"Achieving MDG 7 is an important precondition
for achieving all the other MDGs"

-Achim Steiner

United Nations Under-Secretary General
Executive Director of the United Nations
Environment Programme (UNEP) 2006
(Steiner 2006)

Chapter 2: Millennium Development Goals

This chapter has a special focus: it assesses Kenya's progress towards achieving the targets associated with the Millennium Development Goals. As shown in Chapter 1, environmental goods and services underpin economic and social development; thus maintaining and improving the environment's viability is essential for Kenya to be able to adequately support its growing population and achieve its development plans. In its efforts to achieve Vision 2030, the Government of Kenya is working towards a long-term plan based on the Millennium Development Goals (MDGs). In addition to increasing budgetary allocation for them and tracking and monitoring progress, it has undertaken a number of capacity-building and sensitization activities at the district level. This chapter notes how Kenya has made important strides towards achieving some of the MDG targets, while reversing environmental degradation remains a major challenge.

The Millennium Declaration

The eight Millennium Development Goals (MDGs) (Table 1 on the following page) provide a framework to plan and implement development, and include time-bound targets and indicators by which progress can be measured over the period from 1990 until 2015 when the targets are expected to be met. Each year, the United Nations Secretary-General presents a report to the United Nations General Assembly on progress achieved towards implementing the Declaration, based on the 60 selected indicators and 21 targets aggregated at global and regional levels.

By 2008, it was apparent that no African country was likely to achieve all of its goals by 2015. The international community strengthened partnerships with Africa at the highest level to ensure that its development needs are mainstreamed in the global economy. Numerous environmental, social, and political constraints, however, continuously pose significant challenges to achieving the MDGs in Africa (IISD 2008). Figure 1 shows the proportion of sub-Saharan countries that had attained various levels of seven of the MDGs.

Painted face and headdress of a Kikuyu tribeswoman

The Kikuyu make up the largest tribal population in Kenya. There are about 5 347 000 Kikuyu people in Kenya, equal to about 22 per cent of Kenya's total population. By tradition, the Kikuyu are farmers; their homelands in the foothills of Mt. Kenya and highlands on either side of the Rift Valley are some of the most intesively farmed areas of the country (Gordon 2005, CIA 1996).
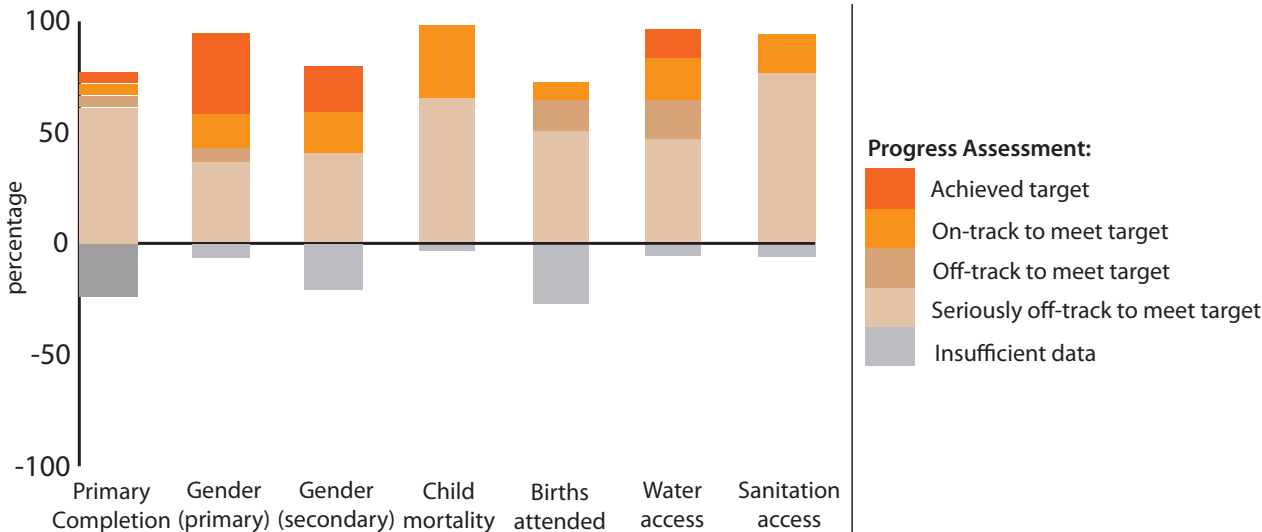

