major offender, are the primary cause of well documented global warming and climate change today. These conclusions are detailed in the landmark 2007 report⁸ of the Intergovernmental Panel on Climate Change (IPCC), the international scientific body organized to evaluate the scientific evidence for human-induced climate change.

The IPCC report represents the contributions of more than 2,500 scientific expert reviewers, more than 800 contributing authors, and more than 450 lead authors from over 130 nations.⁹ The IPCC report details the best scientific estimates of the expected impacts from climate change, which include disruptions to ecosystems and the hydrological cycle, damage from increasingly severe extreme weather events, changes to patterns of infectious disease, and lower crop yields. The IPCC report concluded that warming of the earth's climate 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."¹⁰ The report further concluded that the majority of the observed increase in average global

⁸ IPCC Summary for Policymakers, February 2007: 5 (attached as Appendix Two).

⁹ IPCC press flyer announcing 2007 report, available at <http://www.ipcc.ch/pdf/press-ar4/ipcc-flyer-low.pdf>.

¹⁰ IPCC Summary at 5.

temperatures since the mid-20th century is very likely – i.e., with greater than 90% probability – due to human-induced greenhouse gas concentrations.¹¹

In addition to the IPCC, other prestigious scientific bodies also recognize the reality of global warming. These include the U.S. National Academy of Sciences, which issued a joint statement in 2005 with 10 other National Academies of Science declaring that “the scientific understanding of climate change is now sufficiently clear to justify nations taking prompt action. It is vital that all nations identify cost-effective steps that they can take now, to contribute to substantial and long-term reduction in net global greenhouse gas emissions.”¹²

* * * *

The textbook’s treatment of global warming consists, for the most part, of false and misleading statements. Contrary to the textbook’s assertions, the scientific community is not “divided over the issue” of global warming. Today the scientific community debates not whether temperatures and ocean levels will rise, but how quickly they will continue to do so because of heat-trapping greenhouse gas emissions.¹³ It is inexcusable to misinform students of American Government about such an important policy issue. The textbook’s discussion of global warming should be revised immediately to reflect the settled consensus of the scientific community.

¹¹ *Id.* at 10.

¹² Joint Statement of Science Academies: *Global Response to Climate Change*, 2005 (attached as Appendix Three).

¹³ As with almost any position, some people disagree with the scientific community’s broad consensus on global warming, including a small handful of well-credentialed individuals. This is true of countless issues, from the historical reality of genocide to the carcinogenic effects of smoking. Nevertheless, the consensus of thousands of scientists and scientific organizations on the issue of global warming is clear. It would be irresponsible to leave students of American Government with the false impression that the issue is one of debate.

II. School Prayer

The textbook contains numerous mistaken and/or misleading statements about the U.S. Supreme Court's rulings on school prayer. These statements mislead the reader to conclude, incorrectly, that the U.S. Supreme Court will not allow prayer to occur in public schools under any circumstances. In fact, prayer occurs routinely in public schools. What the Supreme Court has found unconstitutional is government-sponsored prayer, for example, prayers mandated by law, organized by teachers, or incorporated into official school ceremonies. Prayers by private individuals or groups can and do take place in public schools.

As explained below, Supreme Court precedent guarantees the right of students and adults to pray in schools, so long as they do so within the bounds of the Constitution and follow reasonable restrictions on the time and manner of their prayers that apply to other forms of speech. (For example, a student could not yell out a prayer during a school assembly any more than he could yell out a quote from Bertrand Russell.) Much of this precedent appears explicitly in the very Supreme Court cases the textbook cites; other important cases guaranteeing students' free speech and assembly rights to engage in prayer go unmentioned in the textbook. In addition, federal statutory law requires that the Secretary of Education issue guidance on protected prayer in public elementary and secondary schools, and that any local educational agency receiving funds under the Elementary and Secondary Education Act ("ESEA") must certify in writing that it has no policy that prevents or otherwise denies participation in constitutionally protected prayer in public schools.¹⁴ Yet the textbook states inexplicably that prayer is never allowed in schools.

¹⁴ See section 9524 of the Elementary and Secondary Education Act of 1965, 20 U.S.C. § 7904, as amended by the No Child Left Behind Act of 2001. The U.S. Department of Education's guidance on

By presenting only one side of the facts and concealing important aspects of the law, the textbook misinforms student readers and feeds the popular misconception that the U.S. Supreme Court is hostile toward religion and/or prayer. The textbook should be revised to reflect accurately the state of the law regarding school prayer.

A. The Textbook Misrepresents the Law on School Prayer

The textbook repeatedly asserts, without qualification or further explanation, that the U.S. Supreme Court will not allow prayer in public schools. The following excerpts are representative examples of misleading statements:

- Page 111 [*photo caption*]: “Students pray in front of a high school in Virginia. The Supreme Court will not let this happen inside a public school.”
- Page 112: “Since 1947 the Court has applied the wall-of-separation theory to strike down as unconstitutional every effort to have any form of prayer in public schools, even if it is nonsectarian, voluntary, or limited to reading a passage of the Bible. Since 1992 it has even been unconstitutional for a public school to ask a rabbi or minister to offer a prayer—an invocation or a benediction—at the school’s graduation ceremony, and since 2001 it has been unconstitutional for a student, elected by other students, to lead a voluntary prayer at the beginning of a high school football game.”¹⁵
- Page 460: “[Court decisions] can sometimes be resisted or ignored, *if* the person or organization resisting is not highly visible and is willing to run the risk of being caught and charged with contempt of court. For example, long after the Supreme Court had decided that praying and Bible reading could not take place in public

constitutionally protected prayer is available online at http://www.ed.gov/print/policy/gen/guid/religionandschools/prayer_guidance.html.

¹⁵ The footnotes to the passage on page 112 cite the following cases: on nonsectarian prayers, *Engel v. Vitale*, 370 U.S. 421 (1962); on voluntary prayer, *Lubbock Civ. Lib. Union v. Lubbock Indep. Sch. Dist.*, 669 F.2d 1038 (5th Cir. 1982); on Bible readings, *Sch. Dist. Of Abington Township v. Schempp*, 374 U.S. 203 (1963); on graduation benedictions and student-initiated prayers at high school football games, *Lee v. Weisman*, 112 S. Ct. 2649 (1992) and *Santa Fe Indep. Sch. Dist. v. Jane Doe*, 530 U.S. 290 (2000). Note that *Lubbock* is a decision of the U.S. Court of Appeals for the Fifth Circuit, not a decision of the U.S. Supreme Court. The U.S. Supreme Court subsequently denied certiorari to this case. 459 U.S. 1155 (1983).

schools, schools all over the country were still allowing prayers and Bible reading.” (*emphasis in the original*) (*citing Abington Township v. Schempp*, 374 U.S. 203 (1963)).

These statements ignore the U.S. Supreme Court’s well-established case law distinguishing impermissible government religious speech from the constitutionally protected private religious speech of students. The textbook footnotes the U.S. Supreme Court cases barring government-sponsored or endorsed prayer as violations of the Establishment Clause. Yet it elides the crucial factor that determines whether prayer in school is an unconstitutional establishment of religion, or constitutionally protected speech or religious exercise: namely, whether or not the government – e.g., the legislature, government officials, or school employees – sponsors or endorses the prayer. The distinction between government-sponsored prayer and private prayer is crucial for understanding Establishment Clause jurisprudence and its omission from a civics textbook is a glaring fault.

Each of the U.S. Supreme Court cases cited in the textbook involved situations where the Court found an Establishment Clause violation because the government sponsored or endorsed prayer: by writing prayers and directing that they be read in schools,¹⁶ by requiring Bible readings as part of the curriculum,¹⁷ by actively deciding to include prayers at school events and choosing clergy members to perform them,¹⁸ or by adopting policies that favor religious over secular speakers at school events.¹⁹ Where government sponsorship or

¹⁶ *Engel v. Vitale*, 370 U.S. 421 (1962)

¹⁷ *Sch. Dist. Of Abington Township v. Schempp*, 374 U.S. 203 (1963)

¹⁸ *Lee v. Weisman*, 112 S. Ct. 2649 (1992)

¹⁹ *Santa Fe Indep. Sch. Dist. v. Jane Doe*, 530 U.S. 290 (2000)

endorsement is absent and prayer is truly voluntary, however, there is no Establishment Clause violation.²⁰ Instead, the prayer may be legally protected speech or exercise.²¹

The textbook's mistreatment of school prayer is belied by the U.S. Supreme Court's opinion in *Santa Fe Indep. Sch. Dist. v. Jane Doe*,²² the very opinion the textbook cites on the issue of student-led prayer at football games. There, the Court stated explicitly that "nothing in the Constitution . . . prohibits any public school student from voluntarily praying at any time before, during, or after the school day," so long as the State does not "affirmatively sponsor[] the particular practice or prayer."²³ As the Court explained, "there is a crucial difference between *government* speech endorsing religion, which the Establishment Clause forbids, and *private* speech endorsing religion, which the Free Speech and Free Exercise Clauses protect."²⁴

B. Instances of Constitutionally Protected Prayer in Public Schools

Constitutionally protected prayer in public schools occurs under many circumstances, including prayer during noninstructional time; prayer during extracurricular student groups' and community organizations' use of school facilities, both after the school day

²⁰ *See id.* at 313 ("nothing in the Constitution . . . prohibits any public school student from voluntarily praying at any time before, during, or after the school day," so long as the government does not "affirmatively sponsor[] the particular practice or prayer.").

²¹ *See, e.g., Widmar v. Vincent*, 454 U.S. 263 (1981) (holding that the First Amendment freedoms of speech and assembly guarantee student religious groups the right to use school facilities on the same terms as nonreligious groups, even where the student group uses those facilities for religious worship or discussion).

²² *Id.*

²³ *Id.* at 313.

²⁴ *Id.* at 302 (emphasis in the original) (quoting *Board of Educ. v. Mergens*, 496 U.S. 226, 250 (plurality opinion)); accord *Rosenberger v. Rector of Univ. of Virginia*, 515 U.S. 819, 841 (1995).

and on weekends; and prayer in moments of silence during the school day. A brief discussion of these three circumstances follows below. For a full treatment of these and other circumstances under which school prayer is constitutionally protected, see the U.S. Department of Education’s *Guidance on Constitutionally Protected Prayer in Public Elementary and Secondary Schools*.²⁵

1. Prayer During Noninstructional Time

In accordance with the U.S. Department of Education *Guidance*, students may pray outside of instructional time, “subject to the same rules designed to prevent material disruption of the educational program that are applied to other privately initiated expressive activities.” Students may “read their Bibles or other scriptures, say grace before meals, and pray or study religious materials with fellow students during recess, the lunch hour, or other noninstructional time to the same extent that they may engage in nonreligious activities.” Any rules of order or restrictions on student activities “may not discriminate against student prayer or religious speech in applying such rules and restrictions.”

The textbook’s sweeping statement that “the Supreme Court will not let [prayer] happen inside a public school,” together with its one-sided statement of the relevant constitutional law, misleads the student reader to conclude falsely that students may not engage in any prayer at all during noninstructional time. Students using the textbook are left to believe, e.g., that the Court reads the Establishment Clause to forbid students from saying grace at lunch.

2. Extracurricular Activities and Outside Use of School Facilities

The Supreme Court has held that the First Amendment freedoms of speech and assembly guarantee student religious groups the right to use school facilities on the same terms

²⁵ Attached as Appendix One; also available online at http://www.ed.gov/policy/gen/guid/religionandschools/prayer_guidance.html.

as nonreligious groups, even where the student group uses those facilities for religious worship or discussion.²⁶ Similarly, the Court has upheld against constitutional challenge the federal Equal Access Act, which prohibits schools receiving federal funds from discriminating against student groups for access to facilities on the basis of their religious or philosophical activities or beliefs.²⁷

The Court has also ruled that school districts may not exclude religious community groups from using school facilities during after-school hours²⁸ and during weekends and evenings.²⁹ A school district that opens its facilities to community and civic groups outside of the school day may not prevent such groups from using them for religious purposes.³⁰

Under the U.S. Supreme Court's rulings, religious student groups and religious community organizations have a constitutional right to hold prayer meetings in public schools. The U.S. Department of Education's *Guidance* outlines those circumstances under which organized prayer groups and activities are constitutionally permitted. Yet the textbook makes no mention of these facts or the relevant U.S. Supreme Court decisions.

3. Moments of Silence and Other Quiet Periods

The U.S. Supreme Court has held that government may not mandate moments of silence for the purpose of promoting "silent prayer"³¹ in public schools. Legislation passed for

²⁶ *Widmar v. Vincent*, 454 U.S. 263 (1981).

²⁷ *Bd. Of Educ. Of Westside Community Schools v. Mergens*, 496 U.S. 226 (1990).

²⁸ *Good News Club v. Milford Cent. Sch.*, 533 U.S. 98 (2001).

²⁹ *Lamb's Chapel v. Center Moriches Union Free Sch. Dist.*, 508 U.S. 384 (1993).

³⁰ *Id.* at 387.

³¹ *Wallace v. Jaffree*, 472 U.S. 38 (1985).

the purpose of reintroducing prayer in public schools violates the Establishment Clause.³² This notwithstanding, in schools that have constitutionally permissible moments of silence “or other quiet periods during the school day, students are free to pray silently, or not to pray, during these periods of time.”³³ Prayer during these quiet periods raises no constitutional issue where the government does not sponsor or encourage prayer.

The textbook makes no mention of students’ right to pray during these times. Instead, the textbook’s sweeping statement that “the Supreme Court will not let [prayer] happen inside a public school,” together with its one-sided statement of the relevant constitutional law, leaves the student reader to conclude erroneously that students may not pray at all during moments of silence and quiet periods.

* * * *

The textbook’s general failure to distinguish impermissible government sponsorship of prayer from constitutionally protected prayer in public schools misstates the law and disserves the student reader, who may be led to the popular misperception that the U.S. Supreme Court is hostile to religion and prayer. A one-sided presentation of the facts and the law surrounding school prayer is inexcusable. The textbook should be revised to include a more complete and balanced treatment of this issue.

³² *Id.* at 38.

³³ *See* U.S. Department of Education Guidance, *supra* note 6.

III. *Lawrence v. Texas* and Same-Sex Marriage

The textbook contains an opinionated and factually incorrect assessment of the U.S. Supreme Court's landmark gay rights decisions in *Bowers v. Hardwick*³⁴ and *Lawrence v. Texas*.³⁵ The Court's 1986 decision in *Bowers* held that states may criminalize private consensual sexual relations between same-sex partners. In 2003, the Court in *Lawrence* explicitly overruled *Bowers*, holding that state law may not ban sexual relations between same-sex partners.

The textbook first states that the Court in *Lawrence* overturned the state statute in question "again by a five-to-four vote,"³⁶ wrongly implying that the Court's decision was closely divided. In fact, *Lawrence* was a six-to-three ruling.³⁷ This error should be corrected.

The textbook then proceeds to an astonishingly imbalanced statement of the "benefit" and "cost" of the *Lawrence* decision:

The benefit was to strike down a law that was rarely enforced and if introduced today probably could not be passed. The cost was to create the possibility that the Court, and not Congress or the state legislatures, might decide whether same-sex marriages were legal.³⁸

³⁴ 478 U.S. 186 (1986)

³⁵ 539 U.S. 558 (2003)

³⁶ Wilson and DiIulio at 150.

³⁷ Justice Anthony Kennedy wrote an opinion for a majority of five Justices, basing the Court's opinion on the Fourteenth Amendment's Due Process Clause. Justice Sandra Day O'Connor filed a separate opinion concurring with the majority's invalidation of the state law at issue, but basing her opinion on the Fourteenth Amendment's Equal Protection Clause. Only Justices Rehnquist, Scalia, and Thomas declined to overturn the Texas anti-sodomy statute. *Id.*

³⁸ Wilson and DiIulio at 150.

This statement at once belittles the *Lawrence* decision's importance and stakes a politically charged position on the issue of same-sex marriage. The passage is profoundly troubling in at least two ways.

First, the passage unfairly trivializes the grave impact of the *Bowers* ruling and the importance of the Court's decision to overrule it in *Lawrence*. For close to two decades, both legislators and judges cited the *Bowers* decision in opposition to gay rights programs and petitions, making *Bowers* the most massive stumbling block to legal equality for gays and lesbians.³⁹ The textbook wrongly depicts the *Bowers* decision as a trifling inconvenience of little effect.

