

# TABLE OF CONTENTS

## Volume 1

Publisher's Note . . . . .	ix	Antarctic Treaty . . . . .	73
Introduction . . . . .	xi	Antarctica: threats and responses. . . . .	75
Contributors . . . . .	xv	Anthropogenic climate change . . . . .	80
Abbreviations and Acronyms. . . . .	xix	Anthropogeomorphology. . . . .	83
Common Units of Measure. . . . .	xxi	Aral Sea desiccation . . . . .	87
Complete List of Contents . . . . .	xxvii	Arctic . . . . .	91
Categorized List of Contents . . . . .	xxxv	Arctic peoples. . . . .	96
		Arctic seafloor claims . . . . .	99
Abrupt climate change . . . . .	1	Arrhenius, Gustaf . . . . .	101
Adiabatic processes. . . . .	3	Arrhenius, Svante August. . . . .	102
Advancement of Sound Science Center (TASSC) . . . . .	5	Asia-Pacific Partnership . . . . .	104
Aerosols . . . . .	7	Asthma . . . . .	106
Agassiz, Louis . . . . .	12	Atlantic heat conveyor . . . . .	108
Agenda 21 . . . . .	14	Atlantic multidecadal oscillation . . . . .	109
Agriculture and the environment. . . . .	15	Atmosphere . . . . .	111
Agroforestry . . . . .	19	Atmospheric boundary layer . . . . .	115
Air conditioning and air-cooling technology . . . . .	21	Atmospheric chemistry. . . . .	117
Air pollution and pollutants: anthropogenic . . . . .	24	Atmospheric dynamics . . . . .	121
Air pollution and pollutants: natural . . . . .	28	Atmospheric rivers . . . . .	124
Air pollution history . . . . .	33	Atmospheric structure and evolution. . . . .	128
Air quality standards and measurement . . . . .	35	Australia . . . . .	131
Air travel. . . . .	39	Automobile technology . . . . .	135
Albedo feedback . . . . .	42	Average weather . . . . .	138
Alkalinity . . . . .	45	Axelrod, Daniel . . . . .	139
Alleroed oscillation. . . . .	46	Bakken Formation . . . . .	143
Alliance of Small Island States (AOSIS) . . . . .	47	Bangladesh. . . . .	146
Amazon deforestation and global warming . . . . .	49	Barrier islands and global warming . . . . .	150
American Association of Petroleum Geologists (AAPG) . . . . .	55	Basel Convention . . . . .	152
American Association for the Advancement of Science (AAAS) . . . . .	56	Baseline emissions . . . . .	155
American Astronomical Society (AAS) . . . . .	57	Bayesian method . . . . .	156
American Chemical Society (ACS) . . . . .	58	Benefits of climate policy . . . . .	159
American Enterprise Institute (AEI) . . . . .	59	Bennett, Hugh Hammond. . . . .	161
American Geophysical Union (AGU) . . . . .	60	Berlin Mandate . . . . .	162
American Institute of Physics (AIP) . . . . .	61	Biodiversity and climate change . . . . .	164
American Meteorological Society (AMS) . . . . .	62	Bioethics and global warming . . . . .	169
American Physical Society (APS) . . . . .	63	Biofuels. . . . .	171
Amphibians . . . . .	64	Biotechnology. . . . .	174
Animal husbandry practices . . . . .	67	Bowen's ratio . . . . .	178
Annex B of the Kyoto Protocol . . . . .	72	Brazil . . . . .	179
		Brundtland Commission and report . . . . .	183
		Budongo Forest Project . . . . .	185

