

Changes in MDG Goal 7: Environmental Sustainability Indicators	Forested Land as % of Land Area		Carbon Dioxide emissions (CO ₂), metric tons of CO ₂ per capita		Protected area to total surface, area percentage		Access to Improved Water source (% of total population)		Access to Improved Sanitation (% of total population)		Slum Population as percentage of urban population	
	1990	2005	1990	2004	1990	2005	1990	2004	1990	2004	1990	2001
Country Names												
Algeria, People's Democratic Republic of	0.8	1	3.0471	5.994	5	5	94	85	88	92	11.8	11.8
Angola, Republic of	48.9	47.4	0.4413	0.5051	12.1	12.1	36	53	29	31	83.1	83.1
Benin, Republic of	30	21.3	0.138	0.2902	23	23	63	67	12	33	80.3	83.6
Botswana, Republic of	24.2	21.1	1.5876	2.3693	29.4	30.2	93	95	38	42	59.2	60.7
Burkina Faso	30.6	29	0.112	0.0812	14.9	15.4	38	61	7	13	80.9	76.5
Burundi, Republic of	11.3	5.9	0.0341	0.0291	4.4	5.6	69	79	44	36	83.3	65.3
Cameroon, Republic of	52.7	45.6	0.1312	0.2205	5.4	8.9	50	66	48	51	62.1	67
Cape Verde, Republic of	14.3	20.7	0.2476	0.5553	0	0		80		43	70.3	69.6
Central African Republic	37.2	36.5	0.0658	0.0614	15.1	15.7	52	75	23	27	94	92.4
Chad, Republic of	10.4	9.5	0.0234	0.0127	9.3	9.3	19	42	7	9	99.3	99.1
Comoros, Union of the	6.5	2.9	0.1253	0.1132		2.7	93	86	32	33	61.7	61.2
Congo, Republic of the	66.5	65.8	0.4844	1.0034	6.4	14.1		58		27	84.5	90.1
Congo, Democratic Republic of the	62	58.9	0.1047	0.037	7.2	8.4	43	46	16	30	51.9	49.5
Côte d'Ivoire, Republic of	32.1	32.7	0.4217	0.2825	16.4	16.4	69	84	21	37	50.5	67.9
Djibouti, Republic of	0.2	0.2	0.6278	0.4639			72	73	79	82		
Egypt, Arab Republic of	0	0.1	1.369	2.2116	6.5	13.3	94	98	54	70	57.5	39.9
Equatorial Guinea, Republic of	66.3	58.2	0.3454	11.4748	4.9	14.3		43		53	89.1	86.5
Eritrea	16	15.4		0.1735	3.2	3.2	43	60	7	9	69.9	69.9
Ethiopia, Federal Democratic Republic of	13.8	11.9	0.058	0.1037	16.9	16.9	23	22	3	13	99	99.4
Gabonese Republic	85.1	84.5	6.5306	1.0796	4.7	16.2		88		36	56.1	66.2
Gambia, Republic of the	39.1	41.7	0.1981	0.1821	3.9	4.1		82		53	67	67
Ghana, Republic of	32.7	24.2	0.2419	0.326	14.6	14.7	55	75	15	18	80.4	69.6
Guinea, Republic of	30.1	27.4	0.1677	0.1515	3.3	6.1	44	50	14	18	79.6	72.3
Guinea-Bissau, Republic of	78.8	73.7	0.2056	0.1752	3.2	7.3		59		35	93.4	93.4
Kenya, Republic of	6.5	6.2	0.2485	0.3054	12.5	12.7	45	61	40	43	70.4	70.7
Lesotho, Kingdom of	0.2	0.3			0.2	0.2		79	37	37	49.8	57
Liberia, Republic of	42.1	32.7	0.2179	0.1401	12.7	12.7	55	61	39	27	70.2	55.7
Libyan Arab Jamahiriya, Socialist People's	0.1	0.1	8.6612	10.331	0.1	0.1	71		97	97	35.2	35.2
Madagascar, Republic of	23.5	22.1	0.0783	0.1506	1.8	2.6	40	50	14	34	90.9	92.9
Malawi, Republic of	41.4	36.2	0.0637	0.081	16.4	16.4	40	73	47	61	94.6	91.1
Mali, Republic of	11.5	10.3	0.055	0.0501	1.6	2.1	34	50	36	46	94.1	93.2
Mauritania, Islamic Republic of	0.4	0.3	1.3551	0.8866	1.7	1.7	38	53	31	34	94.3	94.3
Mauritius, Republic of	19.2	18.2	1.3844	2.598	0.5	0.9	100	100		94		
Morocco, Kingdom of	9.6	9.8	0.9473	1.3654	0.8	1.2	75	81	56	73	37.4	32.7
Mozambique, Republic of	25.5	24.6	0.0736	0.1079	7.6	8.6	36	43	20	32	94.5	94.1
Namibia, Republic of	10.6	9.3	0.0052	1.2394	14.6	14.6	57	87	24	25	42.3	37.9
Niger, Republic of the	1.5	1	0.1341	0.0947	6.6	6.6	39	46	7	13	96	96.2
Nigeria, Federal Republic of	18.9	12.2	0.4803	0.8263	3.7	6.1	49	48	39	44	80	79.2
Rwanda, Republic of	12.9	19.5	0.0724	0.0632	3.9	7.6	59	74	37	42	82.2	87.9
Sao Tome and Principe, Democratic Republic	28.4	28.4	0.5683	0.6106				79		25		
Senegal, Republic of	48.6	45	0.397	0.4353	10.8	10.8	65	76	33	57	77.6	76.4
Seychelles, Republic of	88.9	88.9	1.5783	6.4395	1	1	88	88				
Sierra Leon, Republic of	42.5	38.5	0.0816	0.1843	3.9	3.9		57		39	90.9	95.8
Somali Republic	13.2	11.4	0.0027		0.7	0.7		29		26	96.3	97.1
South Africa, Republic of	7.6	7.6	9.0777	9.1927	5.6	6.1	83	88	69	65	46.2	33.2
Sudan, Republic of the	32.1	28.4	0.2077	0.287	4.7	4.7	64	70	33	34	86.4	85.7
Swaziland, Kingdom of	27.4	31.5	0.4917	0.8589	3.5	3.5		62		48		
United Republic of Tanzania	46.9	39.9	0.0916	0.116	38	38.4	46	62	47	47	99.1	92.1
Togolese Republic	12.6	7.1	0.1898	0.3805	11.2	11.2	50	52	37	35	80.9	80.6
Tunisia, Republic of	4.1	6.8	1.6144	2.2895	1.2	1.3	81	93	75	85	9	3.7
Uganda, Republic of	25	18.4	0.0456	0.0651	25.6	26.3	44	60	42	43	93.8	93
Western Sahara, Non-Self-Governing Territory of	3.8	3.8	0.8967	0.5726	7.1	7.1						
Zambia, Republic of	66.1	57.1	0.3011	0.203	40.6	41.5	50	58	44	55	72	74
Zimbabwe, Republic of	57.5	45.3	1.5882	0.8106	14.7	14.7	78	81	50	53	4	3.4