Second, the passage inappropriately endorses a controversial position on the issue of same-sex marriage. Many disagree with the position that the courts should not protect fundamental rights, including the right to marry, from interference by Congress or the state legislatures. Proponents of same-sex marriage would view court protection of marriage rights as an important benefit, not a cost.

³⁹ Before the U.S. Supreme Court's 2003 decision in *Lawrence*, the *Bowers* decision was cited to justify multiple forms of discrimination against gay men and lesbians. Courts cited *Bowers* in housing and employment discrimination cases to deny equal protection scrutiny to gays and lesbians. See, e.g., *Woodward v. United States*, 871 F.2d 1068, 1070 (1989); *Equity Foundation of Greater Cincinnati v. Cincinnati*, 54 F.3d 261, 268 (1995). In the wake of *Bowers*, legislatures enacted statutes preventing gays and lesbians from adopting children, while courts cited anti-sodomy laws as an excuse to deny child custody to gay and lesbian parents. See, e.g., *Bottoms v. Bottoms*, 457 S.E. 2d. 102 (Va. 1995) (upholding a state court's removal of a two-year-old boy from his mother's custody because of the mother's then-illegal sexual conduct). *Bowers* was cited to oppose allowing gay men and lesbians to serve in the Armed Forces on the same terms as heterosexuals. See, e.g., *Schowengerdt v. United States*, 944 F.2d 483 (9th Cir. 1991); *Richenberg v. Perry*, 909 F. Supp. 1303, 1313 (D. Neb. 1995), *aff'd*, 97 F.3d 256 (8th Cir. 1996). Further examples of *Bowers*' impediment to gay and lesbian rights abound. See Richard Nunan, *Legal Aspects of Gay and Lesbian Studies*, American Philosophical Association Newsletters Vol. 97, No. 1 (Fall 1997).

Each of the two biases outlined above disserves the student reader by endorsing a skewed or politically charged perspective. The textbook should be revised to contain a more accurate and balanced treatment of the “benefits” and “costs” of the *Lawrence* decision.

IV. Constitutional Government and Original Sin

One of the most persistent and pernicious myths about our constitutional structure is that the Founders intended to create a Christian nation and that they designed our government to embody and reflect religious principles. It is very important for a civics textbook to explain correctly the motivations of our Founders. History unequivocally confirms that the Founders based our Constitution on secular considerations. Unfortunately, the textbook erroneously suggests that one of the principal motivations for the key provisions of the Constitution was the Founders’ alleged recognition of the flaws in human nature resulting from “original sin.”

The key passage in the textbook occurs on page 84, where it is stated that “To the colonists all of mankind suffered from original sin, symbolized by Adam and Eve eating the forbidden fruit in the Garden of Eden. Since no one was born innocent, no one could be trusted with power. Thus the Constitution had to be designed in such a way as to curb the darker side of human nature. Otherwise everyone’s rights would be in jeopardy.”

Undoubtedly some of the colonists believed in original sin. Nonetheless, there is no evidence that the concept of original sin played any significant role in the design of the United States Constitution. When one looks at the debates during the Constitutional Convention, the *Federalist Papers*, and finally the debates in the various state conventions called to consider the adoption of the Constitution, one finds *no* references to original sin. If the concept of original sin were as significant as the textbook maintains, the lack of such a reference is

inexplicable. These documents reflect the concerns of those who drafted, defended, and ratified the Constitution. Original sin was not one of these concerns, and it is seriously misleading for the textbook to suggest otherwise.⁴⁰

The Founders recognized that humans were fallible, prone to disagreements and animosity, and subject to corruption. Accordingly, a government that was limited in its powers and that utilized a system of checks and balances among the various branches of government was advisable. However, their conclusions about human nature were based on historical experience, *not* religious doctrine. For example, in *Federalist Paper* No. 10, James Madison discusses at length the various causes of “faction.” Nowhere in this paper does he cite “original sin” as a cause of faction. To the contrary, he states that “the most common and durable source of factions has been the various and unequal distribution of property.”⁴¹

The Founders based their prudent limitations on the power of government on the lessons of history and common human experience, not on any religious doctrine.

V. The Meaning of the Establishment Clause

No one would deny that the literal wording of the Establishment Clause of the First Amendment does not provide an unequivocal answer to all of the contemporary controversies about the role of religion in public life, such as the circumstances under which nativity scenes can be displayed on public property or prayer can take place in public schools.

⁴⁰ Sources for the debates in the Constitutional Convention and the various state ratifying conventions are, respectively: E. H. Scott, ed., *Journal of the Federal Convention Kept by James Madison* (New York: Books for Libraries Press, 1970) and Jonathan Elliot, *The Debates in the Several State Conventions on the Adoption of the Federal Constitution* (New York: William S. Hein, 1996).

⁴¹ Clinton Rossiter, ed., *The Federalist Papers* (New York: Mentor, 1961), 79.

One very obvious reason for some of the lack of specificity in the Establishment Clause—along with other provisions in the Constitution and the Bill of Rights—is that the Founders realized they were drafting a document that provided general guidance, not a detailed legislative or regulatory code. They understood that they could not possibly anticipate all the future circumstances in which the exercise of government authority might be challenged. A living constitution cannot be narrowly tailored to address only those problems that confront its drafters. The wisdom of the Founders in adopting broad provisions is confirmed by the fact that we continue to look to the Constitution and the Bill of Rights for guidance even when resolving issues that the Founders had no occasion to consider, such as nativity scenes on public property (essentially unheard of in the 1790’s) or prayer in public schools (public schools were then few and far between).

However, the textbook improperly suggests that the Establishment Clause is much vaguer than it actually is. Furthermore, in doing so, the textbook mischaracterizes the significance of the debates in Congress regarding the wording of the Establishment Clause. The proposed wording of the Establishment Clause did change several times, but that does not indicate that its meaning was left unsettled.

In addition, contrary to accepted rules for discerning legislative intent, the textbook suggests that the clause was intended to prohibit only a national religion or government preference for one religion over another “up to the last minute” at which point Congress mysteriously decided to adopt a more ambiguous provision. The relevant passage in the textbook, found on page 111, is as follows:

What in the world did the members of the First Congress mean when they wrote into the First Amendment language prohibiting Congress from making a law “respecting” an “establishment” of religion? The Supreme Court has more or less

consistently interpreted this vague phrase to mean that the constitution erects a “wall of separation” between church and state. That phrase, so often quoted, is not in the Bill of Rights nor in the debates in the First Congress that drafted the Bill of Rights; it comes from the pen of Thomas Jefferson . . . But it is not clear that Jefferson’s view was the majority view. During much of the debate in Congress the wording of this part of the First Amendment was quite different and much plainer than what finally emerged. Up to the last minute the clause was intended to read “no religion shall be established by law” or “no national religion shall be established.” The meaning of those words seems quite clear: whatever the states may do, the federal government cannot create an official, national religion or give support to one religion in preference to another. But Congress instead adopted an ambiguous phrase, and so the Supreme Court had to decide what it meant.

A review of the debates in Congress actually proves that Congress expressly considered *and then rejected* language that would have limited the Establishment Clause to prohibiting a national religion or the preference of one religion over another.

On June 8, 1789, James Madison, as a member of the House of Representatives, introduced into Congress proposed amendments to the Constitution, one of which initially read, in relevant part:

The civil rights of none shall be abridged on account of religious belief or worship, nor shall any national religion be established nor shall the full and equal rights of conscience be in any manner, or on any pretext, infringed.⁴²

Madison’s proposal, as worded, was rejected by his fellow members. Instead, the language that the House eventually approved on August 20, 1789 was the following: “Congress shall make no law establishing religion, or to prevent the free exercise thereof, or to infringe the rights of conscience.”⁴³ This language is obviously very similar to the final language of the First

⁴² 1 Annals of Congress 452.

⁴³ 1 Annals of Congress 766.

Amendment, but arguably narrower. It prevents a law establishing religion but not any law “respecting an establishment of religion.”

However, before Congress adopted the final version, the proposed amendment first had to be approved by the Senate. On September 3, 1789, three motions proposing alternative amendments were considered and then defeated in the Senate. Two out of the three proposed amendments would have explicitly restrained government only from favoring one religion over another, and all three of them were less restrictive of government action than the House version of the amendment. The first proposed amendment rejected by the Senate stated: “Congress shall make no law establishing one religious sect or society in preference to others.” The second proposed amendment to be rejected read: “Congress shall not make any law infringing the rights of conscience or establishing any religious sect or society.” The final defeated proposed amendment said: “Congress shall make no law establishing any particular denomination of religion in preference to any other.”⁴⁴

If the first and third of these proposed amendments had ultimately been approved by Congress and ratified by the states, then those who believe the First Amendment only prohibits government preference of one religion over another would have ample support for their claim. Indeed, their view would have become the law of the land. However, as indicated, none of these proposals prevailed. The Senate explicitly rejected limitation of the Establishment Clause to a prohibition of government preference for some religions.

Exactly what happened next still baffles historians, in part because although the Senate journals record the language of proposed amendments, they do not record the debate on these proposals. What is known is that the Senate first considered broadening the scope of the

⁴⁴ Douglas Laycock, “Nonpreferential Aid to Religion,” *William and Mary Law Review* 27 (1986): 880.

First Amendment and then decided to narrow it. First, it accepted a proposal that spoke of religion in general terms: “Congress shall make no law establishing religion, or prohibiting the free exercise thereof.” However, a week later, the Senate changed its mind and produced a confusing version of the amendment that was arguably narrower than its predecessors: “Congress shall make no law establishing articles of faith or a mode of worship, or prohibiting the free exercise of religion.”⁴⁵

This is the version of the amendment that the Senate returned to the House of Representatives. The House rejected this version. The Senate and House then formed a conference committee to resolve their differences. The version of the amendment that emerged from the committee and that was presented to the Senate on September 24, 1791, is the one that was adopted and ratified and now embodied in the First Amendment: “Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof.”

The final language of the amendment contains the most sweeping restrictions on the government of any of the versions considered by either house. Significantly, the final amendment not only forbids establishing a religion, but it forbids any law *respecting*, that is relating to, an establishment of religion; therefore, it forbids any law that promotes (or disfavors) religion in any way.

In interpreting the Constitution, as is true in interpreting any legal document, we should focus on the document’s final language, but consideration of earlier drafts can be instructive regarding the intent behind the final text. The course of the debate in Congress shows that the House and the Senate expressly considered language that was less restrictive of

⁴⁵ Laycock, “Nonpreferential Aid to Religion,” 880–881. See also Ronald A. Lindsay, “Neutrality Between Religion and Irreligion: Is It Required? Is It Possible?” *Free Inquiry* 10, no. 4 (1990): 19.

government support of religion than the final version of the amendment *and rejected that language*. Two of the specific proposals rejected were draft amendments that would have prohibited Congress only from giving preference to one religion over others. Therefore, as a matter of legal analysis, the First Amendment must do more than merely require the government to be neutral among the various religions. Moreover, it is simply false to assert, as the textbook does, that “[u]p to the last minute the clause was intended to read ‘no religion shall be established by law’ or ‘no national religion shall be established.’” That language had been rejected weeks before the conference committee produced the final version of the Establishment Clause.

Justice David Souter, in his concurring opinion in *Lee v. Weisman*,⁴⁶ extensively reviewed the history of the debates in the First Congress regarding the Establishment Clause. According to Justice Souter, narrow interpretations of the Establishment Clause are decisively refuted by the fact that Congress “repeatedly considered and deliberately rejected . . . narrow language and instead extended their prohibition to state support for ‘religion’ in general.”⁴⁷

The exact reach of the prohibitions of the Establishment Clause is unclear; reasonable people can disagree over the circumstances under which government can provide support to faith-based charities, for example. Nonetheless, the textbook is clearly in error when it suggests that the Establishment Clause was intended only to prohibit a national religion or government preference for one religion until a last minute change rendered the clause ambiguous.

⁴⁶ 505 U.S. 577, 609 (1992).

⁴⁷ *Id.* at 614–615.

VI. The Significance of a Denial of a Petition for a Writ of Certiorari

In one of the passages discussing the limits on government support of religion, the textbook makes a misstatement about permissible government endorsement of religion that, although not especially significant by itself, nonetheless shows a serious misunderstanding of the role and function of the Supreme Court. The passage in question is as follows: “The Court has said that the government cannot ‘advance’ religion, but it has not objected to the printing of the phrase ‘In God We Trust’ on the back of every dollar bill” (page 113).

The Supreme Court has never ruled on the issue of whether the motto “In God We Trust” can appear on our currency. For that matter, it has never ruled on the issue of whether “In God We Trust” can be used as our national motto. It has expressed no legally binding opinion on these issues whatsoever. The federal judiciary does not have the option of resolving any issue that it may find interesting. This is a fundamental difference between the legislative and the judicial branches, and should be understood by any civics student. Congress may take up any issue that interests a member of Congress, but the judiciary can resolve only those cases or controversies that are presented to it by litigants. The fact that the Supreme Court has “not objected to the printing of the phrase ‘In God We Trust’” on our currency signifies nothing; it certainly does not suggest that the Court will not find the display of the motto on our currency unconstitutional if and when it takes up a case that squarely presents this issue.

There have been some lower court rulings upholding use of the motto on our currency or in buildings which the Supreme Court has declined to review. Although it is not clear from the textbook passage whether it is using the fact that the Court has declined to review these rulings as the basis for its assertion that the Court has not “objected” to the motto, it is important to point out that the Court’s decision not to review such rulings carries no significance.

In general, litigants do not have a right to have the Supreme Court review an adverse ruling of the federal or state appellant courts. Litigants must request the Supreme Court to review an adverse ruling through a document that is known as a “petition for a writ of certiorari.” Under the rules adopted by the Court, at least four justices must agree to review a case before such a petition is granted. The vast majority of such petitions are denied.

Moreover, it is hornbook law that an order denying a petition for a writ of certiorari is *not* to be interpreted as reflecting the Court’s views on the merits of a case.⁴⁸ A denial of a petition merely indicates that the Court is exercising its discretion not to review the decision of the lower court. There are any number of reasons why the Court may decline to review a decision, including a record that is unclear or a desire to have more federal appellate courts provide their views on the matter before the Supreme Court takes up the issue. The Supreme Court itself has explicitly cautioned the public that “[t]he denial of a writ of certiorari imports no expression of opinion upon the merits of the case.”⁴⁹

It is critical for civics students to understand the operations of the federal judiciary and, in particular, of the Supreme Court. The passage in question should be deleted and the textbook should contain a concise explanation of the discretionary jurisdiction of the Supreme Court.

⁴⁸ Robert L. Stern, ed., *Supreme Court Practice*, 8th ed. (Washington, D.C.: BNA Books, 2002), 306–07.

⁴⁹ *United States v. Carver*, 260 U. S. 482, 490 (1923). See also *Maryland v. Baltimore Radio Show*, 338 U. S. 912, 917–919 (1950) (opinion of Frankfurter, J.) (a denial of a petition for certiorari “simply means that fewer than four members of the Court deemed it desirable to review a decision of the lower court”).

CONCLUSION

The Center for Inquiry submits that the factual errors, omissions, and misleading statements outlined above warrant the publishers' immediate attention. Their presence poses a strong risk of distorting students' understanding of several basic facts and principles central to the study of American Government, from global warming science and public policy to the meaning and history of the Constitution. The publishers owe a basic duty to students of American Government, to the public, and to the authors to correct these errors and omissions without delay. The Center for Inquiry recommends that the publishers issue a new, corrected edition, and/or issue a table of errata to students now using the textbook. Should it be helpful, the Center for Inquiry will offer further guidance toward that end.

ADDENDUM:

A COMPARISON OF THE 10th AND 11th EDITIONS OF THE TEXTBOOK

The following table presents a comparison of text from the 10th edition of the “advanced” version of *American Government: Institutions and Policies* (Houghton Mifflin Company, 2006) currently used in many schools and the recently-published 11th edition (Houghton Mifflin Company, 2008).

The problematic text in the 10th edition generally survives in the new, 11th edition. The new edition removes an inaccurate photo caption regarding school prayer. Otherwise the discussion of school prayer within the 11th edition text is identical to that of the 10th edition. The 11th edition modifies some of the language addressing global warming. However, new inaccurate statements about global warming appear in the 11th edition. Like the 10th edition of the textbook, the 11th edition also calls into question the broad consensus within the scientific community that human generated greenhouse gases, with carbon dioxide as the major offender, are a major cause of global warming and that this global warming will produce harmful climate change. The problematic text addressing *Lawrence v. Texas*, constitutional government and original sin, the meaning of the Establishment Clause, and the significance of a denial of a petition for a writ of certiorari remain *verbatim* in the 11th edition.

