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

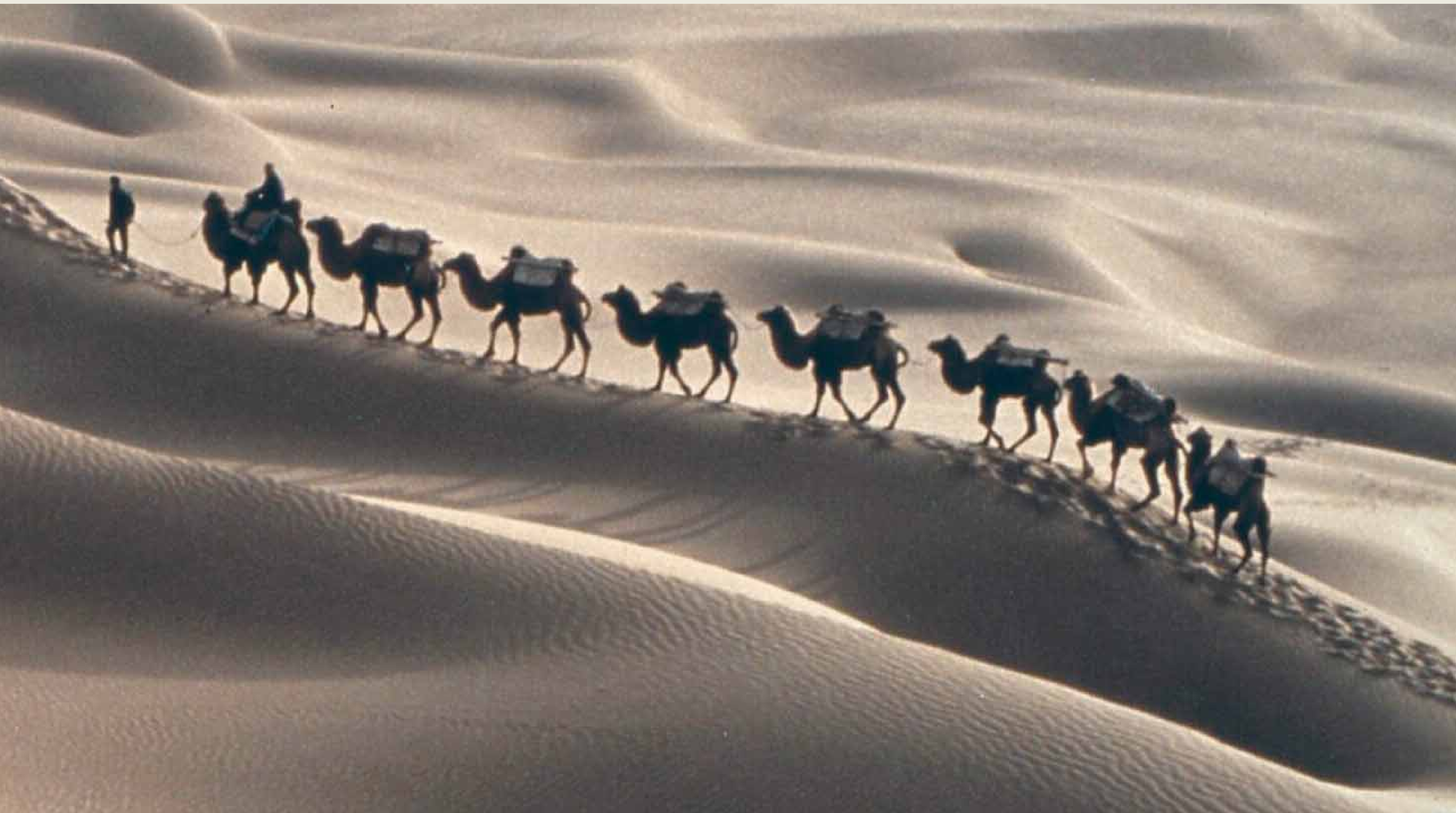
The Technologist's Reply

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
ACT	Action by Church Together
AER	Agriculture Economic Research Service, United States Department of Agriculture
AEZ	Agro-ecological Zones
AMS	American Meteorological Society
AP	Associated Press
APPEA	Australian Petroleum Production and Exploration Association Ltd.
Ar	Argon
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer
BBC	British Broadcasting Corporation
BP	British Petroleum
BRIDGE	BRinging Information to Decision-makers for Global Effectiveness
Btu	British thermal units
ºC	degree Centigrade
CFCs	Chlorofluorocarbons
CH_3Cl	Methyl chloride
CH_4	Methane
CIDA	Canadian International Development Agency
CIESIN	Center for International Earth Science Information Network
CIS	Commonwealth of Independent States
CITEPA	Inter-professional Technical Centre for Research into Air Pollution
CLIRSEN	Center for Integral Surveys of Natural Resources using Remote Sensing (Ecuador)
cm	Centimetres
CNPPA	Commission on National Parks and Protected Areas
CO	Carbon monoxide
CO_2	Carbon dioxide
CPI	Center-pivot irrigation
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSR	Climatological Solar Radiation
DAS	Department of Atmospheric Sciences - University of Illinois at Urbana-Champaign
DETR	Department of Environment, Transport and Regions (United Kingdom)
DEWA	Division of Early Warning and Assessment
DFO	Dartmouth Flood Observatory
DMZ	Demilitarized Zone
DMS	Defense Meteorological Satellite Program
DPRK	Democratic People's Republic of Korea
EEA	European Environment Agency
EIA	Energy Information Administration, United States Department of Energy
ENSO	El Niño/Southern Oscillation
EPA	Environmental Protection Agency
EQE	European Quality & Environment
EROS	Earth Resources Observation and Science (National Center)
ERSDAC	Earth Remote Sensing Data Analysis Center
ESA	Department of Economic and Social Affairs of the United Nations
ETM	Enhanced Thematic Mapper (ETM+).
FAO	Food and Agriculture Organisation of the United Nations
FEMA	Federal Emergency Management Agency
FEWS	Famine Early Warning Systems
FOEE	Friends of the Earth Europe
ft	Foot/Feet
GEF	Global Environment Facility
GEO	Global Environment Outlook
GEO3	Global Environmental Outlook Report 3 (UNEP Publication)
GHG	Greenhouse Gas
GIS	Geographic Information System
GLC	Global Land Cover
GLCF	Global Land Cover Facility
GPS	Global positioning system
GPW	Gridded Population of the World
GRID	Global Resource Information Database
GSFC	Goddard Space Flight Center (NASA)
H_2O	Hydrogen dioxide
HEAVEN	Healthier Environment through the Abatement of Vehicle Emissions and Noise
HFCs	Hydrofluorocarbons
HNO_3	Nitric acid
hPa	Hecto pascals, a unit for atmospheric pressure
IIASA	International Institute for Applied Systems Analysis
IAEA	The International Atomic Energy Agency
ICE	Inventory of Conflict and Environment
IIEES	International Institute of Earthquake Engineering and Seismology
IITK	Indian Institute of Technology Kanpur
IPC	International Programs Center, United States Census Bureau, Population Division
IPCC	Intergovernmental Panel on Climate Change
ISDR	International Strategy for Disaster Reduction
ITOPF	International Tanker Owners Pollution Federation Limited
IUCN	International Union for Conservation of Nature and Natural Resources
JAMS	Japanese Association of Mathematical Sciences
JAROS	Japan Resources Observation System Organization
KBG	Kara-Bogaz-Gol, Turkmenistan
kcal	kilocalories
kg	kilogrammes
km	kilometres
km/h	kilometers/hour
km^2	square kilometres
