

VITAL SIGNS 1997

THE ENVIRONMENTAL
TRENDS THAT ARE
SHAPING OUR
FUTURE

Lester R. Brown
Michael Renner
Christopher Flavin

Pf
1020
1998 /

VITAL SIGNS 1998

THE ENVIRONMENTAL
TRENDS THAT ARE
SHAPING OUR
FUTURE

Lester R. Brown
Michael Renner
Christopher Flavin

WORLDWATCH INSTITUTE

VITAL SIGNS

1997
1998

The Environmental Trends That Are Shaping Our Future

Lester R. Brown
Michael Renner
Christopher Flavin
Editor: Linda Starke

with
Janet N. Abramovitz
Seth Dunn
Hilary F. French
Gary Gardner
Hal Hane
Nicholas Lenssen
Anne McGinn
Jennifer D. Mitchell
Toni Nelson
Molly O'Meara
David M. Roodman
Hira Schmidt
Cheri Sugal
John Tuxill

earthscan
from Routledge

Bis 1996 lag die höchste Globaltemperatur noch bei 15,4°C

Overview: A Year of Contrasts

ROCK MINING INDUSTRY

The world is getting warmer. New data show that 1996 was the fourth warmest year since record keeping began in 1866. (See pages 63 and Figure 2.) The 13 years on record have since 1979, with the four being during the 1990s. The continuation of the 1996 data provides another piece of evidence that the warming trend is under way. The insurance industry is deeply concerned about this. Higher temperatures of surface waters, particularly in the tropics and subtropics, where heat is released into the atmosphere, result in more frequent and more

weather-related disasters in the world \$60 billion. (See pages

70-71.) An estimated \$26 billion of this occurred in China, where a succession of typhoons (hurricanes) led to severe flooding, displacing 2 million people and claiming 2,700 lives.

Weather-related insurance claims, a rough

of carbon emissions, is responsible for 23 percent of the emissions of this climate-changing gas. China, the world's fastest growing economy during the 1990s, now accounts for 14 percent of carbon emissions, largely because of its heavy dependence on coal. Emissions there grew 27 percent from 1990 to 1995, compared with approximately 8-percent increases in both the United States and Japan in the same period.

Since the Industrial Revolution, atmospheric CO₂ levels have risen from an estimated 280 parts per million to 362 parts per million, the highest in 150,000 years. (See Figure 1.) The mainstream scientific community, represented by the Intergovernmental Panel on Climate Change—2,500 of the world's leading atmospheric scientists—now finds evidence that human activity is indeed altering the Earth's climate.

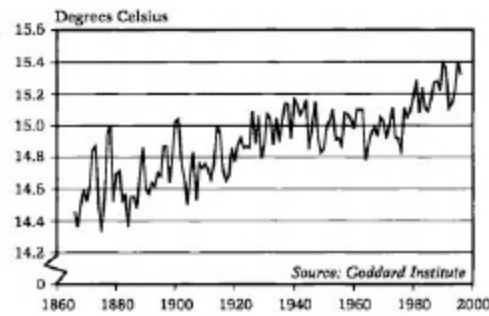


Figure 2: Average Temperature at the Earth's Surface, 1866-1996

VITAL SIGNS

1998

The Environmental Trends That Are Shaping Our Future

Lester R. Brown
Michael Renner
Christopher Flavin
Editor: Linda Starke

with
Janet N. Abramovitz
Seth Dunn
Hilary F. French
Gary Gardner
Brian Halweil
Nicholas Lenssen
Ashley T. Mattoon
Anne Platt McGinn
Jennifer D. Mitchell
Molly O'Meara
David M. Roodman
Payal Sampat
Michael Strauss
John Tuxill

W.W. Norton & Company
New York • London

Am 18.01.1998 hat James Hansen (NASA-GISS) 1°C aus der Erderwärmung verschwinden lassen:

Die höchste Globaltemperatur beträgt ab 1997 nur noch 14,4°C

In the Midwest and the lower Mississippi Valley, it often leads to vast algal blooms that then decay, absorbing the free oxygen in the water and depriving fish of oxygen. The hypoxic region, or "dead zone," now formed through this process each year in the Gulf of Mexico is roughly the size of New Jersey.

Closely associated with the emission of sulfur dioxide and nitrous oxides, which combine with moisture in the atmosphere to form acid rain. Although emissions of these two pollutants have been sharply reduced in North America and Western Europe, they are still climbing rapidly in Asia (pages 134-35.) Acid deposition in Japan is now far higher than the level in Japan in 1975 before that

nation established stringent emission limits. Acids can eliminate fish in freshwater lakes, rendering them lifeless.