Because the problematic text in the 10th edition remains unchanged or has been replaced by additional problematic text in the 11th edition, the Center for Inquiry recommends that the new, 11th edition of the textbook be corrected immediately. Furthermore, because many school districts are likely to possess copies of the older edition, the Center for Inquiry also recommends that the publishers separately issue and distribute a table of errata for the older edition.

I. On Global Warming:

10 th Edition Text	11 th Edition Text
<p>Page 560: “[M]any environmental issues are enmeshed in scientific uncertainty: the experts either do not know or they disagree about what is happening and how to change it. For example . . . scientists do not know how large the greenhouse effect is, whether it will lead to a harmful amount of global warming, or (if it will) what should be done about it.”</p>	<p>Page 556: “[M]any environmental issues are enmeshed in scientific uncertainty: the experts either do not know or they disagree about what is happening and how to change it. For example . . . some people worry . . . that the earth will soon become a greenhouse . . . But there are some scientists who say that human activity is not a major cause of global warming; instead, they argue, it is the result of natural changes in the earth’s temperature.”</p>
<p>Page 560: Describes “entrepreneurial politics” (of which the textbook gives global warming as an example) as “mobilizing decision-makers with strong, often emotional appeals in order to overcome political advantages of the client groups that oppose a change. To make these appeals, people who want change must stir up controversy and find villains.”</p>	<p>Page 556: <i>Identical text.</i></p>
<p>Page 563: “It is a foolish politician who today opposes environmentalism. And that creates a problem, because not all environmental issues are equally deserving of support. Take the case of global warming.”</p>	<p>Page 559: <i>Identical text.</i></p>
<p>Page 563: “Some politicians say that ‘all’ or ‘almost all’ scientists know that global warming will occur in ways that hurt humankind. In fact neither all nor almost all scientists believe this theory. The scientific community is divided over the issue. Most scientists agree that the earth has gotten a bit warmer over the past century. But from there on profound disagreements exist. Activist scientists say that the earth is getting warmer; skeptical ones note that the earth’s atmosphere has been getting cooler. Activists say that fossil-fuel gases are making the earth warmer; skeptics rejoin that the earth’s temperature regularly changes from natural causes, such as changes in the sun’s production of heat. Activists say that the sea will rise because of melting ice caps; skeptics respond that the ice</p>	<p>Page 559: “But our natural concern for global warming must address three difficult questions. First, we do not have an accurate measure of how much human activity has contributed to the warming of the earth. The earth has become warmer, but is this mostly a result of natural climate changes, or is it heavily influenced by humans putting greenhouse gases into the air? Second, if human activity is a main contributor, what would it cost in lost productivity and income to reduce greenhouse gases? Since America acting alone cannot eliminate greenhouse gases, we have to figure out how to get other countries, especially rapidly growing ones such as China and India, to absorb their share of the cost. Third, how large would be the gains to humankind, and when would they occur? On the one hand, a</p>

<p>caps are not melting. Activists say that their computer models prove that the earth will get warmer in the future; skeptics rejoin that these models can't even explain temperature changes that have occurred in the past. Activists say that a warmer earth will be bad for humankind; skeptics say that a warmer earth will make it easier to grow crops and feed people. Activists say that we should act now, despite scientific doubts; skeptics say that we should learn more before doing anything.”</p>	<p>warmer globe will cause sea levels to rise, threatening coastal communities; on the other hand, greater warmth will make it easier and cheaper to grow crops and avoid high heating bills.”</p>
<p>Page 563-64: “As with most kinds of entrepreneurial politics, global warming has resulted in a conflict among elites who often base their arguments on ideology as much as facts. Environmental activists raise money with scary statements about the harm global warming will cause; conservatives raise money with scary statements about the economic pain an American cut in greenhouse gases will cause. But given the popularity of ‘the environment’ as an issue, the activists dominate the discussion, and politicians can only with great difficulty criticize their claims.”</p>	<p>Pages 559-60: <i>Identical text.</i></p>
<p>Page 569 [under the heading “The Environmental Uncertainties”]: “Science doesn’t know whether we are experiencing a dangerous level of global warming or how bad the greenhouse effect is, if it exists at all.”</p>	<p>Page 566 [under the heading “The Environmental Uncertainties”]: “Science doesn’t know how bad the greenhouse effect is.”</p>
<p>Page 572: “<i>Entrepreneurial politics: an unorganized public is to benefit at the expense of a well-organized group.</i> An example is the effort to reduce what some think is global warming.” [emphasis in the original].</p>	<p>Page 569: <i>Identical text.</i></p>
<p>Page 573: “Many environmental issues, including such major concerns as global warning [<i>sic</i>], are enmeshed in scientific uncertainty.”</p>	<p>Page 569: <i>Spelling error removed; otherwise identical text.</i></p>

II. On School Prayer:

10 th Edition Text	11 th Edition Text
Page 111 [<i>photo caption</i>]: “Students pray in front of a high school in Virginia. The Supreme Court will not let this happen inside a public school.”	Page 106: <i>Photo and caption removed.</i> New photo and caption reads: “Two opposing high school basketball teams pray together after a game.”
Page 112: “Since 1947 the Court has applied the wall-of-separation theory to strike down as unconstitutional every effort to have any form of prayer in public schools, even if it is nonsectarian, voluntary, or limited to reading a passage of the Bible. Since 1992 it has even been unconstitutional for a public school to ask a rabbi or minister to offer a prayer—an invocation or a benediction—at the school’s graduation ceremony, and since 2001 it has been unconstitutional for a student, elected by other students, to lead a voluntary prayer at the beginning of a high school football game.”	Page 107: <i>Identical text; identical footnote citations.</i>
Page 460: “[Court decisions] can sometimes be resisted or ignored, <i>if</i> the person or organization resisting is not highly visible and is willing to run the risk of being caught and charged with contempt of court. For example, long after the Supreme Court had decided that praying and Bible reading could not take place in public schools, schools all over the country were still allowing prayers and Bible reading.” (<i>emphasis in the original</i>) (<i>citing Abington Township v. Schempp</i> , 374 U.S. 203 (1963)).	Page 454: <i>Identical text.</i>

III. On *Lawrence v. Texas* and Same-Sex Marriage:

10 th Edition Text	11 th Edition Text
Page 150: Incorrectly states that the Court in <i>Lawrence</i> overturned the state statute in question “again by a five-to-four vote.”	Page 146: <i>Identical text.</i>
Page 150: “The <i>Lawrence</i> decision had a benefit and a cost. The benefit was to strike down a law that was rarely enforced and if introduced today probably could not be passed. The cost was to create the possibility that the Court, and not Congress or the state legislatures, might decide whether same-sex marriages were legal.”	Pages 146-47: <i>Identical text.</i>

IV. On Constitutional Government and Original Sin:

10 th Edition Text	11 th Edition Text
Page 84: “To the colonists all of mankind suffered from original sin, symbolized by Adam and Eve eating the forbidden fruit in the Garden of Eden. Since no one was born innocent, no one could be trusted with power. Thus the Constitution had to be designed in such a way as to curb the darker side of human nature. Otherwise everyone’s rights would be in jeopardy.”	Page 83: <i>Identical text.</i>

V. On the Meaning of the Establishment Clause:

10 th Edition Text	11 th Edition Text
Page 111: “What in the world did the members of the First Congress mean when they wrote into the First Amendment language prohibiting Congress from making a law “respecting” an “establishment” of religion? The Supreme	Page 107: <i>Identical text.</i>

<p>Court has more or less consistently interpreted this vague phrase to mean that the constitution erects a “wall of separation” between church and state.</p> <p>That phrase, so often quoted, is not in the Bill of Rights nor in the debates in the First Congress that drafted the Bill of Rights; it comes from the pen of Thomas Jefferson . . . But it is not clear that Jefferson’s view was the majority view.</p> <p>During much of the debate in Congress the wording of this part of the First Amendment was quite different and much plainer than what finally emerged. Up to the last minute the clause was intended to read ‘no religion shall be established by law’ or ‘no national religion shall be established.’ The meaning of those words seems quite clear: whatever the states may do, the federal government cannot create an official, national religion or give support to one religion in preference to another.</p> <p>But Congress instead adopted an ambiguous phrase, and so the Supreme Court had to decide what it meant.”</p>	
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VI. On the Significance of a Denial of a Petition for a Writ of Certiorari:

10th Edition Text	11th Edition Text
Page 113: “The Court has said that the government cannot ‘advance’ religion, but it has not objected to the printing of the phrase ‘In God We Trust’ on the back of every dollar bill.”	Page 109: <i>Identical text.</i>

APPENDIX ONE

(Source: http://www.ed.gov/policy/gen/guid/religionandschools/prayer_guidance.html)

U.S. DEPARTMENT OF EDUCATION

Guidance on Constitutionally Protected Prayer in Public Elementary and Secondary Schools

February 7, 2003

Introduction

Section 9524 of the Elementary and Secondary Education Act ("ESEA") of 1965, as amended by the No Child Left Behind Act of 2001, requires the Secretary to issue guidance on constitutionally protected prayer in public elementary and secondary schools. In addition, Section 9524 requires that, as a condition of receiving ESEA funds, a local educational agency ("LEA") must certify in writing to its State educational agency ("SEA") that it has no policy that prevents, or otherwise denies participation in, constitutionally protected prayer in public schools as set forth in this guidance.

The purpose of this guidance is to provide SEAs, LEAs, and the public with information on the current state of the law concerning constitutionally protected prayer in the public schools, and thus to clarify the extent to which prayer in public schools is legally protected. This guidance also sets forth the responsibilities of SEAs and LEAs with respect to Section 9524 of the ESEA. As required by the Act, this guidance has been jointly approved by the Office of the General Counsel in the Department of Education and the Office of Legal Counsel in the Department of Justice as reflecting the current state of the law. It will be made available on the Internet through the Department of Education's web site (www.ed.gov). The guidance will be updated on a biennial basis, beginning in September 2004, and provided to SEAs, LEAs, and the public.

The Section 9524 Certification Process

In order to receive funds under the ESEA, an LEA must certify in writing to its SEA that no policy of the LEA prevents, or otherwise denies participation in, constitutionally protected prayer in public elementary and secondary schools as set forth in this guidance. An LEA must provide this certification to the SEA by October 1, 2002, and by October 1 of each subsequent year during which the LEA participates in an ESEA program. However, as a transitional matter, given the timing of this guidance, the initial certification must be provided by an LEA to the SEA by March 15, 2003.

The SEA should establish a process by which LEAs may provide the necessary certification. There is no specific Federal form that an LEA must use in providing this certification to its SEA. The certification may be provided as part of the application process for ESEA programs, or separately, and in whatever form the SEA finds most appropriate, as long as the certification is in writing and clearly states that the LEA has no policy that prevents, or otherwise denies participation in, constitutionally protected prayer in public elementary and secondary schools as set forth in this guidance.

By November 1 of each year, starting in 2002, the SEA must send to the Secretary a list of those LEAs that have not filed the required certification or against which complaints have been made to the SEA that the LEA is not in compliance with this guidance. However, as a transitional matter, given the timing of this guidance, the list otherwise due November 1, 2002, must be sent to the Secretary by April 15, 2003. This list should be sent to:

Office of Elementary and Secondary Education
Attention: Jeanette Lim
U.S. Department of Education
400 Maryland Avenue, S.W.
Washington, D.C. 20202

The SEA's submission should describe what investigation or enforcement action the SEA has initiated with respect to each listed LEA and the status of the investigation or action. The SEA should not send the LEA certifications to the Secretary, but should maintain these records in accordance with its usual records retention policy.

Enforcement of Section 9524

LEAs are required to file the certification as a condition of receiving funds under the ESEA. If an LEA fails to file the required certification, or files it in bad faith, the SEA should ensure compliance in accordance with its regular enforcement procedures. The Secretary considers an LEA to have filed a certification in bad faith if the LEA files the certification even though it has a policy that prevents, or otherwise denies participation in, constitutionally protected prayer in public elementary and secondary schools as set forth in this guidance.

The General Education Provisions Act ("GEPA") authorizes the Secretary to bring enforcement actions against recipients of Federal education funds that are not in compliance with the law. Such measures may include withholding funds until the recipient comes into compliance. Section 9524 provides the Secretary with specific authority to issue and enforce orders with respect to an LEA that fails to provide the required certification to its SEA or files the certification in bad faith.

Overview of Governing Constitutional Principles

The relationship between religion and government in the United States is governed by the First Amendment to the Constitution, which both prevents the government from establishing religion and protects privately initiated religious expression and activities from government interference and discrimination. ^[1] The First Amendment thus establishes certain limits on the conduct of public school officials as it relates to religious activity, including prayer.

The legal rules that govern the issue of constitutionally protected prayer in the public schools are similar to those that govern religious expression generally. Thus, in discussing the operation of Section 9524 of the ESEA, this guidance sometimes speaks in terms of "religious expression." There are a variety of issues relating to religion in the public schools, however, that this guidance is not intended to address.

The Supreme Court has repeatedly held that the First Amendment requires public school officials to be neutral in their treatment of religion, showing neither favoritism toward nor hostility against religious expression such as prayer. ^[2] Accordingly, the First Amendment forbids religious activity that is sponsored by the government but protects religious activity that is

initiated by private individuals, and the line between government-sponsored and privately initiated religious expression is vital to a proper understanding of the First Amendment's scope. As the Court has explained in several cases, "there is a crucial difference between **government** speech endorsing religion, which the Establishment Clause forbids, and **private** speech endorsing religion, which the Free Speech and Free Exercise Clauses protect."^[3]

The Supreme Court's decisions over the past forty years set forth principles that distinguish impermissible governmental religious speech from the constitutionally protected private religious speech of students. For example, teachers and other public school officials may not lead their classes in prayer, devotional readings from the Bible, or other religious activities.^[4] Nor may school officials attempt to persuade or compel students to participate in prayer or other religious activities.^[5] Such conduct is "attributable to the State" and thus violates the Establishment Clause.^[6]

Similarly, public school officials may not themselves decide that prayer should be included in school-sponsored events. In *Lee v. Weisman*^[7], for example, the Supreme Court held that public school officials violated the Constitution in inviting a member of the clergy to deliver a prayer at a graduation ceremony. Nor may school officials grant religious speakers preferential access to public audiences, or otherwise select public speakers on a basis that favors religious speech. In *Santa Fe Independent School District v. Doe*^[8], for example, the Court invalidated a school's football game speaker policy on the ground that it was designed by school officials to result in pregame prayer, thus favoring religious expression over secular expression.

Although the Constitution forbids public school officials from directing or favoring prayer, students do not "shed their constitutional rights to freedom of speech or expression at the schoolhouse gate,"^[9] and the Supreme Court has made clear that "private religious speech, far from being a First Amendment orphan, is as fully protected under the Free Speech Clause as secular private expression."^[10] Moreover, not all religious speech that takes place in the public schools or at school-sponsored events is governmental speech.^[11] For example, "nothing in the Constitution ... prohibits any public school student from voluntarily praying at any time before, during, or after the school day,"^[12] and students may pray with fellow students during the school day on the same terms and conditions that they may engage in other conversation or speech. Likewise, local school authorities possess substantial discretion to impose rules of order and pedagogical restrictions on student activities,^[13] but they may not structure or administer such rules to discriminate against student prayer or religious speech. For instance, where schools permit student expression on the basis of genuinely neutral criteria and students retain primary control over the content of their expression, the speech of students who choose to express themselves through religious means such as prayer is not attributable to the state and therefore may not be restricted because of its religious content.^[14] Student remarks are not attributable to the state simply because they are delivered in a public setting or to a public audience.^[15] As the Supreme Court has explained: "The proposition that schools do not endorse everything they fail to censor is not complicated,"^[16] and the Constitution mandates neutrality rather than hostility toward privately initiated religious expression.^[17]

Applying the Governing Principles in Particular Contexts

Prayer During Noninstructional Time

Students may pray when not engaged in school activities or instruction, subject to the same rules designed to prevent material disruption of the educational program that are applied to other privately initiated expressive activities. Among other things, students may read their Bibles or other scriptures, say grace before meals, and pray or study religious materials with fellow students during recess, the lunch hour, or other noninstructional time to the same extent that they may engage in nonreligious activities. While school authorities may impose rules of order and pedagogical restrictions on student activities, they may not discriminate against student prayer or religious speech in applying such rules and restrictions.

