

Epilogue

One Planet Many People

The history of the human race is filled with stories of ingenuity regarding our ability to harness the bounty of nature. Wind powered the sailing ships of explorers, wood and coal fueled railroads that threaded across our continents, and now petroleum fires the engines of our cars and airplanes and allows us to spread to all corners of the planet.

The goods and services from nature have sustained us, moved us, and inspired us. Our cultural heritage was shaped by the vast bounty of the Earth. Our ever-increasing demand for more of nature's goods has left a series of huge footprints—footprints visible from distant points in space. These footprints represent the places we live and work, the places where we gain food, fiber, and minerals, and the ribbons of transportation needed by our highly mobile societies to conduct our businesses.

As this volume illustrates in colorful and graphical ways, our successes may also be our failure. We have advanced our civilizations by conquering nature. As a people, we should respect what we have accomplished. However, we must ultimately ask ourselves the question—“have our efforts to tame the Earth ensured our permanence?” The evidence in the atlas suggests that our victories over nature are incomplete because in the course of our development, we have depleted our resources and contaminated our environment to the point where our future may be one full of struggles

and challenges as we try to access ever more precious commodities from nature on which we depend.

To survive, we must put the era of nature conquest behind us and embark on a new era—the sustainability and stewardship era. In this era, we must cleanse our air and water so that it supports life in the future. We must serve and renew our natural resources so that we have the food, fiber, and energy we need, and we must protect and preserve our remaining natural areas so that they can soothe our spirits and inspire our minds.

In W.L. Thomas's seminal volume on sustainable development published in 1956, Kenneth Boulding closed the dialog by providing the following point-counterpoint. He suggested that the moral of human exploitation of the Earth's resources was “The evolutionary plan went astray by evolving man.” Boulding then offered the perspective of developers by writing “man's a nuisance, man's a crackpot, but only man can hit the jackpot.”

Which perspective is right? From the vantage of space, we can clearly see our footprints on the Earth and we can over time see the expanding size and number of footprints. Our species can take pride in the complex patterns of our cities and farms as these demonstrate our ingenuity and industriousness. Our numbers have grown dramatically yet we can argue

that the overall quality of life has improved. At least on the surface... For while it appears that we have conquered nature, a closer look at the consequences of our footprint reveals the rest of the story. The Earth's environmental systems are changing fast—and maybe too fast. The impacts of our industriousness are changing as fast or maybe even faster than the pace of our footprints. The frequency of extreme events, such as droughts, floods, severe storms, and wildfires is accelerating faster than ever recorded. Our climate is changing more rapidly than ever before, and the rate of species extinction is going up at an alarming rate. From the vantage of space, we can see the footprints of the human race. Unfortunately, by the time we see those footprints, it may already be too late because the undesirable impacts of our actions are already spreading through the Earth's environment.

Boulding's message was simple: Sustain the Earth, keep it healthy, and make it thrive so that it continues to provide for the many people that use it as home. The view from space suggests that we have a lot of work ahead to tailor our behavior so that the Earth provides bounty for eons. And there's no time like the present to get started on the path to sustainability.



The Conservationist's Lament

The world is finite
Resources are scarce
Things are bad
And will be worse
Coal is burnt
And gas exploded
Forests cut
And soils eroded
Wells are drying
Air's polluted
Dust is blowing
Trees uprooted
Oil is going
Ores depleted
Drains receive
What is excreted
Land is sinking
Seas are rising
Man is far
Too enterprising
Fire will rage
With man to fan it
Soon we'll have
A plundered planet
People breed
Like fertile rabbits
People have
Disgusting habits

MORAL...

*The evolutionary plan
Went astray
By evolving Man*

The Technologist's Reply

Man's potential
Is quite terrific
You can't go back
To the Neolithic
The cream is there
For us to skim it
Knowledge is power
And the sky's the limit
Every mouth
Has hands to feed it
Food is found
When people need it
All we need
Is found in granite
Once we have
The men to plan it
Yeast and algae
Give us meat
Soil is almost
Obsolete
Man can grow
To pastures greener
Till all the earth
Is Pasadena

MORAL...