Figure 1: Sub-Saharan Africa's progress towards MDG targets (Source: World Bank 2008)

Table 1: The MDGs and their associated targets and indicators

Goals and Targets (from the Millennium Declaration)	Indicators for monitoring progress
Goal 1: Eradicate extreme poverty and hunger	
Target 1.A: Halve, between 1990 and 2015, the proportion of people whose income is less than one dollar a day	1.1 Proportion of population below $1 (PPP) per day[a] 1.2 Poverty gap ratio 1.3 Share of poorest quintile in national consumption
Target 1.B: Achieve full and productive employment and decent work for all, including women and young people	1.4 Growth rate of GDP per person employed 1.5 Employment-to-population ration 1.6 Proportion of employed people living below $1 (PPP) per day 1.7 Proportion of own-account and contributing family workers in total employment
Target 1.C: Halve, between 1990 and 2015, the proportion of people who suffer from hunger	1.8 Prevalence of underweight children under-five years of age 1.9 Proportion of population below minimum level of dietary energy consumption
Goal 2: Achieve universal primary education	
Target 2.A: Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling	2.1 Net enrolment ratio in primary education 2.2 Proportion of pupils starting grade 1 who reach grade 5 2.3 Literacy rate of 15-24 year-olds
Goal 3: Promote gender equality and empower women	
Target 3.A: Eliminate gender disparity in primary and secondary education, preferably by 2005, and in all levels of education no later than 2015	3.1 Ratios of girls to boys in primary, secondary and tertiary education 3.2 Share of women in wage employment in the non-agricultural sector 3.3 Proportion of seats held by women in national parliament
Goal 4: Reduce child mortality	
Target 4.A: Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate	4.1 Under-five mortality rate 4.2 Infant mortality rate 4.3 Proportion of one year-old children immunised against measles
Goal 5: Improve maternal health	
Target 5.A: Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio	5.1 Maternal mortality ratio 5.2 Proportion of births attended by skilled health personnel
Target 5.B: Achieve, by 2015, universal access to reproductive health	5.3 Contraceptive prevalence rate 5.4 Adolescent birth rate 5.5 Antenatal care coverage (at least one visit and at least four visits) 5.6 Unmet need for family planning
Goal 6: Combat HIV/AIDS, malaria and other diseases	
Target 6.A: Have halted by 2015 and begun to reverse the spread of HIV/AIDS	6.1 HIV prevalence among population aged 15-24 years 6.2 Condom use at last high-risk sex 6.3 Proportion of population aged 15-24 years with comprehensive correct knowledge of HIV/AIDS 6.4 Ratio of school attendance of orphans to school attendance of non-orphans aged 10-14 years
Target 6.B: Achieve, by 2010, universal access to treatment for HIV/AIDS for all who need it	6.5 Proportion of population with advanced HIV infection with access to antiretroviral drugs
Target 6.C: Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases	6.6 Incidence and death rates associated with malaria 6.7 Proportion of children under 5 sleeping under insecticide-treated bednets 6.8 Proportion of children under 5 with fever who are treated with appropriate anti-malarial drugs 6.9 Incidence, prevalence and death rates associated with tuberculosis 6.10 Proportion of tuberculosis cases detected and cured under directly observed treatment short course
Goal 7: Ensure environmental sustainability	
Target 7.A: Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources	7.1 Proportion of land area covered by forest 7.2 CO_2 emissions, total, per capita and per $1 GDP (PPP) 7.3 Consumption of ozone-depleting substances 7.4 Proportion of fish stocks within safe biological limits 7.5 Proportion of total water resources