Organized Prayer Groups and Activities

Students may organize prayer groups, religious clubs, and "see you at the pole" gatherings before school to the same extent that students are permitted to organize other non-curricular student activities groups. Such groups must be given the same access to school facilities for assembling as is given to other non-curricular groups, without discrimination because of the religious content of their expression. School authorities possess substantial discretion concerning whether to permit the use of school media for student advertising or announcements regarding non-curricular activities. However, where student groups that meet for nonreligious activities are permitted to advertise or announce their meetings—for example, by advertising in a student newspaper, making announcements on a student activities bulletin board or public address system, or handing out leaflets—school authorities may not discriminate against groups who meet to pray. School authorities may disclaim sponsorship of non-curricular groups and events, provided they administer such disclaimers in a manner that neither favors nor disfavors groups that meet to engage in prayer or religious speech.

Teachers, Administrators, and other School Employees

When acting in their official capacities as representatives of the state, teachers, school administrators, and other school employees are prohibited by the Establishment Clause from encouraging or discouraging prayer, and from actively participating in such activity with students. Teachers may, however, take part in religious activities where the overall context makes clear that they are not participating in their official capacities. Before school or during lunch, for example, teachers may meet with other teachers for prayer or Bible study to the same extent that they may engage in other conversation or nonreligious activities. Similarly, teachers may participate in their personal capacities in privately sponsored baccalaureate ceremonies.

Moments of Silence

If a school has a "minute of silence" or other quiet periods during the school day, students are free to pray silently, or not to pray, during these periods of time. Teachers and other school

employees may neither encourage nor discourage students from praying during such time periods.

Accommodation of Prayer During Instructional Time

It has long been established that schools have the discretion to dismiss students to off-premises religious instruction, provided that schools do not encourage or discourage participation in such instruction or penalize students for attending or not attending. Similarly, schools may excuse students from class to remove a significant burden on their religious exercise, where doing so would not impose material burdens on other students. For example, it would be lawful for schools to excuse Muslim students briefly from class to enable them to fulfill their religious obligations to pray during Ramadan.

Where school officials have a practice of excusing students from class on the basis of parents' requests for accommodation of nonreligious needs, religiously motivated requests for excusal may not be accorded less favorable treatment. In addition, in some circumstances, based on federal or state constitutional law or pursuant to state statutes, schools may be required to make accommodations that relieve substantial burdens on students' religious exercise. Schools officials are therefore encouraged to consult with their attorneys regarding such obligations.

Religious Expression and Prayer in Class Assignments

Students may express their beliefs about religion in homework, artwork, and other written and oral assignments free from discrimination based on the religious content of their submissions. Such home and classroom work should be judged by ordinary academic standards of substance and relevance and against other legitimate pedagogical concerns identified by the school. Thus, if a teacher's assignment involves writing a poem, the work of a student who submits a poem in the form of a prayer (for example, a psalm) should be judged on the basis of academic standards (such as literary quality) and neither penalized nor rewarded on account of its religious content.

Student Assemblies and Extracurricular Events

Student speakers at student assemblies and extracurricular activities such as sporting events may not be selected on a basis that either favors or disfavors religious speech. Where student speakers are selected on the basis of genuinely neutral, evenhanded criteria and retain primary control over the content of their expression, that expression is not attributable to the school and therefore may not be restricted because of its religious (or anti-religious) content. By contrast, where school officials determine or substantially control the content of what is expressed, such speech is attributable to the school and may not include prayer or other specifically religious (or anti-religious) content. To avoid any mistaken perception that a school endorses student speech that is not in fact attributable to the school, school officials may make appropriate, neutral disclaimers to clarify that such speech (whether religious or nonreligious) is the speaker's and not the school's.

Prayer at Graduation

School officials may not mandate or organize prayer at graduation or select speakers for such events in a manner that favors religious speech such as prayer. Where students or other private graduation speakers are selected on the basis of genuinely neutral, evenhanded criteria and retain primary control over the content of their expression, however, that expression is not attributable to the school and therefore may not be restricted because of its religious (or anti-religious) content. To avoid any mistaken perception that a school endorses student or other private speech that is not in fact attributable to the school, school officials may make appropriate, neutral disclaimers to clarify that such speech (whether religious or nonreligious) is the speaker's and not the school's.

Baccalaureate Ceremonies

School officials may not mandate or organize religious ceremonies. However, if a school makes its facilities and related services available to other private groups, it must make its facilities and services available on the same terms to organizers of privately sponsored religious baccalaureate ceremonies. In addition, a school may disclaim official endorsement of events sponsored by private groups, provided it does so in a manner that neither favors nor disfavors groups that meet to engage in prayer or religious speech.....

Notes:

[1] The relevant portions of the First Amendment provide: "Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof; or abridging the freedom of speech" U.S. Const. amend. I. The Supreme Court has held that the Fourteenth Amendment makes these provisions applicable to all levels of government—federal, state, and local—and to all types of governmental policies and activities. *See Everson v. Board of Educ.*, 330 U.S. 1 (1947); *Cantwell v. Connecticut*, 310 U.S. 296 (1940).

[2] *See, e.g., Everson*, 330 U.S. at 18 (the First Amendment "requires the state to be a neutral in its relations with groups of religious believers and non-believers; it does not require the state to be their adversary. State power is no more to be used so as to handicap religions than it is to favor them"); *Good News Club v. Milford Cent. Sch.*, 533 U.S. 98 (2001).

[3] *Santa Fe Indep. Sch. Dist. v. Doe*, 530 U.S. 290, 302 (2000) (quoting *Board of Educ. v. Mergens*, 496 U.S. 226, 250 (1990) (plurality opinion)); *accord Rosenberger v. Rector of Univ. of Virginia*, 515 U.S. 819, 841 (1995).

[4] *Engel v. Vitale*, 370 U.S. 421 (1962) (invalidating state laws directing the use of prayer in public schools); *School Dist. of Abington Twp. v. Schempp*, 374 U.S. 203 (1963) (invalidating state laws and policies requiring public schools to begin the school day with Bible readings and prayer); *Mergens*, 496 U.S. at 252 (plurality opinion) (explaining that "a school may not itself lead or direct a religious club"). The Supreme Court has also held, however, that the study of the Bible or of religion, when presented objectively as part of a secular program of education (e.g.,

in history or literature classes), is consistent with the First Amendment. *See Schempp*, 374 U.S. at 225.

[5] *See Lee v. Weisman*, 505 U.S. 577, 599 (1992); *see also Wallace v. Jaffree*, 472 U.S. 38 (1985).

[6] *See Weisman*, 505 U.S. at 587.

[7] 505 U.S. 577 (1992).

[8] 530 U.S. 290 (2000).

[9] *Tinker v. Des Moines Indep. Community Sch. Dist.*, 393 U.S. 503, 506 (1969).

[10] *Capitol Square Review & Advisory Bd. v. Pinette*, 515 U.S. 753, 760 (1995).

[11] *Santa Fe*, 530 U.S. at 302 (explaining that "not every message" that is "authorized by a government policy and take[s] place on government property at government-sponsored school-related events" is "the government's own").

[12] *Santa Fe*, 530 U.S. at 313.

[13] For example, the First Amendment permits public school officials to review student speeches for vulgarity, lewdness, or sexually explicit language. *Bethel Sch. Dist. v. Fraser*, 478 U.S. 675, 683-86 (1986). Without more, however, such review does not make student speech attributable to the state.

[14] *Rosenberger v. Rector of Univ. of Virginia*, 515 U.S. 819 (1995); *Board of Educ. v. Mergens*, 496 U.S. 226 (1990); *Good News Club v. Milford Cent. Sch.*, 533 U.S. 98 (2001); *Lamb's Chapel v. Center Moriches Union Free Sch. Dist.*, 508 U.S. 384 (1993); *Widmar v. Vincent*, 454 U.S. 263 (1981); *Santa Fe*, 530 U.S. at 304 n.15. In addition, in circumstances where students are entitled to pray, public schools may not restrict or censor their prayers on the ground that they might be deemed "too religious" to others. The Establishment Clause prohibits state officials from making judgments about what constitutes an appropriate prayer, and from favoring or disfavoring certain types of prayers—be they "nonsectarian" and "nonproselytizing" or the opposite—over others. *See Engel v. Vitale*, 370 U.S. 421, 429-30 (1962) (explaining that "one of the greatest dangers to the freedom of the individual to worship in his own way lay in the Government's placing its official stamp of approval upon one particular kind of prayer or one particular form of religious services," that "neither the power nor the prestige" of state officials may "be used to control, support or influence the kinds of prayer the American people can say," and that the state is "without power to prescribe by law any particular form of prayer"); *Weisman*, 505 U.S. at 594.

[15] *Santa Fe*, 530 U.S. at 302; *Mergens*, 496 U.S. at 248-50.

[16] *Mergens*, 496 U.S. at 250 (plurality opinion); *id.* at 260-61 (Kennedy, J., concurring in part and in judgment).

[17] *Rosenberger*, 515 U.S. at 845-46; *Mergens*, 496 U.S. at 248 (plurality opinion); *id.* at 260-61 (Kennedy, J., concurring in part and in judgment).

APPENDIX TWO

(Source: http://ipcc-wg1.ucar.edu/wg1/docs/WG1AR4_SPM_Approved_05Feb.pdf)

INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

Climate Change 2007: The Physical Science Basis

Summary for Policymakers

February 2007



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Summary for Policymakers

Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change

This Summary for Policymakers was formally approved at the 10th Session of Working Group I of the IPCC, Paris, February 2007.

Note:

Text, tables and figures given here are final but subject to copy-editing.

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INTRODUCTION

The Working Group I contribution to the IPCC Fourth Assessment Report describes progress in understanding of the human and natural drivers of climate change¹, observed climate change, climate processes and attribution, and estimates of projected future climate change. It builds upon past IPCC assessments and incorporates new findings from the past six years of research. Scientific progress since the TAR is based upon large amounts of new and more comprehensive data, more sophisticated analyses of data, improvements in understanding of processes and their simulation in models, and more extensive exploration of uncertainty ranges.

The basis for substantive paragraphs in this Summary for Policymakers can be found in the chapter sections specified in curly brackets.

HUMAN AND NATURAL DRIVERS OF CLIMATE CHANGE

Changes in the atmospheric abundance of greenhouse gases and aerosols, in solar radiation and in land surface properties alter the energy balance of the climate system. These changes are expressed in terms of radiative forcing², which is used to compare how a range of human and natural factors drive warming or cooling influences on global climate. Since the Third Assessment Report (TAR), new observations and related modelling of greenhouse gases, solar activity, land surface properties and some aspects of aerosols have led to improvements in the quantitative estimates of radiative forcing.

Global atmospheric concentrations of carbon dioxide, methane and nitrous oxide have increased markedly as a result of human activities since 1750 and now far exceed pre-industrial values determined from ice cores spanning many thousands of years (see Figure SPM-1). The global increases in carbon dioxide concentration are due primarily to fossil fuel use and land-use change, while those of methane and nitrous oxide are primarily due to agriculture. {2.3, 6.4, 7.3}

- Carbon dioxide is the most important anthropogenic greenhouse gas (see Figure SPM-2). The global atmospheric concentration of carbon dioxide has increased from a pre-industrial value of about 280 ppm to 379 ppm³ in 2005. The atmospheric concentration of carbon dioxide in 2005 exceeds by far the natural range over the last 650,000 years (180 to 300 ppm) as determined from ice cores. The annual carbon dioxide concentration growth-rate was larger during the last 10 years (1995 – 2005 average: 1.9 ppm per year), than it has been since the beginning of continuous direct atmospheric measurements (1960 – 2005 average: 1.4 ppm per year) although there is year-to-year variability in growth rates. {2.3, 7.3}
- The primary source of the increased atmospheric concentration of carbon dioxide since the pre-industrial period results from fossil fuel use, with land use change providing another significant but smaller contribution. Annual fossil carbon dioxide emissions⁴ increased from an average of 6.4 [6.0 to 6.8]⁵ GtC

¹ *Climate change* in IPCC usage refers to any change in climate over time, whether due to natural variability or as a result of human activity. This usage differs from that in the Framework Convention on Climate Change, where climate change refers to a change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable time periods.

² *Radiative forcing* is a measure of the influence that a factor has in altering the balance of incoming and outgoing energy in the Earth-atmosphere system and is an index of the importance of the factor as a potential climate change mechanism. Positive forcing tends to warm the surface while negative forcing tends to cool it. In this report radiative forcing values are for 2005 relative to pre-industrial conditions defined at 1750 and are expressed in watts per square metre ($W m^{-2}$). See Glossary and Section 2.2 for further details.

³ ppm (parts per million) or ppb (parts per billion, 1 billion = 1,000 million) is the ratio of the number of greenhouse gas molecules to the total number of molecules of dry air. For example: 300 ppm means 300 molecules of a greenhouse gas per million molecules of dry air.

⁴ Fossil carbon dioxide emissions include those from the production, distribution and consumption of fossil fuels and as a by-product from cement production. An emission of 1 GtC corresponds to 3.67 GtCO₂.

⁵ In general, uncertainty ranges for results given in this Summary for Policymakers are 90% uncertainty intervals unless stated otherwise, i.e., there is an estimated 5% likelihood that the value could be above the range given in square brackets and 5% likelihood that the value could be below that range. Best estimates are given where available. Assessed uncertainty intervals are not always symmetric about the corresponding best estimate. Note that a number of uncertainty ranges in the Working Group I TAR corresponded to 2-sigma (95%), often using expert judgement.

(23.5 [22.0 to 25.0] GtCO₂) per year in the 1990s, to 7.2 [6.9 to 7.5] GtC (26.4 [25.3 to 27.5] GtCO₂) per year in 2000–2005 (2004 and 2005 data are interim estimates). Carbon dioxide emissions associated with land-use change are estimated to be 1.6 [0.5 to 2.7] GtC (5.9 [1.8 to 9.9] GtCO₂) per year over the 1990s, although these estimates have a large uncertainty. {7.3}

Changes in Greenhouse Gases from ice-Core and Modern Data

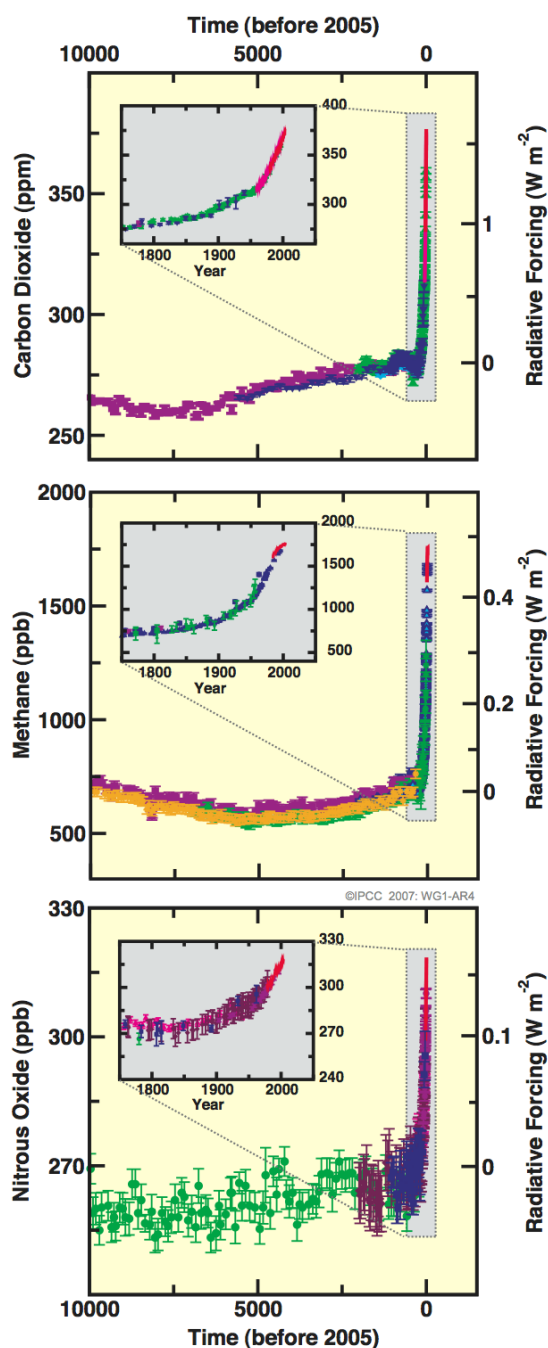


FIGURE SPM-1. Atmospheric concentrations of carbon dioxide, methane and nitrous oxide over the last 10,000 years (large panels) and since 1750 (inset panels). Measurements are shown from ice cores (symbols with different colours for different studies) and atmospheric samples (red lines). The corresponding radiative forcings are shown on the right hand axes of the large panels. {Figure 6.4}