Byrd-Hagel Resolution . . . . .	188	Climate lag . . . . .	302
California . . . . .	191	Climate models and modeling . . . . .	303
Canada . . . . .	195	Climate prediction and projection . . . . .	306
Canadian Meteorological and Oceanographic Society (CMOS) . . . . .	200	Climate Project, The . . . . .	309
Canaries in the coal mine . . . . .	202	Climate reconstruction . . . . .	311
Carbon . . . . .	204	Climate sensitivity . . . . .	313
Carbon: atom for atom . . . . .	208	Climate variability . . . . .	316
Carbon cycle . . . . .	209	Climate zones . . . . .	318
Carbon dioxide . . . . .	212	Climatology . . . . .	320
Carbon dioxide equivalent . . . . .	216	Clouds and cloud feedback . . . . .	322
Carbon dioxide fertilization . . . . .	217	Coal . . . . .	325
Carbon dioxide over earth's surface . . . . .	219	Coal seam fires . . . . .	328
Carbon equivalent . . . . .	222	Coastal impacts of global climate change . . . . .	332
Carbon footprint . . . . .	223	Coastline changes . . . . .	334
Carbon 4 plants . . . . .	227	<i>Collapse</i> (Book) . . . . .	336
Carbon isotopes . . . . .	228	Colorado river transformation . . . . .	338
Carbon monoxide . . . . .	230	Competitive Enterprise Institute . . . . .	341
Carbon taxes . . . . .	231	Composting . . . . .	342
Carbon 3 plants . . . . .	233	Conservation and preservation . . . . .	345
Carbonaceous aerosols . . . . .	235	Conservatism . . . . .	348
Carson, Rachel . . . . .	236	Conspiracy theories . . . . .	350
Catalytic converters . . . . .	238	Consultative Group on International Agricultural Research (CGIAR) . . . . .	352
Catastrophist-Cornucopian debate . . . . .	240	Continental climate . . . . .	355
Cato Institute . . . . .	242	Contrails . . . . .	357
Cement and concrete . . . . .	243	Convention on Biological Diversity (CBD) . . . . .	359
Center for the Study of Carbon Dioxide and Global Change . . . . .	246	Convention on International Trade in Endangered Species (CITES) . . . . .	362
Certified emissions reduction . . . . .	248	Convention on Long-Range Transboundary Air Pollution (LRTAP) . . . . .	364
Charcoal . . . . .	250	Cooler Heads Coalition . . . . .	366
Chemical industry . . . . .	252	Coriolis effect . . . . .	368
Chernobyl and climate change . . . . .	255	Cosmic rays . . . . .	370
China, People's Republic of . . . . .	260	Cryosphere . . . . .	371
Chlorofluorocarbons and related compounds . . . . .	266	Damages: market and nonmarket . . . . .	375
Cities for Climate Protection . . . . .	268	Dating methods . . . . .	377
Civilization and the environment . . . . .	270	<i>Day After Tomorrow, The</i> (Film) . . . . .	379
Clathrates . . . . .	274	Deforestation . . . . .	381
Clean Air Acts, U.S. . . . .	276	Deglaciation . . . . .	384
Clean development mechanism . . . . .	280	Desalination of seawater . . . . .	386
Clean energy . . . . .	282	Desertification . . . . .	388
Climate and the climate system . . . . .	285	Deserts . . . . .	391
Climate change and global warming . . . . .	287	Dew point . . . . .	393
Climate Change Science Program, U.S. . . . .	292	Diatoms . . . . .	395
Climate change skeptics . . . . .	293	Diseases . . . . .	397
Climate engineering . . . . .	297	Displaced persons and refugees . . . . .	401
Climate feedback . . . . .	300		

Dolphins and porpoises . . . . .	403	Elton, Charles Sutherland . . . . .	460
Downscaling . . . . .	405	Emiliani, Cesare . . . . .	462
Drought . . . . .	407	Emission Scenario . . . . .	464
Dust storms and global warming . . . . .	411	Emissions standards . . . . .	465
Earth history . . . . .	415	Employment . . . . .	467
Earth motions . . . . .	418	Endangered and threatened species . . . . .	471
Earth structure and development . . . . .	420	Energy efficiency . . . . .	476
Earth summits . . . . .	423	Energy from waste . . . . .	477
Earthquakes . . . . .	426	Energy Policy Act of 1992 . . . . .	480
Easter Island . . . . .	429	Energy resources and global warming . . . . .	482
Eastern Europe . . . . .	431	Engineers Australia . . . . .	486
Ecocentrism vs. technocentrism . . . . .	434	Enhanced greenhouse effect . . . . .	487
Ecological Impact of Global Climate Change . . . . .	436	Environmental economics . . . . .	489
Economics of Global Climate Change . . . . .	440	Environmental law . . . . .	492
Ecosystems . . . . .	444	Environmental movement . . . . .	494
Ecotaxation . . . . .	447	Estuaries . . . . .	497
Ecoterrorism . . . . .	449	Ethanol . . . . .	499
Education about global climate change . . . . .	450	Europe and the European Union . . . . .	502
8.2ka event . . . . .	454	Evapotranspiration . . . . .	507
Ekman transport and pumping . . . . .	455	Extinctions and mass extinctions . . . . .	509
El Niño-Southern Oscillation and global warming . . . . .	457	Extreme weather events . . . . .	513
		Eyjafjallajökull . . . . .	517