Target 7.B: Reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss	7.6 Proportion of terrestrial and marine areas protected 7.7 Proportion of species threatened with extinction
Target 7.C: Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation	7.8 Proportion of population using an improved water source 7.9 Proportion of population using an improved sanitation facility
Target 7.D: By 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers	7.10 Proportion of urban population living in slums[b]
Goal 8: Develop a global partnership for development	
Target 8.A: Develop further an open, rule-based, predictable, non-discriminatory trading and financial system	Some of the indicators listed below are monitored separately for the least developed countries (LDCs), Africa, landlocked developing countries and small island developing States.
Includes a commitment to good governance, development and poverty reduction—both nationally and internationally	***Official development assistance (ODA)*** 8.1 Net ODA, total and to the least developed countries, as percentage of OECD/DAC donors' gross national income
Target 8.B: Address the special needs of the least developed countries	8.2 Proportion of total bilateral, sector-allocable ODA of OECD/DAC donors to basic social services (basic education, primary health care, nutrition, safe water and sanitation)
Includes: tariff and quota free access for the least developed countries' exports; enhanced programme of debt relief for heavily indebted poor countries (HIPC) and cancellation of official bilateral debt; and more generous ODA for countries committed to poverty reduction	8.3 Proportion of bilateral official development assistance of OECD/DAC donors that is untied 8.4 ODA received in landlocked developing countries as a proportion of their gross national incomes 8.5 ODA received in small island developing States as a proportion of their gross national incomes ***Market access*** 8.6 Proportion of total developed country imports (by value and excluding arms) from developing countries and least developed countries, admitted free of duty
Target 8.C: Address the special needs of landlocked developing countries and small island developing States (through the Programme of Action for the Sustainable Development of Small Island Developing States and the outcome of the twenty-second special session of the General Assembly)	8.7 Average tariffs imposed by developed countries on agricultural products and textiles and clothing from developing countries 8.8 Agricultural support estimate for OECD countries as a percentage of their gross domestic product 8.9 Proportion of ODA provided to help build trade capacity
Target 8.D: Deal comprehensively with the debt problems of developing countries through national and international measures in order to make debt sustainable in the long term.	***Debt sustainability*** 8.10 Total number of countries that have reached their HIPC decision points and number that have reached their HIPC completion points (cumulative) 8.11 Debt relief committed under HIPC and MDRI Initiatives 8.12 Debt service as a percentage of exports of goods and services
Target 8.E: In cooperation with pharmaceutical companies, provide access to affordable essential drugs in developing countries	8.13 Proportion of population with access to affordable essential drugs on a sustainable basis
Target 8.F: In cooperation with the private sector, make available the benefits of new technologies, especially information and communications	8.14 Telephone lines per 100 population 8.15 Cellular subscribers per 100 population 8.16 Internet users per 100 population