- The global atmospheric concentration of methane has increased from a pre-industrial value of about 715 ppb to 1732 ppb in the early 1990s, and is 1774 ppb in 2005. The atmospheric concentration of methane in 2005 exceeds by far the natural range of the last 650,000 years (320 to 790 ppb) as determined from ice cores. Growth rates have declined since the early 1990s, consistent with total emissions (sum of anthropogenic and natural sources) being nearly constant during this period. It is *very likely*⁶ that the observed increase in methane concentration is due to anthropogenic activities, predominantly agriculture and fossil fuel use, but relative contributions from different source types are not well determined. {2.3, 7.4}
- The global atmospheric nitrous oxide concentration increased from a pre-industrial value of about 270 ppb to 319 ppb in 2005. The growth rate has been approximately constant since 1980. More than a third of all nitrous oxide emissions are anthropogenic and are primarily due to agriculture. {2.3, 7.4}

Radiative Forcing Components

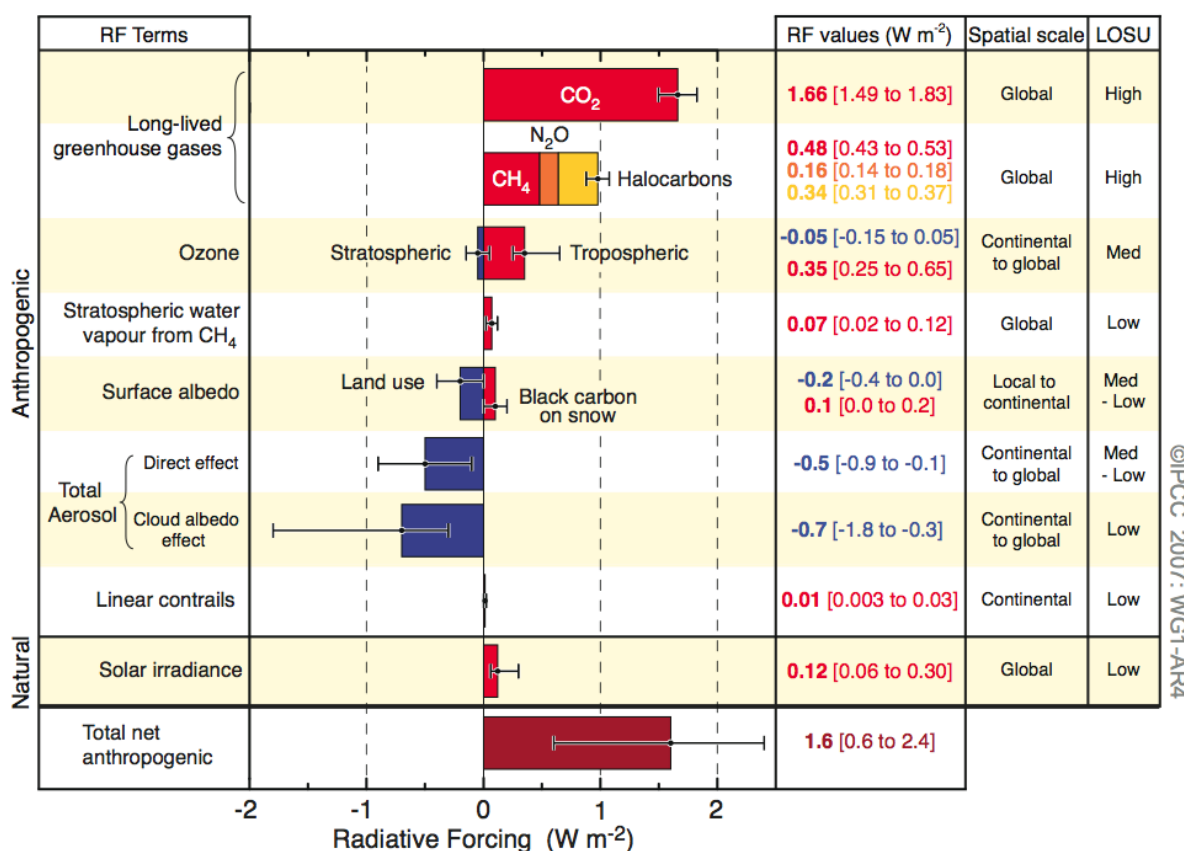


FIGURE SPM-2. Global-average radiative forcing (RF) estimates and ranges in 2005 for anthropogenic carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O) and other important agents and mechanisms, together with the typical geographical extent (spatial scale) of the forcing and the assessed level of scientific understanding (LOSU). The net anthropogenic radiative forcing and its range are also shown. These require summing asymmetric uncertainty estimates from the component terms, and cannot be obtained by simple addition. Additional forcing factors not included here are considered to have a very low LOSU. Volcanic aerosols contribute an additional natural forcing but are not included in this figure due to their episodic nature. Range for linear contrails does not include other possible effects of aviation on cloudiness. {2.9, Figure 2.20}

⁶ In this Summary for Policymakers, the following terms have been used to indicate the assessed likelihood, using expert judgement, of an outcome or a result: *Virtually certain* > 99% probability of occurrence, *Extremely likely* > 95%, *Very likely* > 90%, *Likely* > 66%, *More likely than not* > 50%, *Unlikely* < 33%, *Very unlikely* < 10%, *Extremely unlikely* < 5%. (See Box TS.1.1 for more details).

The understanding of anthropogenic warming and cooling influences on climate has improved since the Third Assessment Report (TAR), leading to *very high confidence*⁷ that the globally averaged net effect of human activities since 1750 has been one of warming, with a radiative forcing of +1.6 [+0.6 to +2.4] W m⁻². (see Figure SPM-2). {2.3, 6.5, 2.9}

- The combined radiative forcing due to increases in carbon dioxide, methane, and nitrous oxide is +2.30 [+2.07 to +2.53] W m⁻², and its rate of increase during the industrial era is *very likely* to have been unprecedented in more than 10,000 years (see Figures SPM-1 and SPM-2). The carbon dioxide radiative forcing increased by 20% from 1995 to 2005, the largest change for any decade in at least the last 200 years. {2.3, 6.4}
- Anthropogenic contributions to aerosols (primarily sulphate, organic carbon, black carbon, nitrate and dust) together produce a cooling effect, with a total direct radiative forcing of -0.5 [-0.9 to -0.1] W m⁻² and an indirect cloud albedo forcing of -0.7 [-1.8 to -0.3] W m⁻². These forcings are now better understood than at the time of the TAR due to improved *in situ*, satellite and ground-based measurements and more comprehensive modelling, but remain the dominant uncertainty in radiative forcing. Aerosols also influence cloud lifetime and precipitation. {2.4, 2.9, 7.5}
- Significant anthropogenic contributions to radiative forcing come from several other sources. Tropospheric ozone changes due to emissions of ozone-forming chemicals (nitrogen oxides, carbon monoxide, and hydrocarbons) contribute +0.35 [+0.25 to +0.65] W m⁻². The direct radiative forcing due to changes in halocarbons⁸ is +0.34 [+0.31 to +0.37] W m⁻². Changes in surface albedo, due to land-cover changes and deposition of black carbon aerosols on snow, exert respective forcings of -0.2 [-0.4 to 0.0] and +0.1 [0.0 to +0.2] W m⁻². Additional terms smaller than ±0.1 W m⁻² are shown in Figure SPM-2. {2.3, 2.5, 7.2}
- Changes in solar irradiance since 1750 are estimated to cause a radiative forcing of +0.12 [+0.06 to +0.30] W m⁻², which is less than half the estimate given in the TAR. {2.7}

DIRECT OBSERVATIONS OF RECENT CLIMATE CHANGE

Since the TAR, progress in understanding how climate is changing in space and in time has been gained through improvements and extensions of numerous datasets and data analyses, broader geographical coverage, better understanding of uncertainties, and a wider variety of measurements. Increasingly comprehensive observations are available for glaciers and snow cover since the 1960s, and for sea level and ice sheets since about the past decade. However, data coverage remains limited in some regions.

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 (see Figure SPM-3). {3.2, 4.2, 5.5}

- Eleven of the last twelve years (1995 -2006) rank among the 12 warmest years in the instrumental record of global surface temperature⁹ (since 1850). The updated 100-year linear trend (1906–2005) of 0.74 [0.56 to 0.92]°C is therefore larger than the corresponding trend for 1901-2000 given in the TAR of 0.6 [0.4 to 0.8]°C. The linear warming trend over the last 50 years (0.13 [0.10 to 0.16]°C per decade) is nearly twice that for the last 100 years. The total temperature increase from 1850 – 1899 to 2001 – 2005 is 0.76 [0.57 to 0.95]°C. Urban heat island effects are real but local, and have a negligible influence (less than 0.006°C per decade over land and zero over the oceans) on these values. {3.2}

⁷ In this Summary for Policymakers the following levels of confidence have been used to express expert judgments on the correctness of the underlying science: *very high confidence* at least a 9 out of 10 chance of being correct; *high confidence* about an 8 out of 10 chance of being correct. (See Box TS.1.1)

⁸ Halocarbon radiative forcing has been recently assessed in detail in IPCC's Special Report on Safeguarding the Ozone Layer and the Global Climate System (2005).

⁹ The average of near surface air temperature over land, and sea surface temperature.

Changes in Temperature, Sea Level and Northern Hemisphere Snow Cover

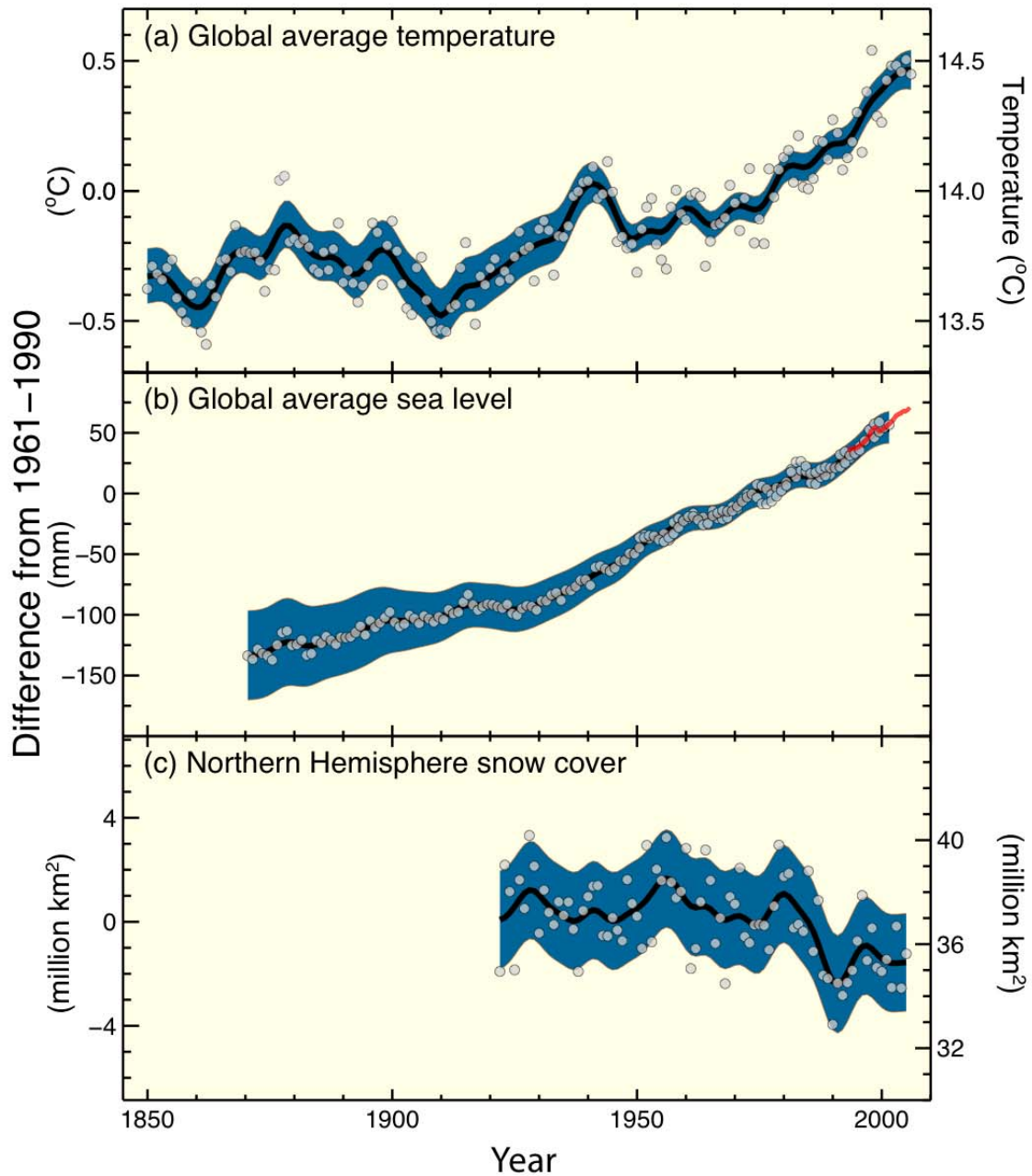


FIGURE SPM-3. Observed changes in (a) global average surface temperature; (b) global average sea level rise from tide gauge (blue) and satellite (red) data and (c) Northern Hemisphere snow cover for March–April. All changes are relative to corresponding averages for the period 1961–1990. Smoothed curves represent decadal averaged values while circles show yearly values. The shaded areas are the uncertainty intervals estimated from a comprehensive analysis of known uncertainties (a and b) and from the time series (c). {FAQ 3.1, Figure 1, Figure 4.2 and Figure 5.13}

- New analyses of balloon-borne and satellite measurements of lower- and mid-tropospheric temperature show warming rates that are similar to those of the surface temperature record and are consistent within their respective uncertainties, largely reconciling a discrepancy noted in the TAR. {3.2, 3.4}

- The average atmospheric water vapour content has increased since at least the 1980s over land and ocean as well as in the upper troposphere. The increase is broadly consistent with the extra water vapour that warmer air can hold. {3.4}
- Observations since 1961 show that the average temperature of the global ocean has increased to depths of at least 3000 m and that the ocean has been absorbing more than 80% of the heat added to the climate system. Such warming causes seawater to expand, contributing to sea level rise (see Table SPM-1). {5.2, 5.5}

Table SPM-1. Observed rate of sea level rise and estimated contributions from different sources. {5.5, Table 5.3}

Source of sea level rise	Rate of sea level rise (mm per year)	
	1961 – 2003	1993 – 2003
Thermal expansion	0.42 ± 0.12	1.6 ± 0.5
Glaciers and ice caps	0.50 ± 0.18	0.77 ± 0.22
Greenland ice sheet	0.05 ± 0.12	0.21 ± 0.07
Antarctic ice sheet	0.14 ± 0.41	0.21 ± 0.35
Sum of individual climate contributions to sea level rise	1.1 ± 0.5	2.8 ± 0.7
Observed total sea level rise	1.8 ± 0.5 ^a	3.1 ± 0.7 ^a
Difference (Observed minus sum of estimated climate contributions)	0.7 ± 0.7	0.3 ± 1.0

Table note:

^a Data prior to 1993 are from tide gauges and after 1993 are from satellite altimetry.