*Man's a nuisance
Man's a crackpot
But only man
Can hit the jackpot*

Kenneth Boulding in:

Thomas, W.L. ed. 1956. *Man's Role in Changing the Face of the Earth*.
Chicago: University of Chicago Press.

Credit: Thomas Lang/UNEP/Topfoto



Acronyms and Abbreviations

AAAS	American Association for the Advancement of Science	GEF	Global Environment Facility
ACT	Action by Church Together	GEO	Global Environment Outlook
AER	Agriculture Economic Research Service, United States Department of Agriculture	GEO3	Global Environmental Outlook Report 3 (UNEP Publication)
AEZ	Agro-ecological Zones	GHG	Greenhouse Gas
AMS	American Meteorological Society	GIS	Geographic Information System
AP	Associated Press	GLC	Global Land Cover
APPEA	Australian Petroleum Production and Exploration Association Ltd.	GLCF	Global Land Cover Facility
Ar	Argon	GPS	Global positioning system
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer	GPW	Gridded Population of the World
BBC	British Broadcasting Corporation	GRID	Global Resource Information Database
BP	British Petroleum	GSFC	Goddard Space Flight Center (NASA)
BRIDGE	BRinging Information to Decision-makers for Global Effectiveness	H ₂ O	Hydrogen dioxide
Btu	British thermal units	HEAVEN	Healthier Environment through the Abatement of Vehicle Emissions and Noise
°C	degree Centigrade	HFCs	Hydrofluorocarbons
CFCs	Chlorofluorocarbons	HNO ₃	Nitric acid
CH ₃ Cl	Methyl chloride	hPa	Hecto pascals, a unit for atmospheric pressure
CH ₄	Methane	IIASA	International Institute for Applied Systems Analysis
CIDA	Canadian International Development Agency	IAEA	The International Atomic Energy Agency
CIESIN	Center for International Earth Science Information Network	ICE	Inventory of Conflict and Environment
CIS	Commonwealth of Independent States	IIEES	International Institute of Earthquake Engineering and Seismology
CITEPA	Inter-professional Technical Centre for Research into Air Pollution	IITK	Indian Institute of Technology Kanpur
CLIRSEN	Center for Integral Surveys of Natural Resources using Remote Sensing (Ecuador)	IPC	International Programs Center, United States Census Bureau, Population Division
cm	Centimetres	IPCC	Intergovernmental Panel on Climate Change
CNPPA	Commission on National Parks and Protected Areas	ISDR	International Strategy for Disaster Reduction
CO	Carbon monoxide	ITOPF	International Tanker Owners Pollution Federation Limited
CO ₂	Carbon dioxide	IUCN	International Union for Conservation of Nature and Natural Resources
CPI	Center-pivot irrigation	JAMS	Japanese Association of Mathematical Sciences
CSIRO	Commonwealth Scientific and Industrial Research Organisation	JAROS	Japan Resources Observation System Organization
CSR	Climatological Solar Radiation	KBG	Kara-Bogaz-Gol, Turkmenistan
DAS	Department of Atmospheric Sciences - University of Illinois at Urbana-Champaign	kcal	kilocalories
DETR	Department of Environment, Transport and Regions (United Kingdom)	kg	kilogrammes
DEWA	Division of Early Warning and Assessment	km	kilometres
DFO	Dartmouth Flood Observatory	km/h	kilometers/hour
DMZ	Demilitarized Zone	km ²	square kilometres
DMS	Defense Meteorological Satellite Program	kWh	Kilo-watt hours
DPRK	Democratic People's Republic of Korea	KWS	Kenya Wildlife Service
EEA	European Environment Agency	lb	pounds
EIA	Energy Information Administration, United States Department of Energy	LDCs	Least Developed Countries
ENSO	El Niño/Southern Oscillation	LHWP	Lesotho Highlands Water Project
EPA	Environmental Protection Agency	LLDCs	Landlocked Developing Countries
EQE	European Quality & Environment	LP DAAC	Land Processes Distributed Active Archive Center
EROS	Earth Resources Observation and Science (National Center)	LPG	Liquefied petroleum gas
ERSDAC	Earth Remote Sensing Data Analysis Center	LUT	Land Utilization Types
ESA	Department of Economic and Social Affairs of the United Nations	LWF	Lutheran World Federation
ETM	Enhanced Thematic Mapper (ETM+).	M	Magnitude
FAO	Food and Agriculture Organisation of the United Nations	m	metres
FEMA	Federal Emergency Management Agency	MDG	Millennium Development Goals
FEWS	Famine Early Warning Systems	MEA	Multilateral Environment Agreement
FOEE	Friends of the Earth Europe	METI	Ministry of Economy Trade and Industry (Japan)
ft	Foot/Feet	MIC	Methyl Isocyanate
		MISR	Multi-angle Imaging SpectroRadiometer
		mm	millimetres
		MODIS	Moderate Resolution Imaging Spectroradiometer
		MOPITT	Measurements of pollution in the troposphere instrument aboard NASA's Terra satellite
		MPA	Multi-satellite Precipitation Analysis