# TABLE OF CONTENTS

## Volume 2

Abbreviations and Acronyms . . . . .	ix	Glaciations . . . . .	606
Common Units of Measure . . . . .	xi	Glaciers . . . . .	608
Complete List of Contents . . . . .	xvii	Glacken, Clarence J. . . . .	612
Categorized List of Contents . . . . .	xxv	Global climate . . . . .	614
		Global Climate Coalition . . . . .	617
Faculae . . . . .	521	Global cooling event of 535-547 CE . . . . .	619
Falsifiability rule . . . . .	523	Global dimming . . . . .	621
Famine from global warming . . . . .	525	Global economy and climate change . . . . .	623
Fire . . . . .	527	Global energy balance . . . . .	626
Fishing industry, fisheries, and fish farming . . . . .	530	Global Environment Facility (GEF) . . . . .	628
Flood barriers, movable . . . . .	532	Global monitoring . . . . .	629
Floods and flooding . . . . .	534	Global surface temperature . . . . .	632
Florida . . . . .	537	Global warming hiatus . . . . .	633
Fog . . . . .	539	Global warming potential . . . . .	637
Food and Agriculture Organization (FAO) . . . . .	541	Gore, Al . . . . .	638
Forcing mechanisms . . . . .	543	Greenhouse effect . . . . .	640
Forestry and forest management . . . . .	545	Greenhouse gas protocol . . . . .	642
Forests . . . . .	548	Greenhouse gases and global warming . . . . .	644
Fossil fuel emissions . . . . .	550	Greening Earth Society . . . . .	647
Fossil fuel reserves . . . . .	553	Greenland ice cap . . . . .	649
Fossil fuels and global warming . . . . .	554	Greenpeace . . . . .	652
Fracking . . . . .	557	Ground ice . . . . .	655
France . . . . .	560	Groundwater . . . . .	657
Fraser Institute . . . . .	563	Group of 77 and China . . . . .	659
Freshwater . . . . .	564	Gulf Stream . . . . .	661
Friends of Science Society . . . . .	567	Gyres . . . . .	663
Friends of the Earth (FoE) . . . . .	568	Hadley circulation . . . . .	667
Fronts . . . . .	570	Halocarbons . . . . .	669
Fuels, alternative . . . . .	572	Halons . . . . .	670
Fukushima Daiichi and climate change . . . . .	576	Health impacts of global warming . . . . .	671
Gaia hypothesis . . . . .	579	Heartland Institute . . . . .	676
Gasoline prices . . . . .	581	Heat capacity . . . . .	677
The “Gates of Hell” firepit . . . . .	584	Heat content . . . . .	678
General circulation models . . . . .	587	Heat vs. temperature . . . . .	680
Geographic information systems in climatology . . . . .	590	Heritage Foundation . . . . .	681
Geoid . . . . .	592	Heterotrophic respiration . . . . .	682
Geological Society of America (GSA) . . . . .	594	High global warming potential . . . . .	684
George C. Marshall Institute . . . . .	595	High Park Group . . . . .	685
Geothermal energy . . . . .	597	Holocene climate . . . . .	686
Germany . . . . .	600	Hubbert’s peak . . . . .	690
Glacial Lake Agassiz . . . . .	603	Human behavior change . . . . .	693

