

AFRICA

ATLAS OF OUR CHANGING ENVIRONMENT

© 2008, United Nations Environment Programme

ISBN: 978-92-807-2871-2

Job Number: DEW/1000/NA

This publication may be reproduced in whole or in part and in any form for educational or non-profit purposes without special permission from the copyright holder, provided acknowledgement of the source is made. UNEP and the authors would appreciate receiving a copy of any publication that uses this report as a source.

No use of this publication may be made for resale or for any other commercial purpose whatsoever without prior permission in writing from the United Nations Environment Programme.

United Nations Environment Programme
PO Box 30552, Nairobi 00100, Kenya
Tel: +254 20 7621234
Fax: +254 20 7623943/44
<http://www.unep.org>

United Nations Environment Programme
Division of Early Warning and Assessment-North America
47914 252nd Street, USGS, The Earth Resources Observation and Science (EROS) Center
Sioux Falls, SD 57198-0001 USA
Tel: 1-605-594-6117
Fax: 1-605-594-6119
info@na.unep.net
www.na.unep.net

For bibliographic and reference purposes this publication should be referred to as:

UNEP (2008), "Africa: Atlas of Our Changing Environment."
Division of Early Warning and Assessment (DEWA)
United Nations Environment Programme (UNEP)
P.O. Box 30552
Nairobi 00100, Kenya

This book is available from Earthprint.com, <http://www.earthprint.com>.

Printed by ProgressPress Inc., Malta

Distribution by SMI London

The following organisations collaborated on this Atlas:

- The African Ministerial Conference on the Environment (AMCEN)
- United Nations Environment Programme (UNEP)
- Group on Earth Observations (GEO)
- Southern African Development Community (SADC)
- Regional Centre for Mapping of Resources for Development (RCMRD)
- Environmental Information Systems – Africa (EIS - Africa)
- African Association of Remote Sensing of the Environment (AARSE)
- Belgium Development Fund
- United States Geological Survey (USGS)
- United States Agency for International Development (USAID)
- World Resources Institute (WRI)
- South Dakota State University (SDSU)
- University of Maryland (UMD)

The funding support for this Atlas was provided by UNEP, Belgium Development Fund, and USAID. USGS EROS, the host of UNEP/GRID-Sioux Falls, provided all the necessary support needed for visiting scientists and production of this Atlas.

Special thanks are extended to the National Aeronautics and Space Administration (NASA), the US National Geospatial-Intelligence Agency (NGA), DigitalGlobe, and GeoEye for providing access to satellite data, and Environmental Systems Research Institute (ESRI) for software support.

DISCLAIMER

The views expressed in this publication are not necessarily those of the agencies cooperating in this project. The designations employed and the presentations do not imply the expression of any opinion whatsoever on the part of UNEP or cooperating agencies concerning the legal status of any country, territory, city, or area of its authorities, or the delineation of its frontiers or boundaries.

Mention of a commercial company or product in this report does not imply endorsement by the United Nations Environment Programme. The use of information from this publication concerning proprietary products for publicity or advertising is not permitted. Trademark names and symbols are used in an editorial fashion with no intention of infringement on trademark or copyright laws.

We regret any errors or omissions that may have been unwittingly made.

UNEP promotes environmentally sound practices globally and in its own activities. This publication is printed on 100 per cent chlorine free paper from sustainably managed forests. Our distribution policy aims to reduce UNEP's carbon footprint.