MRS	Metropolitan Region of Santiago	UNESCO	United Nations Educational, Scientific and Cultural Organization
MSS	Multispectral scanner	UNF	United Nations Foundation
Mt.	Mount	UNFCCC	United Nations Framework Convention on Climate Change
n.d.	Not dated	UNFPA	United Nations Population Fund
N ₂	Nitrogen	UNHCR	United Nations High Commissioner for Refugees
N ₂ O	Nitrogen dioxide	UN-ISDR	United Nations Inter-Agency Secretariat of the International Strategy for Disaster Reduction
NASA	National Aeronautics and Space Administration	UPI	United Press International
NCAR	The National Center for Atmospheric Research	USAID	United States Agency for International Development
NCPPR	National Center for Public Policy Research	USCCSP	United States Climate Change Science Program
NCR&LB	National Contractor Referrals and License Bureau	USDA/FAS	United States Department of Agriculture/Foreign Agricultural Service
NDVI	Normalized Difference Vegetation Index	USF	University of San Francisco
NEIC	National Earthquake Information Center	USGS	United States Geological Survey
NOAA	National Oceanic and Atmospheric Administration	USSR	Union of Soviet Socialist Republics
NOx	Nitrogen oxides	UTC	Universal Time
NREL	National Renewable Energy Laboratory	UV	Ultraviolet
NRCS	Natural Resources Conservation Service	VOCNM	Volatile organic compound (non-methane)
NRDC	Natural Resources Defense Council	VOC	Volatile organic compound
NSIDC	National Snow and Ice Data Center	WCMC	World Conservation Monitoring Centre
NSW EPA	New South Wales Environmental Protection Authority	WCST	Wildlife Conservation Society – Tanzania
NWT	Northwestern Territories	WHO	World Health Organization
O ₂	Oxygen	WMO	World Meteorological Organization
O ₃	Ozone	WRI	World Resources Institute
OECD	Organisation for Economic Co-operation and Development	WWF	World Wildlife Fund
OWF	Our World Foundation	WWF/DCP	World Wildlife Fund/Danube-Carpathian Programme
PBS	Public Broadcasting System		
PFCs	Perfluorocarbons	ETM/LANDSAT	Equipped with high resolution instruments, Landsat-7 was successfully launched on 15 April 1999. This satellite carries the Enhanced Thermal Mapper Plus (ETM+), which is an eight-band, multispectral scanning radiometer. The ETM+ is capable of resolving distances of meters in the panchromatic band; 30m (98 feet) in the visible, near and short-wave infrared band; and 60m (197 feet) in the thermal infrared band.
RFD	Reasonably Foreseeable Development	LANDSAT	On 23 July 1972, NASA launched the first in a series of satellites designed to provide repetitive global coverage of the Earth's land masses. It was designated initially as the 'Earth Resources Technology Satellite-A'. The second in this series of Earth resources satellites (designated 'ERTS-B') was launched on 22 January 1975. It was renamed 'Landsat 2' by NASA, which also renamed 'ERTS-1' as 'Landsat 1'. Four additional Landsats were launched in 1978, 1982, and 1999 (Landsat 3, 4, 5 and 7), respectively.
ROK	Republic of Korea	SCANSAR	Scanning synthetic aperture radar (ScanSAR) data is acquired on board the Canadian satellite RADARSAT-1. The RADARSAT-1 satellite was launched on 4 November 1995 and has been providing imagery for operational monitoring services on a global basis ever since. The state-of-the-art Synthetic Aperture Radar (SAR) can be steered to collect data over a 1 175 km (730 miles) wide area using 7 beam modes. This provides users with superb flexibility in acquiring images with a range of resolutions, incidence angles, and coverage area.