Human migration . . . . .	695	Kilimanjaro . . . . .	795
Humidity . . . . .	697	Kyoto lands . . . . .	797
Hybrid automobiles . . . . .	700	Kyoto mechanisms . . . . .	799
Hydroelectricity . . . . .	702	Kyoto Protocol . . . . .	802
Hydrofluorocarbons . . . . .	704	La Niña . . . . .	807
Hydrogen power . . . . .	706	Lamb, Hubert Horace . . . . .	808
Hydrologic cycle . . . . .	707	Land use and reclamation . . . . .	810
Hydrosphere . . . . .	710	Last Glacial Maximum (LGM) . . . . .	812
Ice cores . . . . .	715	Latent heat flux . . . . .	814
Ice shelves . . . . .	717	Lavoisier Group . . . . .	815
Ice-out studies . . . . .	719	Levees . . . . .	816
<i>Inconvenient Truth, An</i> (Book and Movie) . . . . .	721	Level of scientific understanding . . . . .	819
India . . . . .	723	Liberalism . . . . .	820
Industrial ecology . . . . .	728	Libertarianism . . . . .	823
Industrial emission controls . . . . .	730	Lichens . . . . .	825
Industrial greenhouse emissions . . . . .	732	Liming . . . . .	827
Industrial Revolution and global warming . . . . .	736	<i>The Limits to Growth</i> (Book) . . . . .	828
Information Council on the Environment (ICE) . . . . .	739	Lithosphere . . . . .	830
Institute for Trade, Standards, and Sustainable Development (ITSSD) . . . . .	740	Little Ice Age (LIA) . . . . .	832
Intergenerational equity . . . . .	741	Louisiana coast . . . . .	835
Interglacials . . . . .	743	Maldives . . . . .	839
Intergovernmental Panel on Climate Change (IPCC) . . . . .	745	Malthus, Thomas Robert . . . . .	841
Intergovernmental Panel on Forests (IPF) . . . . .	749	Manabe, Syukuro . . . . .	843
International agreements and cooperation . . . . .	750	Mangroves . . . . .	844
International Atomic Energy Agency (IAEA) . . . . .	752	Marginal seas . . . . .	847
International Council for Science (ICS) . . . . .	754	Maritime climate . . . . .	849
International Geosphere-Biosphere Programme . . . . .	755	Marsh, George Perkins . . . . .	850
International Human Dimensions Programme on Global Environmental Change . . . . .	757	Mass balance . . . . .	852
International Institute for Applied Systems Analysis (IIASA) . . . . .	759	Mauna Loa Record . . . . .	853
International Policy Network . . . . .	761	Mean sea level . . . . .	854
International Union for Conservation of Nature . . . . .	762	Media . . . . .	855
International waters . . . . .	763	Medieval Warm Period (MWP) . . . . .	859
Inter-Tropical Convergence Zone . . . . .	766	Mediterranean climate . . . . .	861
Invasive exotic species . . . . .	768	Mediterranean Sea . . . . .	864
Iran . . . . .	773	Megacities . . . . .	867
Islands . . . . .	776	Meridional Overturning Circulation (MOC) . . . . .	868
Isostasy . . . . .	780	Mesosphere . . . . .	870
Italy . . . . .	782	Meteorology . . . . .	872
Japan . . . . .	785	Methane . . . . .	875
Jet stream . . . . .	789	Mexico . . . . .	878
Journalism and journalistic ethics . . . . .	791	Microwave sounding units . . . . .	883
		Middle East . . . . .	885
		Milanković, Milutin . . . . .	888
		Military implications of global warming . . . . .	891
		Minerals and mining . . . . .	895
		Modes of climate variability . . . . .	897