- Mountain glaciers and snow cover have declined on average in both hemispheres. Widespread decreases in glaciers and ice caps have contributed to sea level rise (ice caps do not include contributions from the Greenland and Antarctic ice sheets). (See Table SPM-1.) {4.6, 4.7, 4.8, 5.5}
- New data since the TAR now show that losses from the ice sheets of Greenland and Antarctica have *very likely* contributed to sea level rise over 1993 to 2003 (see Table SPM-1). Flow speed has increased for some Greenland and Antarctic outlet glaciers, which drain ice from the interior of the ice sheets. The corresponding increased ice sheet mass loss has often followed thinning, reduction or loss of ice shelves or loss of floating glacier tongues. Such dynamical ice loss is sufficient to explain most of the Antarctic net mass loss and approximately half of the Greenland net mass loss. The remainder of the ice loss from Greenland has occurred because losses due to melting have exceeded accumulation due to snowfall. {4.6, 4.8, 5.5}
- Global average sea level rose at an average rate of 1.8 [1.3 to 2.3] mm per year over 1961 to 2003. The rate was faster over 1993 to 2003, about 3.1 [2.4 to 3.8] mm per year. Whether the faster rate for 1993 to 2003 reflects decadal variability or an increase in the longer-term trend is unclear. There is *high confidence* that the rate of observed sea level rise increased from the 19th to the 20th century. The total 20th century rise is estimated to be 0.17 [0.12 to 0.22] m. {5.5}
- For 1993-2003, the sum of the climate contributions is consistent within uncertainties with the total sea level rise that is directly observed (see Table SPM-1). These estimates are based on improved satellite and *in-situ* data now available. For the period of 1961 to 2003, the sum of climate contributions is estimated to be smaller than the observed sea level rise. The TAR reported a similar discrepancy for 1910 to 1990. {5.5}

At continental, regional, and ocean basin scales, numerous long-term changes in climate have been observed. These include changes in Arctic temperatures and ice, widespread changes in precipitation amounts, ocean salinity, wind patterns and aspects of extreme weather including droughts, heavy precipitation, heat waves and the intensity of tropical cyclones¹⁰. {3.2, 3.3, 3.4, 3.5, 3.6, 5.2}

- Average Arctic temperatures increased at almost twice the global average rate in the past 100 years. Arctic temperatures have high decadal variability, and a warm period was also observed from 1925 to 1945. {3.2}
- Satellite data since 1978 show that annual average Arctic sea ice extent has shrunk by 2.7 [2.1 to 3.3]% per decade, with larger decreases in summer of 7.4 [5.0 to 9.8]% per decade. These values are consistent with those reported in the TAR. {4.4}
- Temperatures at the top of the permafrost layer have generally increased since the 1980s in the Arctic (by up to 3°C). The maximum area covered by seasonally frozen ground has decreased by about 7% in the Northern Hemisphere since 1900, with a decrease in spring of up to 15%. {4.7}
- Long-term trends from 1900 to 2005 have been observed in precipitation amount over many large regions¹¹. Significantly increased precipitation has been observed in eastern parts of North and South America, northern Europe and northern and central Asia. Drying has been observed in the Sahel, the Mediterranean, southern Africa and parts of southern Asia. Precipitation is highly variable spatially and temporally, and data are limited in some regions. Long-term trends have not been observed for the other large regions assessed¹¹. {3.3, 3.9}
- Changes in precipitation and evaporation over the oceans are suggested by freshening of mid and high latitude waters together with increased salinity in low latitude waters. {5.2}
- Mid-latitude westerly winds have strengthened in both hemispheres since the 1960s. {3.5}
- More intense and longer droughts have been observed over wider areas since the 1970s, particularly in the tropics and subtropics. Increased drying linked with higher temperatures and decreased precipitation have contributed to changes in drought. Changes in sea surface temperatures (SST), wind patterns, and decreased snowpack and snow cover have also been linked to droughts. {3.3}
- The frequency of heavy precipitation events has increased over most land areas, consistent with warming and observed increases of atmospheric water vapour. {3.8, 3.9}
- Widespread changes in extreme temperatures have been observed over the last 50 years. Cold days, cold nights and frost have become less frequent, while hot days, hot nights, and heat waves have become more frequent (see Table SPM-2). {3.8}
- There is observational evidence for an increase of intense tropical cyclone activity in the North Atlantic since about 1970, correlated with increases of tropical sea surface temperatures. There are also suggestions of increased intense tropical cyclone activity in some other regions where concerns over data quality are greater. Multi-decadal variability and the quality of the tropical cyclone records prior to routine satellite observations in about 1970 complicate the detection of long-term trends in tropical cyclone activity. There is no clear trend in the annual numbers of tropical cyclones. {3.8}

¹⁰ Tropical cyclones include hurricanes and typhoons.

¹¹ The assessed regions are those considered in the regional projections Chapter of the TAR and in Chapter 11 of this Report.

Table SPM-2. Recent trends, assessment of human influence on the trend, and projections for extreme weather events for which there is an observed late 20th century trend. {Tables 3.7, 3.8, 9.4, Sections 3.8, 5.5, 9.7, 11.2-11.9}

Phenomenon ^a and direction of trend	Likelihood that trend occurred in late 20th century (typically post 1960)	Likelihood of a human contribution to observed trend ^b	Likelihood of future trends based on projections for 21st century using SRES scenarios
Warmer and fewer cold days and nights over most land areas	<i>Very likely</i> ^c	<i>Likely</i> ^d	<i>Virtually certain</i> ^d
Warmer and more frequent hot days and nights over most land areas	<i>Very likely</i> ^e	<i>Likely (nights)</i> ^d	<i>Virtually certain</i> ^d
Warm spells / heat waves. Frequency increases over most land areas	<i>Likely</i>	<i>More likely than not</i> ^f	<i>Very likely</i>
Heavy precipitation events. Frequency (or proportion of total rainfall from heavy falls) increases over most areas	<i>Likely</i>	<i>More likely than not</i> ^f	<i>Very likely</i>
Area affected by droughts increases	<i>Likely</i> in many regions since 1970s	<i>More likely than not</i>	<i>Likely</i>
Intense tropical cyclone activity increases	<i>Likely</i> in some regions since 1970	<i>More likely than not</i> ^f	<i>Likely</i>
Increased incidence of extreme high sea level (excludes tsunamis) ^g	<i>Likely</i>	<i>More likely than not</i> ^{f, h}	<i>Likely</i> ⁱ

Table notes:

^a See Table 3.7 for further details regarding definitions.

^b See Table TS-4, Box TS.3.4 and Table 9.4.

^c Decreased frequency of cold days and nights (coldest 10%).

^d Warming of the most extreme days and nights each year.

^e Increased frequency of hot days and nights (hottest 10%).

^f Magnitude of anthropogenic contributions not assessed. Attribution for these phenomena based on expert judgement rather than formal attribution studies.

^g Extreme high sea level depends on average sea level and on regional weather systems. It is defined here as the highest 1% of hourly values of observed sea level at a station for a given reference period.

^h Changes in observed extreme high sea level closely follow the changes in average sea level {5.5.2.6}. It is *very likely* that anthropogenic activity contributed to a rise in average sea level. {9.5.2}

ⁱ In all scenarios, the projected global average sea level at 2100 is higher than in the reference period {10.6}. The effect of changes in regional weather systems on sea level extremes has not been assessed.

Some aspects of climate have not been observed to change. {3.2, 3.8, 4.4, 5.3}

- A decrease in diurnal temperature range (DTR) was reported in the TAR, but the data available then extended only from 1950 to 1993. Updated observations reveal that DTR has not changed from 1979 to 2004 as both day- and night-time temperature have risen at about the same rate. The trends are highly variable from one region to another. {3.2}
- Antarctic sea ice extent continues to show inter-annual variability and localized changes but no statistically significant average trends, consistent with the lack of warming reflected in atmospheric temperatures averaged across the region. {3.2, 4.4}

- There is insufficient evidence to determine whether trends exist in the meridional overturning circulation of the global ocean or in small scale phenomena such as tornadoes, hail, lightning and dust-storms. {3.8, 5.3}

A PALEOCLIMATIC PERSPECTIVE

Paleoclimatic studies use changes in climatically sensitive indicators to infer past changes in global climate on time scales ranging from decades to millions of years. Such proxy data (e.g., tree ring width) may be influenced by both local temperature and other factors such as precipitation, and are often representative of particular seasons rather than full years. Studies since the TAR draw increased confidence from additional data showing coherent behaviour across multiple indicators in different parts of the world. However, uncertainties generally increase with time into the past due to increasingly limited spatial coverage.

Paleoclimate information supports the interpretation that the warmth of the last half century is unusual in at least the previous 1300 years. The last time the polar regions were significantly warmer than present for an extended period (about 125,000 years ago), reductions in polar ice volume led to 4 to 6 metres of sea level rise. {6.4, 6.6}

- 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. Some recent studies indicate greater variability in Northern Hemisphere temperatures than suggested in the TAR, particularly finding that cooler periods existed in the 12 to 14th, 17th, and 19th centuries. Warmer periods prior to the 20th century are within the uncertainty range given in the TAR. {6.6}
- Global average sea level in the last interglacial period (about 125,000 years ago) was *likely* 4 to 6 m higher than during the 20th century, mainly due to the retreat of polar ice. Ice core data indicate that average polar temperatures at that time were 3 to 5°C higher than present, because of differences in the Earth's orbit. The Greenland ice sheet and other Arctic ice fields *likely* contributed no more than 4 m of the observed sea level rise. There may also have been a contribution from Antarctica. {6.4}

UNDERSTANDING AND ATTRIBUTING CLIMATE CHANGE

This Assessment considers longer and improved records, an expanded range of observations, and improvements in the simulation of many aspects of climate and its variability based on studies since the TAR. It also considers the results of new attribution studies that have evaluated whether observed changes are quantitatively consistent with the expected response to external forcings and inconsistent with alternative physically plausible explanations.

Most of the observed increase in globally averaged temperatures since the mid-20th century is *very likely* due to the observed increase in anthropogenic greenhouse gas concentrations¹². This is an advance since the TAR's conclusion that "most of the observed warming over the last 50 years is *likely* to have been due to the increase in greenhouse gas concentrations". Discernible human influences now extend to other aspects of climate, including ocean warming, continental-average temperatures, temperature extremes and wind patterns (see Figure SPM-4 and Table SPM-2). {9.4, 9.5}

- It is *likely* that increases in greenhouse gas concentrations alone would have caused more warming than observed because volcanic and anthropogenic aerosols have offset some warming that would otherwise have taken place. {2.9, 7.5, 9.4}
- The observed widespread warming of the atmosphere and ocean, together with ice mass loss, support the conclusion that it is *extremely unlikely* that global climate change of the past fifty years can be explained without external forcing, and *very likely* that it is not due to known natural causes alone. {4.8, 5.2, 9.4, 9.5, 9.7}

¹² Consideration of remaining uncertainty is based on current methodologies.

- Warming of the climate system has been detected in changes of surface and atmospheric temperatures, temperatures in the upper several hundred metres of the ocean and in contributions to sea level rise. Attribution studies have established anthropogenic contributions to all of these changes. The observed pattern of tropospheric warming and stratospheric cooling is *very likely* due to the combined influences of greenhouse gas increases and stratospheric ozone depletion. {3.2, 3.4, 9.4, 9.5}
- It is *likely* that there has been significant anthropogenic warming over the past 50 years averaged over each continent except Antarctica (see Figure SPM-4). The observed patterns of warming, including greater warming over land than over the ocean, and their changes over time, are only simulated by models that include anthropogenic forcing. The ability of coupled climate models to simulate the observed temperature evolution on each of six continents provides stronger evidence of human influence on climate than was available in the TAR. {3.2, 9.4}

Global and Continental Temperature Change

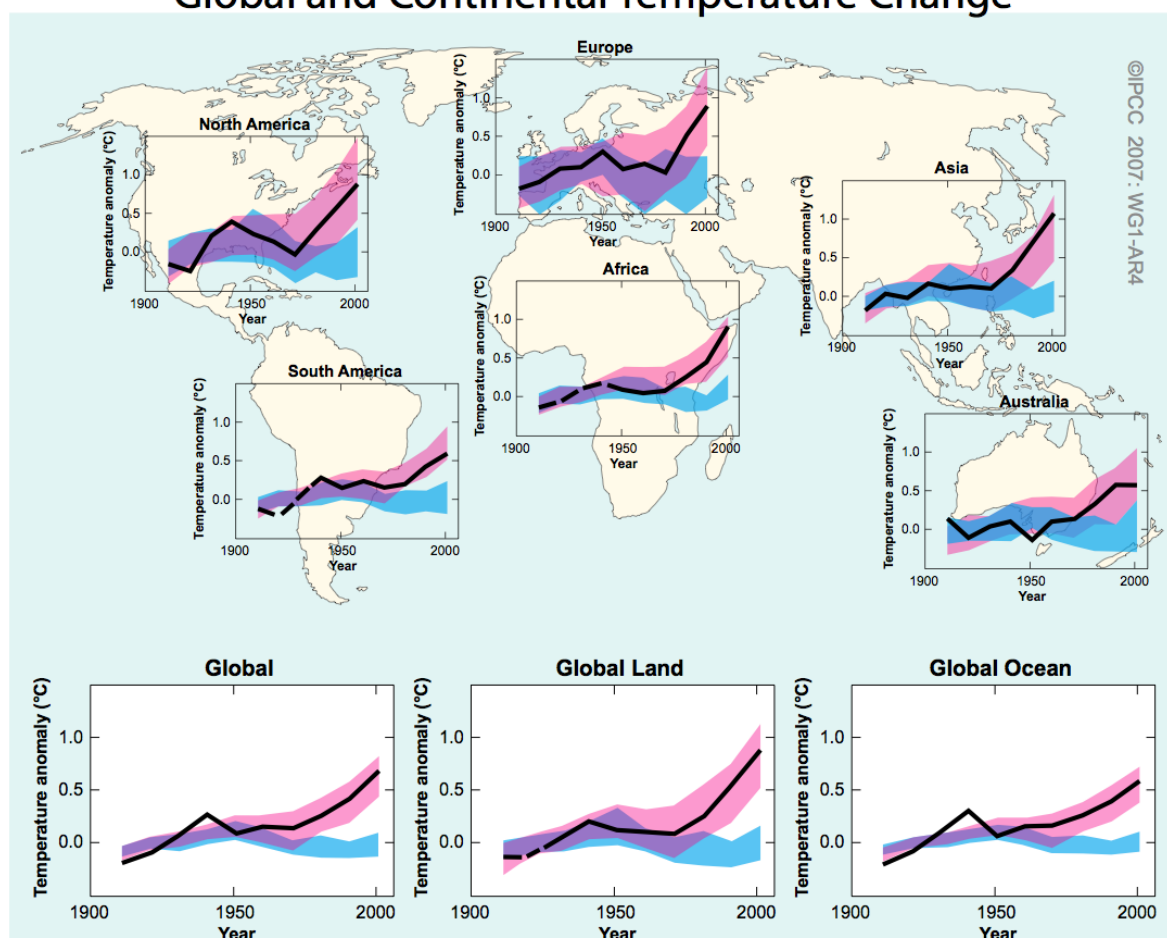


FIGURE SPM-4. Comparison of observed continental- and global-scale changes in surface temperature with results simulated by climate models using natural and anthropogenic forcings. Decadal averages of observations are shown for the period 1906–2005 (black line) plotted against the centre of the decade and relative to the corresponding average for 1901–1950. Lines are dashed where spatial coverage is less than 50%. Blue shaded bands show the 5–95% range for 19 simulations from 5 climate models using only the natural forcings due to solar activity and volcanoes. Red shaded bands show the 5–95% range for 58 simulations from 14 climate models using both natural and anthropogenic forcings. {FAQ 9.2, Figure 1}

- Difficulties remain in reliably simulating and attributing observed temperature changes at smaller scales. On these scales, natural climate variability is relatively larger making it harder to distinguish changes expected due to external forcings. Uncertainties in local forcings and feedbacks also make it difficult to estimate the contribution of greenhouse gas increases to observed small-scale temperature changes. {8.3, 9.4}
- Anthropogenic forcing is *likely* to have contributed to changes in wind patterns¹³, affecting extra-tropical storm tracks and temperature patterns in both hemispheres. However, the observed changes in the Northern Hemisphere circulation are larger than simulated in response to 20th century forcing change. {3.5, 3.6, 9.5, 10.3}
- Temperatures of the most extreme hot nights, cold nights and cold days are *likely* to have increased due to anthropogenic forcing. It is *more likely than not* that anthropogenic forcing has increased the risk of heat waves (see Table SPM-2). {9.4}

Analysis of climate models together with constraints from observations enables an assessed *likely* range to be given for climate sensitivity for the first time and provides increased confidence in the understanding of the climate system response to radiative forcing. {6.6, 8.6, 9.6, Box 10.2}

- The equilibrium climate sensitivity is a measure of the climate system response to sustained radiative forcing. It is not a projection but is defined as the global average surface warming following a doubling of carbon dioxide concentrations. It is *likely* to be in the range 2 to 4.5°C with a best estimate of about 3°C, and is *very unlikely* to be less than 1.5°C. Values substantially higher than 4.5°C cannot be excluded, but agreement of models with observations is not as good for those values. Water vapour changes represent the largest feedback affecting climate sensitivity and are now better understood than in the TAR. Cloud feedbacks remain the largest source of uncertainty. {8.6, 9.6, Box 10.2}
- It is *very unlikely* that climate changes of at least the seven centuries prior to 1950 were due to variability generated within the climate system alone. A significant fraction of the reconstructed Northern Hemisphere interdecadal temperature variability over those centuries is *very likely* attributable to volcanic eruptions and changes in solar irradiance, and it is *likely* that anthropogenic forcing contributed to the early 20th century warming evident in these records. {2.7, 2.8, 6.6, 9.3}

PROJECTIONS OF FUTURE CHANGES IN CLIMATE

A major advance of this assessment of climate change projections compared with the TAR is the large number of simulations available from a broader range of models. Taken together with additional information from observations, these provide a quantitative basis for estimating likelihoods for many aspects of future climate change. Model simulations cover a range of possible futures including idealised emission or concentration assumptions. These include SRES¹⁴ illustrative marker scenarios for the 2000–2100 period and model experiments with greenhouse gases and aerosol concentrations held constant after year 2000 or 2100.