kWh	Kilo-watt hours
KWS	Kenya Wildlife Service
lb	pounds
LDCs	Least Developed Countries
LHWP	Lesotho Highlands Water Projet
LLDCs	Landlocked Developing Countries
LP DAAC	Land Processes Distributed Active Archive Center
LPG	Liquefied petroleum gas
LUT	Land Utilization Types
LWF	Lutheran World Federation
M	Magnitude
m	metres
MDG	Millennium Development Goals
MEA	Multilateral Environment Agreement
METI	Ministry of Economy Trade and Industry (Japan)
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
MSS	Multispectral scanner
Mt.	Mount
n.d.	Not dated
N_2	Nitrogen
N_2O	Nitrogen dioxide
NASA	National Aeronautics and Space Administration
NCAR	The National Center for Atmospheric Research
NCPPR	National Center for Public Policy Research
NCR&LB	National Contractor Referrals and License Bureau
NDVI	Normalized Difference Vegetation Index
NEIC	National Earthquake Information Center
NOAA	National Oceanic and Atmospheric Administration
NOx	Nitrogen oxides
NREL	National Renewable Energy Laboratory
NRCS	Natural Resources Conservation Service
NRDC	Natural Resources Defense Council
NSIDC	National Snow and Ice Data Center
NSW EPA	New South Wales Environmental Protection Authority
NWT	Northwestern Territories
O_2	Oxygen
O_3	Ozone
OECD	Organisation for Economic Co-operation and Development
OWF	Our World Foundation
PBS	Public Broadcasting System
PFCs	Perfluorocarbons
RFD	Reasonably Foreseeable Development
ROK	Republic of Korea
RRC-AP	Regional Resource Centre for Asia and the Pacific
SAIC	Science Applications International Corporation
SARCS	Southeast Asian Regional Committee for START
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
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNF	United Nations Foundation
UNFCCC	United Nations Framework Convention on Climate Change
UNFPA	United Nations Population Fund
UNHCR	United Nations High Commissioner for Refugees
UN-ISDR	United Nations Inter-Agency Secretariat of the International Strategy for Disaster Reduction
UPI	United Press International
USAID	United States Agency for International Development
USCCSP	United States Climate Change Science Program
USDA / FAS	United States Department of Agriculture / Foreign Agricultural Service
USF	University of San Francisco
USGS	United States Geological Survey
USSR	Union of Soviet Socialist Republics
UTC	Universal Time
UV	Ultraviolet
VOCNM	Volatile organic compound (non-methane)
VOC	Volatile organic compound
WCMC	World Conservation Monitoring Centre
WCST	Wildlife Conservation Society – Tanzania
WHO	World Health Organiation
WMO	World Meteorological Organization
WRI	World Resources Institute
WWF	World Wildlife Fund
WWF / DCP	World Wildlife Fund / Danube-Carpathian Programme

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 infraredband.

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.

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.

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.

QUICKBIRD The QuickBird satellite, launched in October 2001on 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.

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 Enrîquez; J.P. Eaton; Juan Schlatter; Claudio Donoso; Lorant Czaran; 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 Quaschning; Ramesh P. Singh; Randy Cyr; Regional Resource Centre for Asia and Pacific (RRC-AP); Saman Salari Sharif,; Sergey Chernomorets ; 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. Sahanatien; Walter Silverio.

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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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