AFRICA

ATLAS OF OUR CHANGING ENVIRONMENT





A Rwandan dance troupe

Table of Contents

Preface	viii
Foreword	ix
Reader's Overview.....	x
CHAPTER 1: Africa	
Introduction.....	1
1.1: Africa's Geography	2
The Land	2
Soils	3
Deserts.....	3
Mountains.....	4
<i>The Great Rift Valley</i>	5
Coasts	5
Water Resources.....	6
Rivers.....	7
Lakes	7
Wetlands.....	7
Climate Zones	8
The Plants and Animals	10
People	12
1.2: Africa's Changing Environment	13
Natural Change and Population.....	13
Changing Population	13
Urban Population.....	14
Coastal Population	14
Air and Atmosphere	16
Land Cover and Land Use	16
<i>More People, More Trees: Success Story in Niger</i>	16
Land Conversion	17
Deforestation	18
Changes in Land Productivity	19
Land Degradation	19
Desertification	19
Water	20
Freshwater.....	20
<i>Freshwater Fish</i>	20
Wetlands.....	21
Coastal and Marine Environments.....	22
<i>Benguela Current Large Marine Ecosystem</i>	22
Biodiversity.....	23
8 Biological Hotspots of Africa	24
A Few African Animals Extinct in the Wild	26
1.3: Earth Observations	28
Africa at Night.....	28
Africa – Lightning Centre of the World	29
<i>Gas Flaring in the Niger Delta</i>	29
Global Land Surface Temperature	29
<i>Flooding in Mali</i>	29
Africa and Ultra Violet (UV) Exposure.....	30
Global Phytoplankton Distribution	30
<i>Phytoplankton Bloom off Namibia</i>	30
<i>Crater Highlands, United Republic of Tanzania</i>	31
Global Sea Surface Temperature	31
<i>Botswana Salt Pans</i>	31
<i>Saharan Dust has Chilling Effect on North Atlantic</i>	32
<i>Soil Moisture Monitoring in Southern Africa</i>	32
<i>Smart Sensing of Volcanoes</i>	33
References	34

CHAPTER 2: Transboundary Environmental Issues

Across Country Borders.....	39
2.1: Transboundary Ecosystems and Protected Areas	41
Ecosystems and Protected Areas	41
Transboundary Ecosystems	42
<i>The Congo Basin Forests</i>	42
Transboundary Protected Areas	43
<i>Maasai Mara – Serengeti Protected Areas in East Africa</i>	44
<i>W-Arby-Pendjari Parks Complex</i>	45
<i>The Great Limpopo Transfrontier Park</i>	45
<i>Mountain Gorilla Conservation in the Virunga Heartland</i>	46
<i>Southern Sudan: A Survival Surprise</i>	46
2.2: Transboundary Water Resources	47
Transboundary River Basins.....	47
<i>Lake Victoria: Africa’s Largest Freshwater Lake</i>	48
Historical water level elevations of Lake Victoria.....	48
High population growth rate around Lake Victoria	48
Lake Victoria’s Winam Gulf.....	49
Water Hyacinth in Lake Victoria, 1995-2001	50
<i>Lake Chad: Africa’s Shrinking Lake</i>	52
Declining Water Levels in Lake Chad, 1972-2007.....	53
<i>Okavango: The World’s Largest Inland Delta</i>	56
2.3: Transboundary Movement of People	57
Conflicts and Refugees.....	57
<i>Dadaab Refugee Camp</i>	58
<i>The Parrot’s Beak Region</i>	59
<i>Darfur Conflict</i>	60
2.4: Transboundary Movement of Pollutants	61
Dust Storms and Fires.....	61
Dust storms	62
<i>Dust Storm in the Bodele Depression</i>	62
Aerosols.....	63
<i>Smoke Spreading From Greece to Africa</i>	63
Fires	64
<i>Biomass Burning in Africa</i>	64
<i>Seasonal Pattern of Wildland Fires</i>	65
Carbon Monoxide Pollution: A Result of Biomass Burning.....	66
<i>Widespread Fires Release High Levels of CO</i>	66
<i>Southern Africa: Hotspot for Nitrogen Dioxide (NO₂)</i>	67
2.5: Conclusion	67
References	68

CHAPTER 3: Tracking Progress Towards Environmental Sustainability

3.1 United Nations Millennium Development Goals—The Millennium Declaration	73
3.2 Country Profiles and Images of Our Changing Environment	76
Epilogue	354
References	355
Acronyms and Abbreviations.....	368
Annex I: Changes in MDG Goal 7: Environmental Sustainability Indicators	369
About Remote Sensing Images and Aerial Photographs Used in this Publication	370
Index.....	371
Acknowledgements	373