RRC-AP	Regional Resource Centre for Asia and the Pacific	IKONOS	Since its launch in September 1999, Space Imaging's IKONOS earth imaging satellite has provided a reliable stream of image data. IKONOS produces 1-meter black-and-white (panchromatic) and 4-meter multispectral (red, blue, green, near infrared) imagery that can be combined in a variety of ways to accommodate a wide range of high-resolution imagery applications.
SAIC	Science Applications International Corporation	QUICKBIRD	The QuickBird satellite, launched in October 2001 on a Boeing Delta II rocket from Vandenberg Air Force Base, California, is the first in a constellation of spacecraft that DigitalGlobe® is developing. QuickBird offers sub-meter resolution imagery, geolocational accuracy, and large on-board data storage. QuickBird's global collection of panchromatic and multispectral imagery is designed to support applications ranging from map publishing to land and asset management to insurance risk assessment.
SARCS	Southeast Asian Regional Committee for START	PHOTOS	Africa Focus; African Wildlife Foundation; Beth Allen; Bigfoto (www.bigfoto.com); Canadian Auto Workers (CAW); Chandra Giri; Christian Lambrechts; Cpl. Mike Escobar; David McKee; David P. Shorthouse; Digital Globe; Dmitry Petrakov; Ed Simpson; Elena; FEMA; Freefoto (freefoto.com); FAO; Gray Tappan; H. Gyde Lund; Hassan Partow; International Centre for Integrated Mountain Development (ICIMOD); IIEES; Invasive.org; Jim Welch; John Townshend; José de Jesús Campos Enríquez; J.P. Eaton; Juan Schlatter; Claudio Donoso; Lorant Czarán; Lumbuenamo Raymond; Lyn Topinka; Lynn Betts; Morgue File (www.Morguefile.com), DT Creations, Kevin Connors; NASA; NOAA; NREL; NRCS; Nik Wheeler; Olga Tutubalina; Peter Aengst; Peter Bardos-Déak, Philip Wijmans; Prof. Dr.-Ing.habil. Volker Quaschnig; Ramesh P. Singh; Randy Cyr; Regional Resource Centre for Asia and Pacific (RRC-AP); Saman Salari Sharif; Sergey Chernomoretz; Servicio Aerofotográfico Nacional, Lima, Perú; Simon Tsuo; South Florida Water Management District; Stephan Volz; Teal H.F. Smith; Topfoto (http://www.topfoto.co.uk/); Topham Photos; Ukrainianweb; UNEP-GRID; USGS; USDA; United States National Park Service; V. Sahanatian; Walter Silverio.
SCOPE	Scientific Committee on Problems on the Environment		
SBSTTA	Subsidiary Body on Scientific, Technical and Technological Advice		
SF ₆	Sulphur hexafluoride		
SIDS	Small Island Developing States		
SIDA	Swedish International Development Cooperation Agency		
SIO	Scripps Institution of Oceanography		
SNHP	Spanish National Hydrological Plan		
SNWA	Southern Nevada Water Authority		
SO ₂	Sulfur dioxide		
SPRI	Scott Polar Research Institute		
SRM	Society for Range Management		
SWERA	Solar and Wind Energy Resource Assessment		
TBR	Transboundary Biosphere Reserve		
TM	Thematic Mapper		
TOMS	Total Ozone Mapping Spectrometer		
TSSC	Technical Support Services Contractor		
UCC	Union Carbide Corporation		
UCIL	Union Carbide India Limited		
UCL	University College London		
UCS	Union of Concerned Scientists		
UGRB	Upper Green River Basin		
UN	United Nations		
UND	University of North Dakota		
UN-DHA	United Nations, Department of Humanitarian Affairs		
UNDP	United Nations Development Programme		
UNDRO	United Nations Disaster Relief Organization		
UNEP	United Nations Environment Programme		