* Improvements are marked in "Green and Bold"

About Remote Sensing Images and Aerial Photographs Used in this Publication

The Landsat satellite program, jointly managed by NASA and the U.S. Geological Survey, has collected and archived images of the Earth's surface for over 35 years. This historical record provides a unique opportunity for identifying and documenting areas of environmental change anywhere on the planet. The majority of the remote sensing images used in this atlas are Landsat images.

The sensors used in the Landsat series are referred to as “multi-spectral” sensors. They collect reflected electromagnetic energy from the visible range (400 to 700 nanometers) as well as wavelengths that the human eye cannot see (700-2 350 nanometers) and thermal energy. Multi-spectral sensors divide the electromagnetic spectrum into a small number of “bands” or ranges of wavelength. For example Landsat-7 collects electromagnetic radiation in eight different bands or ranges of wavelength (see table). Each of these ranges of “light” can tell us something different about the Earth's surface.

To create viewable images from multi-spectral sensors, three of the available bands are selected and displayed, each through one of the three colours of standard monitor displays—red, green and blue. This can sometimes yield an image that is not intuitive for the non-specialist to interpret (left image). By selecting certain bands and adjusting the distribution of brightness, the overall brightness and the contrast, a more intuitive looking image can be achieved (right image). The images in this atlas have been adjusted so that non-expert readers can interpret these images more easily. The specific sensors and the band combinations used in chapter three can be found the references at the end of the chapter.

In general, the images are displayed so that growing vegetation shows as various shades of green. Conifer forests will generally

Both of these images are from the same Landsat-7 remote sensing image taken over the Everglades of Florida, USA in March of 2002. On the left bands 1, 2 and 3 are shown as red, green and blue respectively with the contrast and brightness determined by the default settings of a standard Geographic

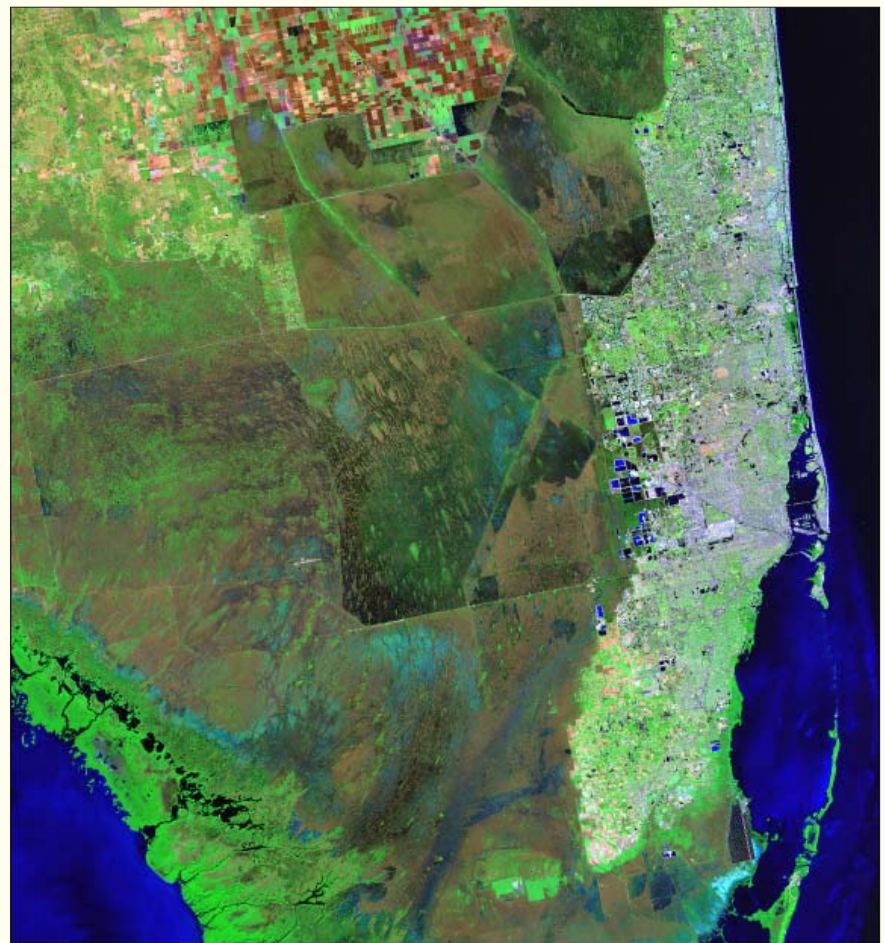
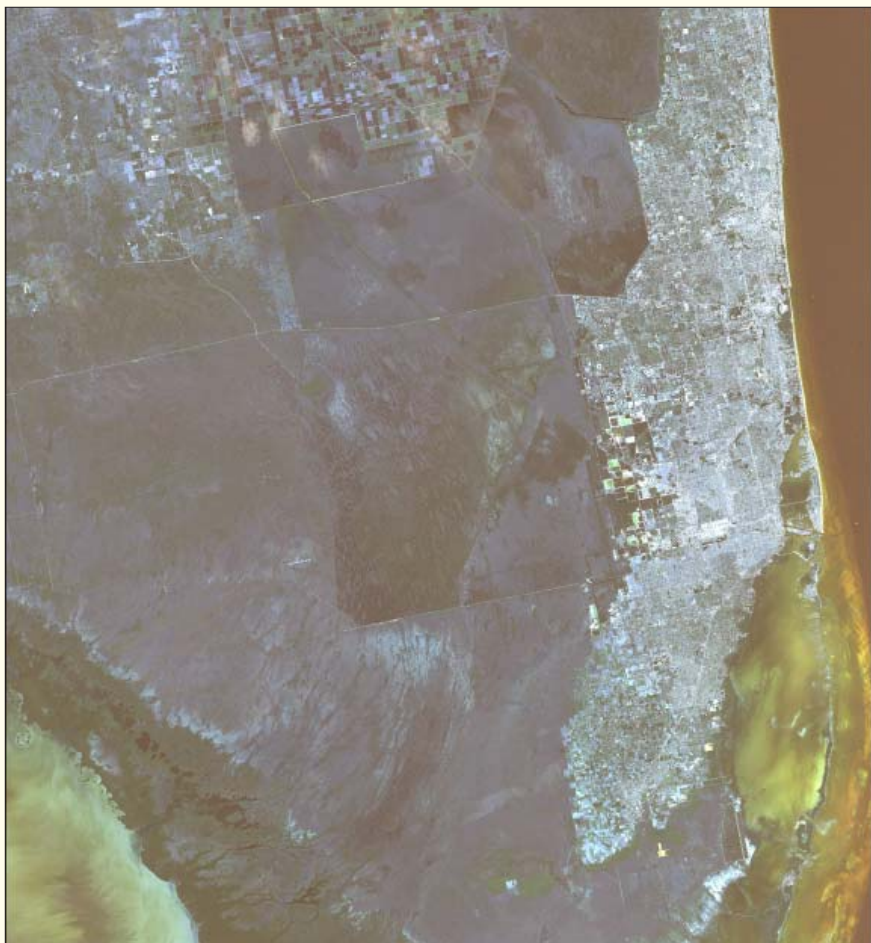
Landsat-7 ETM+ Bands		
Band	Spectral Range (nm)	Description
1	450 to 515 nm	blue-green light
2	525 to 605 nm	green light
3	630 to 690 nm	red light
4	775 to 900 nm	near-infrared radiation
5	1 550 to 1 750 nm	mid-infrared radiation
6	10 400 to 12 500 nm	thermal-infrared radiation
7	2 090 to 2 350 nm	mid-infrared radiation
8	520 to 900 nm	pan-chromatic