For the next two decades a warming of about 0.2°C per decade is projected for a range of SRES emission scenarios. Even if the concentrations of all greenhouse gases and aerosols had been kept constant at year 2000 levels, a further warming of about 0.1°C per decade would be expected. {10.3, 10.7}

¹³ In particular, the Southern and Northern Annular Modes and related changes in the North Atlantic Oscillation. {3.6, 9.5, Box TS.3.1}

¹⁴ SRES refers to the IPCC Special Report on Emission Scenarios (2000). The SRES scenario families and illustrative cases, which did not include additional climate initiatives, are summarized in a box at the end of this Summary for Policymakers. Approximate CO₂ equivalent concentrations corresponding to the computed radiative forcing due to anthropogenic greenhouse gases and aerosols in 2100 (see p. 823 of the TAR) for the SRES B1, A1T, B2, A1B, A2 and A1FI illustrative marker scenarios are about 600, 700, 800, 850, 1250 and 1550 ppm respectively. Scenarios B1, A1B, and A2 have been the focus of model inter-comparison studies and many of those results are assessed in this report.

- Since IPCC's first report in 1990, assessed projections have suggested global averaged temperature increases between about 0.15 and 0.3°C per decade for 1990 to 2005. This can now be compared with observed values of about 0.2°C per decade, strengthening confidence in near-term projections. {1.2, 3.2}
- Model experiments show that even if all radiative forcing agents are held constant at year 2000 levels, a further warming trend would occur in the next two decades at a rate of about 0.1°C per decade, due mainly to the slow response of the oceans. About twice as much warming (0.2°C per decade) would be expected if emissions are within the range of the SRES scenarios. Best-estimate projections from models indicate that decadal-average warming over each inhabited continent by 2030 is insensitive to the choice among SRES scenarios and is *very likely* to be at least twice as large as the corresponding model-estimated natural variability during the 20th century. {9.4, 10.3, 10.5, 11.2–11.7, Figure TS-29}

Continued greenhouse gas emissions at or above current 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. {10.3}

- Advances in climate change modelling now enable best estimates and *likely* assessed uncertainty ranges to be given for projected warming for different emission scenarios. Results for different emission scenarios are provided explicitly in this report to avoid loss of this policy-relevant information. Projected globally-averaged surface warmings for the end of the 21st century (2090–2099) relative to 1980–1999 are shown in Table SPM-3. These illustrate the differences between lower to higher SRES emission scenarios and the projected warming uncertainty associated with these scenarios. {10.5}
- Best estimates and *likely* ranges for globally average surface air warming for six SRES emissions marker scenarios are given in this assessment and are shown in Table SPM-3. For example, the best estimate for the low scenario (B1) is 1.8°C (*likely* range is 1.1°C to 2.9°C), and the best estimate for the high scenario (A1FI) is 4.0°C (*likely* range is 2.4°C to 6.4°C). Although these projections are broadly consistent with the span quoted in the TAR (1.4 to 5.8°C), they are not directly comparable (see Figure SPM-5). The AR4 is more advanced as it provides best estimates and an assessed likelihood range for each of the marker scenarios. The new assessment of the *likely* ranges now relies on a larger number of climate models of increasing complexity and realism, as well as new information regarding the nature of feedbacks from the carbon cycle and constraints on climate response from observations. {10.5}

Table SPM-3. Projected globally averaged surface warming and sea level rise at the end of the 21st century. {10.5, 10.6, Table 10.7}

Case	Temperature Change (°C at 2090-2099 relative to 1980-1999) ^a		Sea Level Rise (m at 2090-2099 relative to 1980-1999)
	Best estimate	<i>Likely</i> range	Model-based range excluding future rapid dynamical changes in ice flow
Constant Year 2000 concentrations ^b	0.6	0.3 – 0.9	NA
B1 scenario	1.8	1.1 – 2.9	0.18 – 0.38
A1T scenario	2.4	1.4 – 3.8	0.20 – 0.45
B2 scenario	2.4	1.4 – 3.8	0.20 – 0.43
A1B scenario	2.8	1.7 – 4.4	0.21 – 0.48
A2 scenario	3.4	2.0 – 5.4	0.23 – 0.51
A1FI scenario	4.0	2.4 – 6.4	0.26 – 0.59

Table notes:

^a These estimates are assessed from a hierarchy of models that encompass a simple climate model, several Earth Models of Intermediate Complexity (EMICs), and a large number of Atmosphere-Ocean Global Circulation Models (AOGCMs).

^b Year 2000 constant composition is derived from AOGCMs only.

Multi-model Averages and Assessed Ranges for Surface Warming

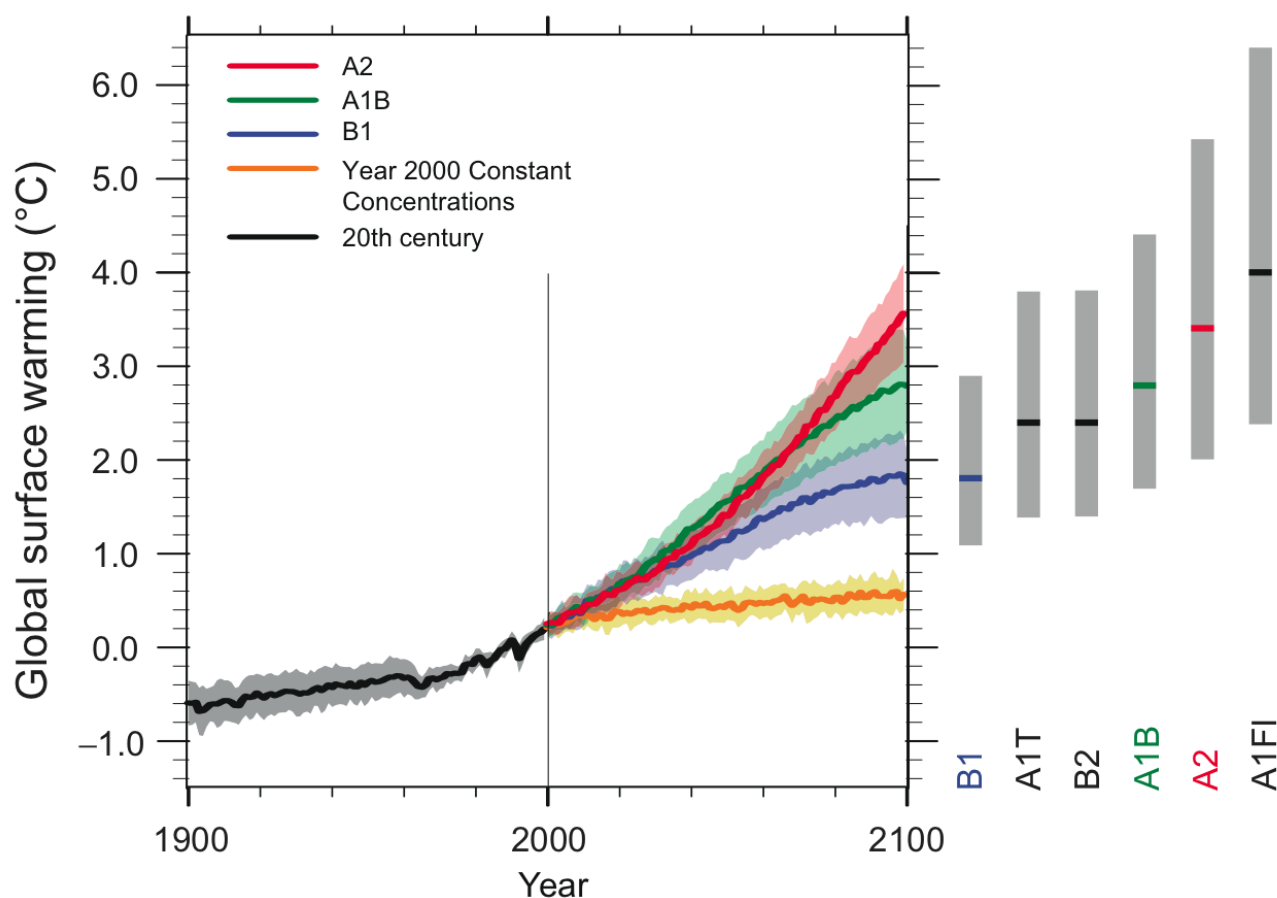


FIGURE SPM-5. Solid lines are multi-model global averages of surface warming (relative to 1980-99) for the scenarios A2, A1B and B1, shown as continuations of the 20th century simulations. Shading denotes the plus/minus one standard deviation range of individual model annual averages. The orange line is for the experiment where concentrations were held constant at year 2000 values. The gray bars at right indicate the best estimate (solid line within each bar) and the *likely* range assessed for the six SRES marker scenarios. The assessment of the best estimate and *likely* ranges in the gray bars includes the AOGCMs in the left part of the figure, as well as results from a hierarchy of independent models and observational constraints. {Figures 10.4 and 10.29}

- Warming tends to reduce land and ocean uptake of atmospheric carbon dioxide, increasing the fraction of anthropogenic emissions that remains in the atmosphere. For the A2 scenario, for example, the climate-carbon cycle feedback increases the corresponding global average warming at 2100 by more than 1°C. Assessed upper ranges for temperature projections are larger than in the TAR (see Table SPM-3) mainly because the broader range of models now available suggests stronger climate-carbon cycle feedbacks. {7.3, 10.5}
- Model-based projections of global average sea level rise at the end of the 21st century (2090-2099) are shown in Table SPM-3. For each scenario, the midpoint of the range in Table SPM-3 is within 10% of the TAR model average for 2090-2099. The ranges are narrower than in the TAR mainly because of improved information about some uncertainties in the projected contributions¹⁵. {10.6}
- Models used to date do not include uncertainties in climate-carbon cycle feedback nor do they include the full effects of changes in ice sheet flow, because a basis in published literature is lacking. The projections include a contribution due to increased ice flow from Greenland and Antarctica at the rates observed for 1993-2003, but these flow rates could increase or decrease in the future. For example, if this contribution were to grow

¹⁵ TAR projections were made for 2100, whereas projections in this Report are for 2090-2099. The TAR would have had similar ranges to those in Table SPM-2 if it had treated the uncertainties in the same way.

linearly with global average temperature change, the upper ranges of sea level rise for SRES scenarios shown in Table SPM-3 would increase by 0.1 m to 0.2 m. Larger values cannot be excluded, but understanding of these effects is too limited to assess their likelihood or provide a best estimate or an upper bound for sea level rise. {10.6}

- Increasing atmospheric carbon dioxide concentrations leads to increasing acidification of the ocean. Projections based on SRES scenarios give reductions in average global surface ocean pH¹⁶ of between 0.14 and 0.35 units over the 21st century, adding to the present decrease of 0.1 units since pre-industrial times. {5.4, Box 7.3, 10.4}

There is now higher confidence in projected patterns of warming and other regional-scale features, including changes in wind patterns, precipitation, and some aspects of extremes and of ice. {8.2, 8.3, 8.4, 8.5, 9.4, 9.5, 10.3, 11.1}

- Projected warming in the 21st century shows scenario-independent geographical patterns similar to those observed over the past several decades. Warming is expected to be greatest over land and at most high northern latitudes, and least over the Southern Ocean and parts of the North Atlantic ocean (see Figure SPM-6). {10.3}

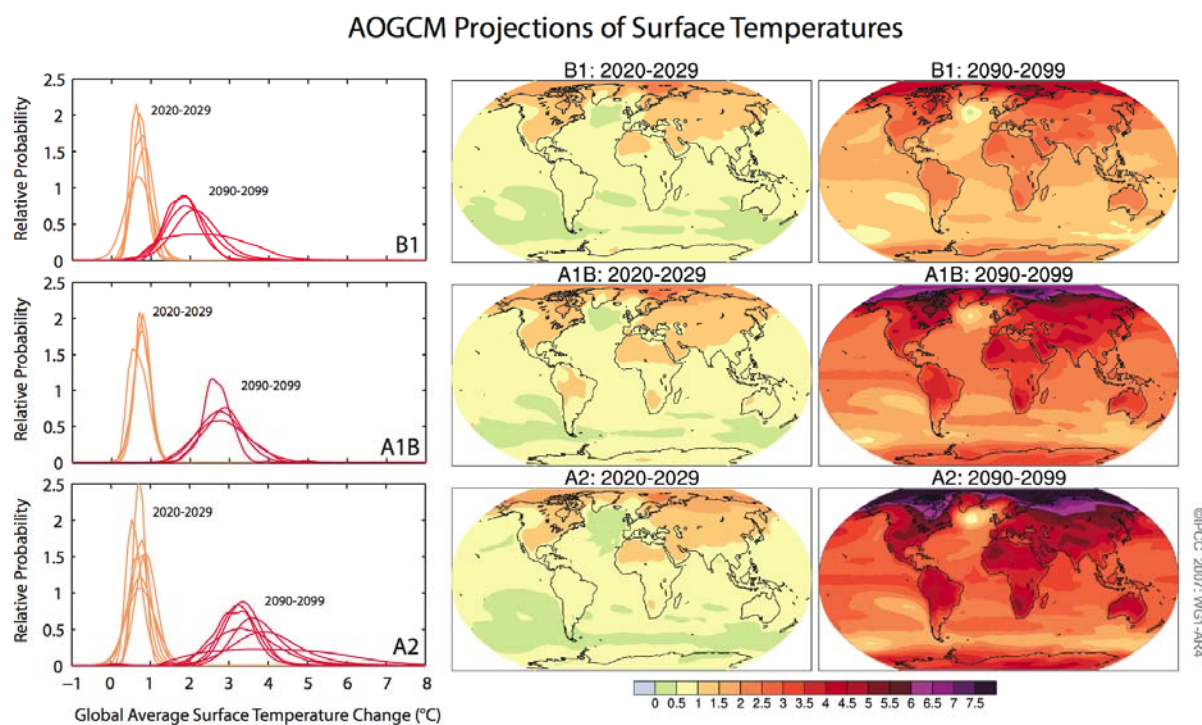


FIGURE SPM-6. Projected surface temperature changes for the early and late 21st century relative to the period 1980–1999. The central and right panels show the Atmosphere–Ocean General Circulation multi-Model average projections for the B1 (top), A1B (middle) and A2 (bottom) SRES scenarios averaged over decades 2020–2029 (center) and 2090–2099 (right). The left panel shows corresponding uncertainties as the relative probabilities of estimated global average warming from several different AOGCM and EMICs studies for the same periods. Some studies present results only for a subset of the SRES scenarios, or for various model versions. Therefore the difference in the number of curves, shown in the left-hand panels, is due only to differences in the availability of results. {Figures 10.8 and 10.28}

¹⁶ Decreases in pH correspond to increases in acidity of a solution. See Glossary for further details.