Mold spores . . . . .	899	Organization of Petroleum Exporting Countries (OPEC). . . . .	979
Monsoons . . . . .	901	Oxygen isotopes . . . . .	981
Montreal Protocol . . . . .	904	Oxygen, atmospheric . . . . .	982
Motor vehicles . . . . .	907	Ozone . . . . .	985
Mount Pinatubo . . . . .	911	Paleoclimates and paleoclimate change . . . . .	991
Mount Toba eruption . . . . .	913	Parameterization . . . . .	994
National Center for Policy Analysis . . . . .	917	Particulates . . . . .	995
National Climate Program Act . . . . .	918	Peer review . . . . .	997
National Research Council (NRC) . . . . .	920	Penguins . . . . .	999
Natural Resources Stewardship Project (NRSP) . . . . .	921	Perfluorocarbons . . . . .	1000
Netherlands . . . . .	922	Permafrost . . . . .	1002
New Orleans . . . . .	924	Pesticides and pest management . . . . .	1004
Nitrogen cycle . . . . .	927	Petroleum hydrocarbons in the ocean . . . . .	1007
Nitrogen fertilization . . . . .	929	pH . . . . .	1009
Nitrous oxide . . . . .	931	Phosphorus cycle . . . . .	1011
Noctilucent clouds . . . . .	933	Photosynthesis . . . . .	1014
Nongovernmental International Panel on Climate Change (NIPCC). . . . .	935	Pinchot, Gifford . . . . .	1017
Nongovernmental Organizations (NGOs) and Climate Change . . . . .	936	Planetary atmospheres and evolution . . . . .	1019
Nonlinear processes . . . . .	938	Plankton . . . . .	1022
North Atlantic Oscillation (NAO) . . . . .	939	Plate tectonics . . . . .	1024
North Korea . . . . .	941	Pleistocene climate . . . . .	1027
Northwest Passage . . . . .	944	Poland . . . . .	1031
Nuclear energy . . . . .	945	Polar bears . . . . .	1034
Nuclear winter . . . . .	949	Polar climate . . . . .	1036
Obama administration efforts on climate change . . . . .	953	Polar stratospheric clouds . . . . .	1039
Ocean acidification . . . . .	956	Polar vortex . . . . .	1041
Ocean disposal . . . . .	959	Pollen analysis . . . . .	1043
Ocean dynamics . . . . .	960	Polluter pays principle . . . . .	1046
Ocean life . . . . .	963	Popular culture . . . . .	1048
Ocean-atmosphere coupling . . . . .	968	Population growth . . . . .	1050
Offsetting . . . . .	969	Portfolio analysis . . . . .	1053
Oil industry . . . . .	971	Poverty and climate change . . . . .	1054
Oregon Institute of Science and Medicine (OISM) . . . . .	977	Precautionary approach . . . . .	1057
		Preindustrial society . . . . .	1058
		Pseudoscience and junk science . . . . .	1059

# TABLE OF CONTENTS

## Volume 3

Abbreviations and Acronyms . . . . .	vii	Siberian river diversion proposal . . . . .	1141
Common Units of Measure . . . . .	ix	Sierra Club . . . . .	1143
Complete List of Contents . . . . .	xv	Sinks . . . . .	1145
Categorized List of Contents . . . . .	xxiii	Skin cancer . . . . .	1147
		Slab-ocean model . . . . .	1149
Radiative damping . . . . .	1065	Soil erosion . . . . .	1151
Radiative forcing . . . . .	1066	Solar cycle . . . . .	1153
Rainfall patterns . . . . .	1067	Solar energy . . . . .	1156
Ramsar Convention . . . . .	1070	SourceWatch . . . . .	1160
Reason Public Policy Institute . . . . .	1072	South Africa . . . . .	1161
Reefs . . . . .	1073	South Korea . . . . .	1163
Regional, local, and microclimates . . . . .	1077	Speculative fiction and climate change . . . . .	1166
Religious Right . . . . .	1079	Stockholm Declaration . . . . .	1169
Renewable energy . . . . .	1082	Storm surges . . . . .	1171
Reservoirs, pools, and stocks . . . . .	1084	Stratigraphy Commission of the Geological Society of London . . . . .	1174
Residence time . . . . .	1086	Stratosphere . . . . .	1175
Response time . . . . .	1087	Subsidiary Body for Scientific and Technological Advice (SBSTA) . . . . .	1177
Revelle, Roger . . . . .	1089	Sulfate aerosols . . . . .	1178
Rowland, F. Sherwood . . . . .	1091	Sulfur cycle . . . . .	1180
Rural air quality . . . . .	1092	Sulfur hexafluoride . . . . .	1183
Russian Federation . . . . .	1095	Sun . . . . .	1184
Sahara Desert . . . . .	1101	Sun protection . . . . .	1187
Sahel drought . . . . .	1103	Sunspots . . . . .	1190
Saltwater intrusion . . . . .	1105	Supreme Court and climate change . . . . .	1192
Santorini (Thera) . . . . .	1107	Sustainable development . . . . .	1195
Saudi Arabia . . . . .	1110	Technological change . . . . .	1201
Sauer, Carl . . . . .	1114	Thermocline . . . . .	1203
Schumacher, E. F. . . . .	1116	Thermohaline Circulation (THC) . . . . .	1204
Science and Public Policy Institute . . . . .	1117	Thermosphere . . . . .	1206
Scientific Alliance . . . . .	1118	Thoreau, Henry David . . . . .	1209
Scientific credentials . . . . .	1119	Thunderstorms . . . . .	1211
Scientific proof . . . . .	1121	Tidal power . . . . .	1213
Sea ice . . . . .	1123	Tire fires . . . . .	1215
Sea sediments . . . . .	1125	Tornadoes . . . . .	1218
Sea surface temperatures . . . . .	1127	Trace gases . . . . .	1221
Sea-level change . . . . .	1130	Transportation . . . . .	1223
Seasonal changes . . . . .	1132	Tree-planting programs . . . . .	1225
Second Assessment Report . . . . .	1134	Tree rings . . . . .	1228
Security . . . . .	1136	Tropical climate . . . . .	1230
Seesaw: polar (or bipolar) . . . . .	1138		
Sequestration . . . . .	1139		