Acknowledgements

UNEP would like to thank the following for their contributions to *One Planet Many People: Atlas of Our Changing Environment*:

Jonathan M. Adams, Department of Biology, Providence College, United States
Robert G. Bailey, United States Department of Agriculture Forest Service, United States
Elgene Box, University of Georgia, United States
Robert Campbell, South Dakota School of Mines and Technology, United States
Ellen Carnevale, Population Reference Bureau, United States
Glenn Carver, Centre for Atmosphere Science, University of Cambridge, United Kingdom
Cyrille Chatelain, Conservatoire du Jardin Botanique, Switzerland
Sergey Chernomorets, University Centre for Engineering Geodynamics and Monitoring, Russia
Lorant Czarán, United Nations, New York
Paul Davis, University of Maryland, United States
Timothy Foresman, International Center for Remote Sensing Education, United States
Johann G. Goldammer, Freiberg University, Germany
David Herring, Earth Observatory, United States
Jean-Michel Jaquet, University of Geneva and United Nations Environment Programme, Global Resources Information Database, Switzerland
Satya P. S. Kushwaha, Forestry & Ecology Division, Indian Institute of Remote Sensing, India
Rebecca Lindsey, Science Systems and Applications, Inc., National Aeronautics and Space Administration, United States
Luisa Maffi, Terralingua, Canada
Martha Maiden, National Aeronautics and Space Administration, United States
James W. Merchant, University of Nebraska – Lincoln, United States
Eleanore Meredith, Earth Satellite Corporation, United States
Roger Mitchell, Earth Satellite Corporation, United States
Erika Monnati, Italy

Sumith Pathirana, Southern Cross University, Australia
Dmitry Petrakov, Moscow State University, Russia
Volker Quaschnig, University of Applied Sciences, Germany
Navin Ramankutty, Center for Sustainability and the Global Environment, Institute for Environmental Studies, University of Wisconsin-Madison, United States
Era Singh, United States
Ramesh Singh, Indian Institute of Technology Kanpur, India
Leena Srivastava, The Energy and Resources Institute (TERI), India
Woody Turner, National Aeronautics and Space Administration, United States
Olga Tutubalina, Moscow State University, Russia
Antoinette Wannebo, Center for International Earth Science Information Network, Columbia University, United States
Wang Wenjie, Intergraph Mapping and Geospatial Solutions, China
Wesley Wettengel, World Wildlife Federation, United States
Ben White, University of Maryland, United States

From the United States Geological Survey, National Center for Earth Resources Observation and Science, United States:

Ron Beck
John Faundeen
Tom Holm
Rachel Kurtz
Janice Nelson

From Science Applications International Corporation, contractor to the United States Geological Survey, National Center for Earth Resources Observation and Science, United States:

Kwabena Asante
Roger Auch
Jon Christopherson
Jeff Danielson
Chandra Giri

Nazmul Hossain
Rynn Lamb
Lee McManus
Sandra Prince
James Rowland
Pat Scaramuzza
G. Gray Tappan

From the United Nations Environment Programme, Division of Early Warning and Assessment:

Johannes Akiwumi, Kenya
Dan Claasen, Kenya
Jesper Koefed, Kenya
Christian Lambrechts, Kenya
Dominique del Pietro, GRID – Geneva
Hassan Partow, GRID – Geneva
Pascal Peduzzi, GRID – Geneva
Walter Silverio, GRID – Geneva
Nicole Strub, GRID – Geneva
Tin Aung Moe, Thailand

Visiting scientists or interns at the United Nations Environment Programme, Global Resources Information Database - Sioux Falls, United States:

Daniel Amamoo-Otchere, Ghana
Lily-Rose Maida Awori, Kenya
Abdullah Daud, Bangladesh
José de Jesús Campos Enríquez, Mexico
Ragna Godtland, United States
Shingo Ikeda, Japan
Alfa N. Isiaku, Nigeria
John Molefe, Botswana
Elitsa Peneva, Bulgaria
Anup Prasad, India
S.K. Puri, India
Anil Raghavan, India
Ryan Reker, United States
Hua Shi, China
Shalini Venkataraman, Singapore

Special thanks goes to the Global Land Cover Facility (GLCF) of the University of Maryland and the National Aeronautics and Space Administration (NASA) Earth Observatory for providing access to satellite data.

Map Credits:

Topographic Map of the World

This image of the world was generated with data from the Global 30-arc second elevation (GTOPO30) dataset. The image is in the Orthographic Projection (Eastern hemisphere centered on 20 north latitude, 65 east longitude; Western hemisphere centered on 15 north latitude, 75 west longitude) commonly used for maps of the world. Elevation data used in this image were acquired by the SRTM aboard the Space Shuttle Endeavour, launched on 11 February 2000. The mission is a cooperative project between NASA, the National Geospatial-Intelligence Agency (NGA) of the U.S. Department of Defense and the German and Italian space agencies. It is managed by NASA's Jet Propulsion Laboratory, Pasadena, California, for NASA's Earth Science Enterprise, Washington, DC, USA. <http://www2.jpl.nasa.gov/srtm/world.htm> on 28 December 2004.

Nightlight Map of the World

This image of Earth's city lights was created with data from the Defense Meteorological Satellite Program (DMSP) Operational Linescan System (OLS). Originally designed to view clouds by moonlight, the OLS is also used to map the locations of permanent lights on the Earth's surface. Data courtesy Marc Imhoff of NASA GSFC and Christopher Elvidge of NOAA NGDC. Image by Craig Mayhew and Robert Simmon, NASA GSFC. <http://visibleearth.nasa.gov> on 30 December 2002.

Daylight Map of the World

NASA Goddard Space Flight Center Image by Reto Stöckli (land surface, shallow water, and clouds). Enhancements by Robert Simmon (ocean color, compositing, 3D globes, animation). Data and technical support: MODIS Land Group; MODIS Science Data Support Team; MODIS Atmosphere Group; MODIS Ocean Group Additional data: USGS EROS Data Center (topography); USGS Terrestrial Remote Sensing Flagstaff Field Center (Antarctica). <http://visibleearth.nasa.gov> on 30 December 2004.

Earthquake Map of the World

The earthquake map was produced by overlaying earthquake data (major earthquakes, 1995-2004), shown as dots of varying sizes depending on magnitude on the Richter scale, over a global elevation map produced from the Global 30-arc second elevation (GTOPO30) dataset. The earthquake data are from the U.S Geological Survey National Earthquake Information Centre, <http://neic.usgs.gov/> on 15 February 2005. The GTOPO30 data are from the National Center for Earth Resources Observation and Science. <http://edcdaac.usgs.gov/gtopo30/gtopo30.html> on 15 February 2005.

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