Another economic activity that is particularly disruptive of the environment is mining. In recent years, mineral exploration has expanded dramatically in developing coun-

By far the most visible human alteration of the planet has been the destruction of forests. Almost half the forests that once covered vast expanses of the Earth are already gone. Between 1980 and 1995, the world lost at least 200 million hectares of forest—an area three times as large as Texas. In recent years, the world has experienced an estimated net loss of 16 million hectares a year. (See pages 124-25.)

The amount of nitrogen fixed in forms that plants can use through fertilizer manufacturing, the burning of fossil fuels, and the extensive planting of leguminous crops such as soybeans now exceeds the amount fixed by nature. (See pages 132-33.) Synthesized nitrogen fertilizer, the use of which has increased ninefold since 1950, is the major form of nitrogen fixation as a result of human activities. Wherever it leads to excessive nutrient runoff, as it does in

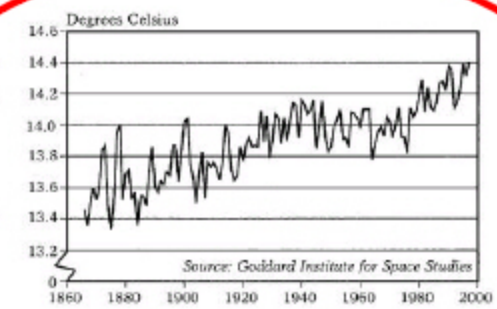


Figure 5: Average Temperature at the Earth's Surface, 1866-1997

"vital signs 1996", S. 67

GLOBAL AVERAGE TEMPERATURE, 1950-95

YEAR	TEMPERATURE (degrees Celsius)
1950	14.86
1955	14.92
1960	14.98
1965	14.88
1966	14.95
1967	14.99
1968	14.93
1969	15.05
1970	15.02
1971	14.93
1972	15.00
1973	15.11
1974	14.92
1975	14.92
1976	14.84
1977	15.11
1978	15.06
1979	15.09
1980	15.18
1981	15.29
1982	15.08
1983	15.24
1984	15.11
1985	15.09
1986	15.16
1987	15.27
1988	15.28
1989	15.22
1990	15.38
1991	15.36
1992	15.11
1993	15.14
1994	15.23
1995 (prel)	15.39

SOURCES: Goddard Institute for Space Studies, New York, January 19, 1996.

"vital signs 1997", S. 63

GLOBAL AVERAGE TEMPERATURE, 1950-96

YEAR	TEMPERATURE (degrees Celsius)
1950	14.86
1955	14.92
1960	14.98
1965	14.88
1966	14.95
1967	14.99
1968	14.93
1969	15.05
1970	15.02
1971	14.93
1972	15.00
1973	15.11
1974	14.92
1975	14.92
1976	14.82
1977	15.11
1978	15.05
1979	15.09
1980	15.18
1981	15.29
1982	15.08
1983	15.24
1984	15.11
1985	15.09
1986	15.16
1987	15.27
1988	15.28
1989	15.22
1990	15.39
1991	15.36
1992	15.11
1993	15.14
1994	15.23
1995	15.40
1996 (prel)	15.32

SOURCE: Goddard Institute for Space Studies, New York, 14 January 1997.

"vital signs 1998", S. 68

GLOBAL AVERAGE TEMPERATURE, 1950-97

YEAR	TEMPERATURE ¹ (degrees Celsius)
1950	13.86
1955	13.92
1960	13.98
1965	13.88
1966	13.95
1967	13.99
1968	13.93
1969	14.05
1970	14.02
1971	13.92
1972	14.00
1973	14.11
1974	13.92
1975	13.92
1976	13.82
1977	14.11
1978	14.05
1979	14.09
1980	14.18
1981	14.29
1982	14.08
1983	14.24
1984	14.11
1985	14.09
1986	14.15
1987	14.27
1988	14.28
1989	14.22
1990	14.38
1991	14.36
1992	14.11
1993	14.14
1994	14.23
1995	14.39
1996	14.31
1997 (prel)	14.40

¹Base number is 1 degree Celsius lower than in earlier *Vital Signs*.
SOURCE: Surface Air Temperature Analyses, Goddard Institute for Space Studies, New York, 14 January 1998.