Tropical storms . . . . .	1233	Volcanic CO <sub>2</sub> vs. anthropogenic CO <sub>2</sub> . . . . .	1302
Troposphere. . . . .	1235	Volcanoes . . . . .	1304
Tsunamis . . . . .	1237	Walker circulation . . . . .	1309
Tundra . . . . .	1241	Walker, Gilbert. . . . .	1311
Tuvalu . . . . .	1243	Water quality . . . . .	1312
2015 El Niño . . . . .	1246	Water resources, global . . . . .	1315
Ukraine. . . . .	1249	Water resources, North American . . . . .	1319
Ultraviolet radiation. . . . .	1251	Water rights . . . . .	1321
Union of Concerned Scientists (UCS) . . . . .	1254	Water vapor . . . . .	1324
United Kingdom . . . . .	1256	Wave power and global warming . . . . .	1326
United Nations Climate Change Conference . . . . .	1261	Weather forecasting . . . . .	1328
United Nations Conference on Environment and Development (UNCED) . . . . .	1263	Weather vs. climate . . . . .	1331
United Nations Conference on the Human Environment. . . . .	1265	Wegener, Alfred . . . . .	1334
United Nations Convention on the Law of the Sea (UNCLOS). . . . .	1267	Western Fuels Association . . . . .	1336
United Nations Convention to Combat Desertification (UNCCD). . . . .	1270	Wetlands . . . . .	1337
United Nations Division for Sustainable Development (DSD). . . . .	1271	WGII LESS scenarios . . . . .	1341
United Nations Environment Programme (UNEP). . . . .	1273	Whales . . . . .	1343
United Nations Framework Convention on Climate Change (UNFCCC) . . . . .	1275	Wind power . . . . .	1345
United States . . . . .	1277	World Bank . . . . .	1347
United States Climate Action Report, 2002. . . . .	1282	World Health Organization (WHO). . . . .	1350
United States energy policy . . . . .	1284	World Heritage Sites . . . . .	1351
United States legislation. . . . .	1288	World Meteorological Organization (WMO) . . . . .	1353
Urban heat island (UHI) . . . . .	1293	World Trade Organization (WTO). . . . .	1354
Venice. . . . .	1297	Younger Dryas . . . . .	1357
Volatile organic compounds (VOCs) . . . . .	1299		
		Mediagraphy . . . . .	1361
		Time Line. . . . .	1375
		Glossary . . . . .	1385
		General Bibliography. . . . .	1417
		Web Sites . . . . .	1585
		Subject Index . . . . .	1589