- Snow cover is projected to contract. Widespread increases in thaw depth are projected over most permafrost regions. {10.3, 10.6}
- Sea ice is projected to shrink in both the Arctic and Antarctic under all SRES scenarios. In some projections, Arctic late-summer sea ice disappears almost entirely by the latter part of the 21st century. {10.3}
- It is *very likely* that hot extremes, heat waves, and heavy precipitation events will continue to become more frequent. {10.3}
- Based on a range of models, it is *likely* that future tropical cyclones (typhoons and hurricanes) will become more intense, with larger peak wind speeds and more heavy precipitation associated with ongoing increases of tropical SSTs. There is less confidence in projections of a global decrease in numbers of tropical cyclones. The apparent increase in the proportion of very intense storms since 1970 in some regions is much larger than simulated by current models for that period. {9.5, 10.3, 3.8}
- Extra-tropical storm tracks are projected to move poleward, with consequent changes in wind, precipitation, and temperature patterns, continuing the broad pattern of observed trends over the last half-century. {3.6, 10.3}
- Since the TAR there is an improving understanding of projected patterns of precipitation. Increases in the amount of precipitation are *very likely* in high-latitudes, while decreases are *likely* in most subtropical land regions (by as much as about 20% in the A1B scenario in 2100, see Figure SPM-7), continuing observed patterns in recent trends. {3.3, 8.3, 9.5, 10.3, 11.2 to 11.9}
- Based on current model simulations, it is *very likely* that the meridional overturning circulation (MOC) of the Atlantic Ocean will slow down during the 21st century. The multi-model average reduction by 2100 is 25% (range from zero to about 50%) for SRES emission scenario A1B. Temperatures in the Atlantic region are projected to increase despite such changes due to the much larger warming associated with projected increases of greenhouse gases. It is *very unlikely* that the MOC will undergo a large abrupt transition during the 21st century. Longer-term changes in the MOC cannot be assessed with confidence. {10.3, 10.7}

Projected Patterns of Precipitation Changes

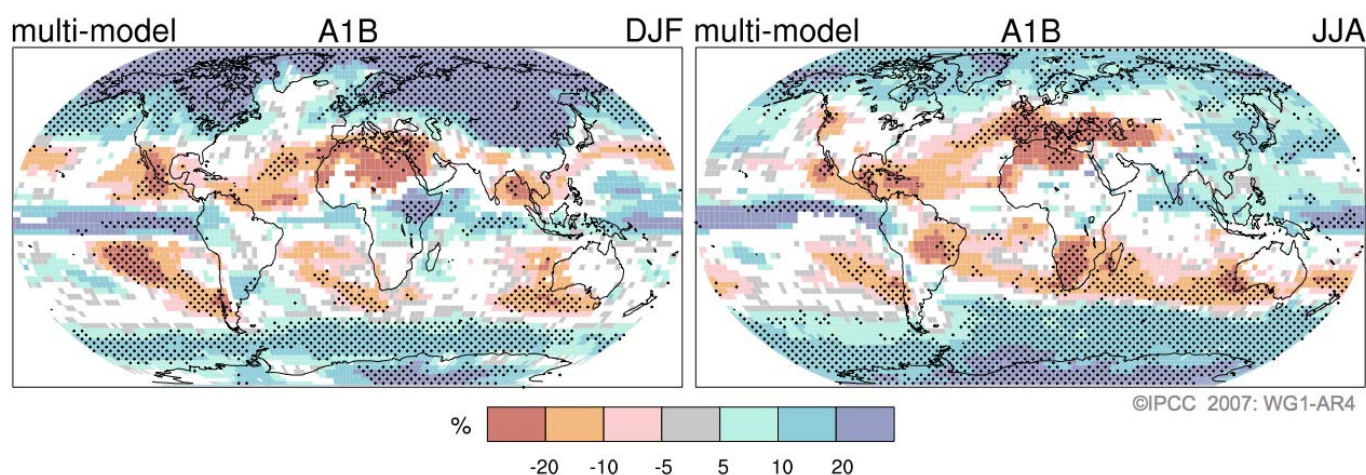


FIGURE SPM-7. Relative changes in precipitation (in percent) for the period 2090–2099, relative to 1980–1999. Values are multi-model averages based on the SRES A1B scenario for December to February (left) and June to August (right). White areas are where less than 66% of the models agree in the sign of the change and stippled areas are where more than 90% of the models agree in the sign of the change. {Figure 10.9}

Anthropogenic warming and sea level rise would continue for centuries due to the timescales associated with climate processes and feedbacks, even if greenhouse gas concentrations were to be stabilized. {10.4, 10.5, 10.7}

- Climate carbon cycle coupling is expected to add carbon dioxide to the atmosphere as the climate system warms, but the magnitude of this feedback is uncertain. This increases the uncertainty in the trajectory of carbon dioxide emissions required to achieve a particular stabilisation level of atmospheric carbon dioxide concentration. Based on current understanding of climate carbon cycle feedback, model studies suggest that to stabilise at 450 ppm carbon dioxide, could require that cumulative emissions over the 21st century be reduced from an average of approximately 670 [630 to 710] GtC (2460 [2310 to 2600] GtCO₂) to approximately 490 [375 to 600] GtC (1800 [1370 to 2200] GtCO₂). Similarly, to stabilise at 1000 ppm this feedback could require that cumulative emissions be reduced from a model average of approximately 1415 [1340 to 1490] GtC (5190 [4910 to 5460] GtCO₂) to approximately 1100 [980 to 1250] GtC (4030 [3590 to 4580] GtCO₂). {7.3, 10.4}
- If radiative forcing were to be stabilized in 2100 at B1 or A1B levels¹¹ a further increase in global average temperature of about 0.5°C would still be expected, mostly by 2200. {10.7}
- If radiative forcing were to be stabilized in 2100 at A1B levels¹¹, thermal expansion alone would lead to 0.3 to 0.8 m of sea level rise by 2300 (relative to 1980–1999). Thermal expansion would continue for many centuries, due to the time required to transport heat into the deep ocean. {10.7}
- Contraction of the Greenland ice sheet is projected to continue to contribute to sea level rise after 2100. Current models suggest ice mass losses increase with temperature more rapidly than gains due to precipitation and that the surface mass balance becomes negative at a global average warming (relative to pre-industrial values) in excess of 1.9 to 4.6°C. If a negative surface mass balance were sustained for millennia, that would lead to virtually complete elimination of the Greenland ice sheet and a resulting contribution to sea level rise of about 7 m. The corresponding future temperatures in Greenland are comparable to those inferred for the last interglacial period 125,000 years ago, when paleoclimatic information suggests reductions of polar land ice extent and 4 to 6 m of sea level rise. {6.4, 10.7}
- Dynamical processes related to ice flow not included in current models but suggested by recent observations could increase the vulnerability of the ice sheets to warming, increasing future sea level rise. Understanding of these processes is limited and there is no consensus on their magnitude. {4.6, 10.7}
- Current global model studies project that the Antarctic ice sheet will remain too cold for widespread surface melting and is expected to gain in mass due to increased snowfall. However, net loss of ice mass could occur if dynamical ice discharge dominates the ice sheet mass balance. {10.7}
- Both past and future anthropogenic carbon dioxide emissions will continue to contribute to warming and sea level rise for more than a millennium, due to the timescales required for removal of this gas from the atmosphere. {7.3, 10.3}

The Emission Scenarios of the IPCC Special Report on Emission Scenarios (SRES)¹⁷

A1. The A1 storyline and scenario family describes a future world of very rapid economic growth, global population that peaks in mid-century and declines thereafter, and the rapid introduction of new and more efficient technologies. Major underlying themes are convergence among regions, capacity building and increased cultural and social interactions, with a substantial reduction in regional differences in per capita income. The A1 scenario family develops into three groups that describe alternative directions of technological change in the energy system. The three A1 groups are distinguished by their technological emphasis: fossil intensive (A1FI), non-fossil energy sources (A1T), or a balance across all sources (A1B) (where balanced is defined as not relying too heavily on one particular energy source, on the assumption that similar improvement rates apply to all energy supply and end use technologies).

A2. The A2 storyline and scenario family describes a very heterogeneous world. The underlying theme is self reliance and preservation of local identities. Fertility patterns across regions converge very slowly, which results in continuously increasing population. Economic development is primarily regionally oriented and per capita economic growth and technological change more fragmented and slower than other storylines.

B1. The B1 storyline and scenario family describes a convergent world with the same global population, that peaks in mid-century and declines thereafter, as in the A1 storyline, but with rapid change in economic structures toward a service and information economy, with reductions in material intensity and the introduction of clean and resource efficient technologies. The emphasis is on global solutions to economic, social and environmental sustainability, including improved equity, but without additional climate initiatives.

B2. The B2 storyline and scenario family describes a world in which the emphasis is on local solutions to economic, social and environmental sustainability. It is a world with continuously increasing global population, at a rate lower than A2, intermediate levels of economic development, and less rapid and more diverse technological change than in the B1 and A1 storylines. While the scenario is also oriented towards environmental protection and social equity, it focuses on local and regional levels.

An illustrative scenario was chosen for each of the six scenario groups A1B, A1FI, A1T, A2, B1 and B2. All should be considered equally sound.

The SRES scenarios do not include additional climate initiatives, which means that no scenarios are included that explicitly assume implementation of the United Nations Framework Convention on Climate Change or the emissions targets of the Kyoto Protocol.

¹⁷ Emission scenarios are not assessed in this Working Group One report of the IPCC. This box summarizing the SRES scenarios is taken from the TAR and has been subject to prior line by line approval by the Panel.

APPENDIX THREE

(Source: <http://www.nationalacademies.org/onpi/06072005.pdf>)

**JOINT SCIENCE ACADEMIES' STATEMENT:
GLOBAL RESPONSE TO CLIMATE CHANGE**

2005



Joint science academies' statement: Global response to climate change

Climate change is real

There will always be uncertainty in understanding a system as complex as the world's climate. However there is now strong evidence that significant global warming is occurring¹. The evidence comes from direct measurements of rising surface air temperatures and subsurface ocean temperatures and from phenomena such as increases in average global sea levels, retreating glaciers, and changes to many physical and biological systems. It is likely that most of the warming in recent decades can be attributed to human activities (IPCC 2001)². This warming has already led to changes in the Earth's climate.

The existence of greenhouse gases in the atmosphere is vital to life on Earth – in their absence average temperatures would be about 30 centigrade degrees lower than they are today. But human activities are now causing atmospheric concentrations of greenhouse gases – including carbon dioxide, methane, tropospheric ozone, and nitrous oxide – to rise well above pre-industrial levels. Carbon dioxide levels have increased from 280 ppm in 1750 to over 375 ppm today – higher than any previous levels that can be reliably measured (i.e. in the last 420,000 years). Increasing greenhouse gases are causing temperatures to rise; the Earth's surface warmed by approximately 0.6 centigrade degrees over the twentieth century. The Intergovernmental Panel on Climate Change (IPCC) projected that the average global surface temperatures will continue to increase to between 1.4 centigrade degrees and 5.8 centigrade degrees above 1990 levels, by 2100.

Reduce the causes of climate change

The scientific understanding of climate change is now sufficiently clear to justify nations taking prompt action. It is vital that all nations identify cost-effective steps that they can take now, to contribute to substantial and long-term reduction in net global greenhouse gas emissions.

Action taken now to reduce significantly the build-up of greenhouse gases in the atmosphere will lessen the magnitude and rate of climate change. As the United Nations Framework Convention on Climate Change (UNFCCC) recognises, a lack of full scientific certainty about some aspects of climate change is not a reason for delaying an immediate response that will, at a reasonable cost, prevent dangerous anthropogenic interference with the climate system.

As nations and economies develop over the next 25 years, world primary energy demand is estimated to increase by almost 60%. Fossil fuels, which are responsible for the majority of carbon dioxide emissions produced by human activities, provide valuable resources for many nations and are projected to provide 85% of this demand (IEA 2004)³. Minimising the amount of this carbon dioxide reaching the atmosphere presents a huge challenge. There are many

potentially cost-effective technological options that could contribute to stabilising greenhouse gas concentrations. These are at various stages of research and development. However barriers to their broad deployment still need to be overcome.

Carbon dioxide can remain in the atmosphere for many decades. Even with possible lowered emission rates we will be experiencing the impacts of climate change throughout the 21st century and beyond. Failure to implement significant reductions in net greenhouse gas emissions now, will make the job much harder in the future.

Prepare for the consequences of climate change

Major parts of the climate system respond slowly to changes in greenhouse gas concentrations. Even if greenhouse gas emissions were stabilised instantly at today's levels, the climate would still continue to change as it adapts to the increased emission of recent decades. Further changes in climate are therefore unavoidable. Nations must prepare for them.

The projected changes in climate will have both beneficial and adverse effects at the regional level, for example on water resources, agriculture, natural ecosystems and human health. The larger and faster the changes in climate, the more likely it is that adverse effects will dominate. Increasing temperatures are likely to increase the frequency and severity of weather events such as heat waves and heavy rainfall. Increasing temperatures could lead to large-scale effects such as melting of large ice sheets (with major impacts on low-lying regions throughout the world). The IPCC estimates that the combined effects of ice melting and sea water expansion from ocean warming are projected to cause the global mean sea-level to rise by between 0.1 and 0.9 metres between 1990 and 2100. In Bangladesh alone, a 0.5 metre sea-level rise would place about 6 million people at risk from flooding.

Developing nations that lack the infrastructure or resources to respond to the impacts of climate change will be particularly affected. It is clear that many of the world's poorest people are likely to suffer the most from climate change. Long-term global efforts to create a more healthy, prosperous and sustainable world may be severely hindered by changes in the climate.

The task of devising and implementing strategies to adapt to the consequences of climate change will require worldwide collaborative inputs from a wide range of experts, including physical and natural scientists, engineers, social scientists, medical scientists, those in the humanities, business leaders and economists.



Conclusion

We urge all nations, in the line with the UNFCCC principles⁴, to take prompt action to reduce the causes of climate change, adapt to its impacts and ensure that the issue is included in all relevant national and international strategies. As national science academies, we commit to working with governments to help develop and implement the national and international response to the challenge of climate change.

G8 nations have been responsible for much of the past greenhouse gas emissions. As parties to the UNFCCC, G8 nations are committed to showing leadership in addressing climate change and assisting developing nations to meet the challenges of adaptation and mitigation.

We call on world leaders, including those meeting at the Gleneagles G8 Summit in July 2005, to:

- Acknowledge that the threat of climate change is clear and increasing.

- Launch an international study⁵ to explore scientifically-informed targets for atmospheric greenhouse gas concentrations, and their associated emissions scenarios, that will enable nations to avoid impacts deemed unacceptable.
- Identify cost-effective steps that can be taken now to contribute to substantial and long-term reduction in net global greenhouse gas emissions. Recognise that delayed action will increase the risk of adverse environmental effects and will likely incur a greater cost.
- Work with developing nations to build a scientific and technological capacity best suited to their circumstances, enabling them to develop innovative solutions to mitigate and adapt to the adverse effects of climate change, while explicitly recognising their legitimate development rights.
- Show leadership in developing and deploying clean energy technologies and approaches to energy efficiency, and share this knowledge with all other nations.
- Mobilise the science and technology community to enhance research and development efforts, which can better inform climate change decisions.

Notes and references

1 This statement concentrates on climate change associated with global warming. We use the UNFCCC definition of climate change, which is 'a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods'.

2 IPCC (2001). Third Assessment Report. We recognise the international scientific consensus of the Intergovernmental Panel on Climate Change (IPCC).

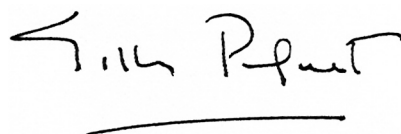
3 IEA (2004). World Energy Outlook 4. Although long-term projections of future world energy demand and supply are highly uncertain, the World Energy Outlook produced by the International Energy Agency (IEA) is a useful source of information about possible future energy scenarios.

4 With special emphasis on the first principle of the UNFCCC, which states: 'The Parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities. Accordingly, the developed country Parties should take the lead in combating climate change and the adverse effects thereof'.

5 Recognising and building on the IPCC's ongoing work on emission scenarios.



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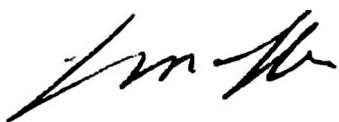
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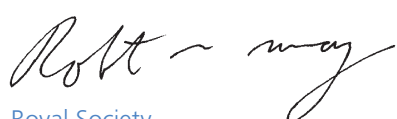
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