The Millennium Development Goals and targets come from the Millennium Declaration, signed by 189 countries, including 147 heads of State and Government, in September 2000 (http://www.un.org/millennium/declaration/ares552e.htm) and from further agreement by member states at the 2005 World Summit (Resolution adopted by the General Assembly—A/RES/60/1, http://www.un.org/Docs/journal/asp/ws.asp?m=A/RES/60/1). The goals and targets are interrelated and should be seen as a whole. They represent a partnership between the developed countries and the developing countries "to create an environment—at the national and global levels alike—which is conducive to development and the elimination of poverty".

[a] For monitoring country poverty trends, indicators based on national poverty lines should be used, where available.

[b] The actual proportion of people living in slums is measured by a proxy, represented by the urban population living in households with at least one of the four characteristics: (a) lack of access to improved water supply; (b) lack of access to improved sanitation; (c) overcrowding (3 or more person per room); and (d) dwellings made of non-durable material.

Source: UN 2007b

Table 2: Key links between the environment and the MDGs	
MDG 1: Eradicate poverty and hunger	Poor people often depend on natural resources and ecosystems for income and livelihoods (food, shelter, medicine, water, etc.). The economy of the poorest countries often relies on natural resources exports, such as agricultural commodities and raw materials, and ecotourism.
MDG 2: Universal primary education	Time spent collecting water and fuelwood by children—especially girls, and especially during droughts—can reduce the time at school or prevent school attendance.
MDG 3: Gender equality	Time spent collecting water and fuelwood by women can reduce the time for schooling, undertaking income-generating activities, and participating in community decision-making. Unequal access to land and other natural resources limits possibilities for decision-making and empowerment.
MDG 4: Reduce child mortality	Children are more vulnerable to environment-related health problems because their immune systems are not fully developed and their metabolisms are different from those of adults. Environment-related diseases (diarrhoea, acute respiratory infection, leukaemia, childhood cancer, etc.) are primary causes of child mortality. Increasing the provision of clean, accessible water (MDG 7) can significantly decrease child mortality (MDG 4) and fatal diseases (MDG 6), making it possible for children and women to go to school (MDGs 2 and 3).
MDG 5: Improve maternal health	Exposure to indoor air pollution and carrying heavy loads of water and fuelwood negatively affect women's health, can make women less fit for childbirth, and put them at greater risk of complications during pregnancy.
MDG 6: Combat disease	Most diseases in developing countries are environmental in origin, as specific environmental conditions may contribute to the growth and the spread of illnesses and limit access to treatment facilities and supplies. For example, a range of environmental factors affect malaria, since stagnated water and increasing temperatures associated with climate change create favourable conditions for disease-carrying mosquitoes. Undisturbed forests also harbour fewer malaria vectors, thereby reducing exposure to disease.

(Source: UNDP 2006)

Environmental Links to the MDGs

Environmental resources and conditions have a significant impact on many aspects of poverty and development, and achieving environmental sustainability is fundamental to achieving all of the MDGs. One of the most powerful ways to help achieve the first MDG—eradicate extreme poverty and hunger—is to ensure environmental quality and quantity is maintained in the long term (Table 2).

Lush vegetation in forest understory provides biodiversity

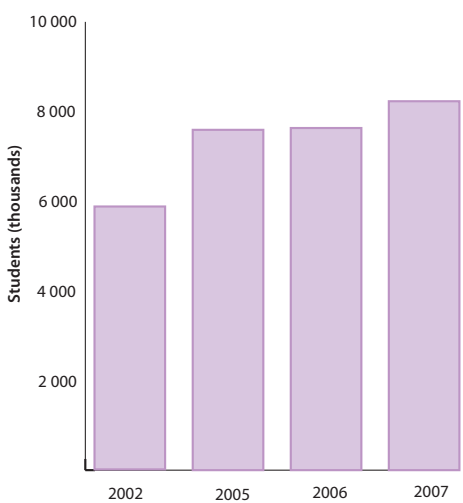Johannes Akiwumi/UNEP

Eager children in school

Figure 2: Primary school enrollment, 2002-2007 (Source: KNBS 2008)

Kenya's progress towards achieving the Millennium Development Goals

Kenya has made progress towards achieving a number of the goals. By 2007, the nation had achieved notable headway in the fight against poverty. Although the proportion of the population living below the poverty line increased from 52.3 per cent in 1997 to an estimated 56 per cent between 2000 and 2002, by 2005/06, it had dropped to 45.9 per cent (GoK 2007). Likewise, headway has been made towards the provision of universal primary education (Goal 2), with 90 per cent of girls and 95 per cent of boys enrolled in primary school. Kenya is also making promising advances in combating HIV/AIDS, malaria, and other diseases (Goal 6) (GoK 2007).