GLOBAL AVERAGE TEMPERATURE, 1950-98, AND ATMOSPHERIC CONCENTRATIONS OF CARBON DIOXIDE, 1960-98

YEAR	TEMPERATURE (degrees Celsius)	CARBON DIOXIDE (parts per mill.)
1950	13.84	n.a.
1955	13.91	n.a.
1960	13.96	316.8
1965	13.88	319.9
1966	13.96	321.2
1967	14.00	322.0
1968	13.94	322.9
1969	14.03	324.5
1970	14.02	325.5
1971	13.93	326.2
1972	14.01	327.3
1973	14.11	329.5
1974	13.92	330.1
1975	13.94	331.0
1976	13.81	332.0
1977	14.11	333.7
1978	14.04	335.3
1979	14.08	336.7
1980	14.18	338.5
1981	14.30	339.8
1982	14.09	341.0
1983	14.28	342.6
1984	14.13	344.2
1985	14.10	345.7
1986	14.16	347.0
1987	14.28	348.8
1988	14.32	351.3
1989	14.24	352.8
1990	14.40	354.0
1991	14.36	355.5
1992	14.11	356.3
1993	14.12	357.0
1994	14.21	358.9
1995	14.38	360.9
1996	14.32	362.7
1997	14.40	363.8
1998 (prel)	14.57	366.7

SOURCES: Surface Air Temperature Analyses, Goddard Institute for Space Studies, New York, 26 February 1999; Scripps Institution of Oceanography, August 1998 and January 1999.

"vital signs 1999", S. 59

"vital signs 2000", S. 65

GLOBAL AVERAGE TEMPERATURE, 1950-99

YEAR	TEMPERATURE (degrees Celsius)
1950	13.84
1955	13.91
1960	13.96
1965	13.88
1966	13.96
1967	14.02
1968	13.94
1969	14.03
1970	14.02
1971	13.93
1972	14.01
1973	14.11
1974	13.92
1975	13.94
1976	13.81
1977	14.11
1978	14.04
1979	14.08
1980	14.18
1981	14.30
1982	14.09
1983	14.28
1984	14.13
1985	14.10
1986	14.16
1987	14.28
1988	14.32
1989	14.24
1990	14.40
1991	14.37
1992	14.20
1993	14.12
1994	14.22
1995	14.38
1996	14.32
1997	14.40
1998	14.58
1999 (prel)	14.35

SOURCES: Surface Air Temperature Analyses, Goddard Institute for Space Studies, New York, 11 January 2000.

Quellen:

- Vital Signs 1996 S. 67
- Vital Signs 1997 S. 63
- Vital Signs 1998 S. 68
- Vital Signs 1999 S. 59
- Vital Signs 2000 S. 65

Fussnotiz zu Vital Signs 1998 S. 174

2. The importance of Figure 1 is the change in temperature over time, as the Goddard Institute analyzes temperature change rather than absolute temperature. In earlier versions of *Vital Signs*, *Worldwatch* added the temperature change reported by the Goddard Institute to an estimated global temperature of 15 degrees Celsius, but the institute has since informed *Worldwatch* that a better base number would be 14 degrees Celsius. James Hansen, Goddard Institute for Space Studies, New York, e-mail to author, 18 January 1998.

GLOBAL TEMPERATURE REACHES RECORD HIGH

[pages 68-69]

aus: "vital signs", 1998, Seite 174

1. James Hansen et al., Goddard Institute for Space Studies, Surface Air Temperature Analyses, "Global Land-Ocean Temperature Index," as posted at <<http://www.giss.nasa.gov/Data/GISTEMP>>, viewed 14 January 1998.
2. The importance of Figure 1 is the change in temperature over time, as the Goddard Institute analyzes temperature change rather than absolute temperature. In earlier versions of *Vital Signs*, *Worldwatch* added the temperature change reported by the Goddard Institute to an estimated global temperature of 15 degrees Celsius, but the institute has since informed *Worldwatch* that a better base number would be 14 degrees Celsius. James Hansen, Goddard Institute for Space Studies, New York, e-mail to author, 18 January 1998.
3. "World Warms Into Record Books," (London) *Daily Telegraph*, 28 November 1997; National Climatic Data Center (NCDC), National Oceanic and Atmospheric Administration,

Century Decline in
from Whaling Rec
1997.

10. Houghton et al., op
11. NOAA, "1997 War
Reports," press re
January 1998).
12. Ibid.
13. B.D. Santer et al., "I
and Attribution of
op. cit. note 4; B.D.
Human Influences
the Atmosphere," /
Kaufmann and D
Human Influence o
Temperature Relatio
14. James Hansen et
Space Studies, S
Analyses, "1997 Te
posted at <<http://observe/>>, viewed
Center for Atmosph
in Temperatures Sup
for the Late N
Colloquium This
(Boulder, CO: 17 Ju
15. NOAA, "El Niño