show as darker shades of green as will mangroves to a lesser degree. Broadleaf forests are typically a slightly brighter shade of green. Agricultural fields with actively growing crops can show as a still brighter shade of green; however this is dependant on the crop and its state of growth. The patterns of brightness are often important clues as to the nature of the vegetation as well. Senescent or inactive vegetation generally appears as shades of gray and brown.

Water bodies will generally be blue to black in appearance, however when sediment is present or the water is shallow it will appear lighter even taking on a pink caste. Areas of bare ground will show as bright usually almost white while urban areas and roads generally appear as a shade of pale purple. Clouds, when they cannot be avoided, will appear as bright white.

In addition to Landsat images, data from other sensors such as ASTER¹ and MODIS², have been used as well as the high resolution commercial sensors QuickBird³ and IKONOS⁴, declassified spy satellite images (Corona and Argon)⁵ and aerial photography.

Information System software program. On the right bands 7, 4 and 2 are displayed as red, green and blue and the contrast and brightness have been adjusted.



1 ASTER (The Advanced Spaceborne Thermal Emission and Reflection Radiometer) is a sensor aboard the TERRA satellite is a joint effort between National Aeronautics and Space Administration (NASA) and Japan's Earth Remote Sensing Data Analysis Center (ERSDAC).

2 MODIS (Moderate Resolution Imaging Spectroradiometer) is a sensor carried on NASA's TERRA and AQUA satellites.

3 QuickBird is a high resolution commercial multispectral sensor aboard the QuickBird satellite, operated by DigitalGlobe.

4 IKONOS is a high resolution commercial multispectral sensor aboard GeoEye's IKONOS satellite.

5 Corona and Argon are U.S. photographic surveillance satellites flown from the 1950s through the early 1970s.