Table 4 (pages 46-47) provides an overview of Kenya's progress towards achieving the MDG goals from the 1990s to about 2000. To better evaluate the success of each goal, estimated targets (when quantifiable) are included in parentheses.
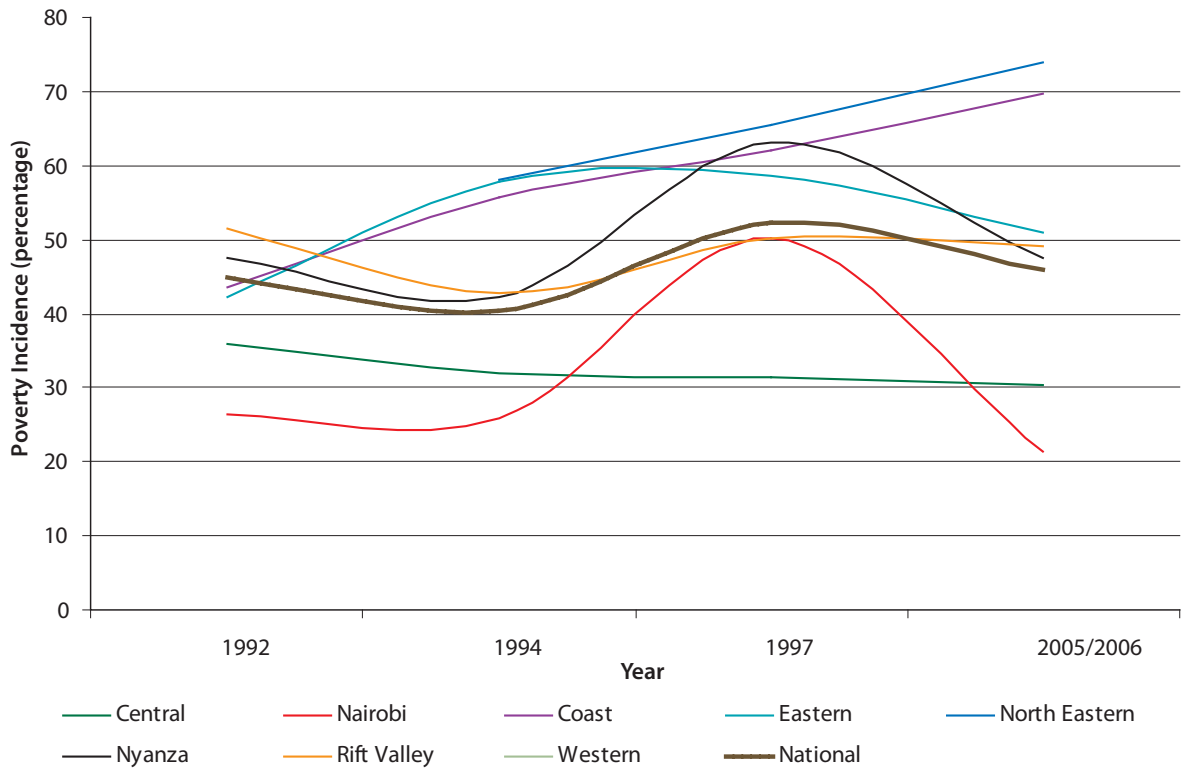

Figure 3: Poverty incidence, 1992-2006

Poverty incidence decreased in all provinces between 1997 and 2005/06 except the Coast and North Eastern Provinces.

(Source: GoK 2007, from Kenya Intregrated Household Budget Survey 2006)

Agricultural fields provide income and food security

Table 3: MDG 7— Ensure Environmental Sustainability	
Target A:	Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources
Target B:	Reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss
Target C:	Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation
Target D:	By 2020, achieve a significant improvement in the lives of at least 100 million slum dwellers

Kenya's progress towards MDG 7: Ensure Environmental Sustainability

Kenya's environment has suffered from the impacts of human activities. Deforestation, land degradation, and water pollution are some of the challenges the nation needs to address in order to achieve MDG 7. The nation, however, has increased the proportion of land area protected for biological diversity from 12.1 per cent in 1990 to 12.7 per cent in 2007. A number of social and political factors continue to put pressure on natural resources and compromise the effective implementation of sustainable development strategies in Kenya. They include limited government capacity for environmental management and insufficient institutional and legal frameworks for enforcement and coordination (UNDP 2005).
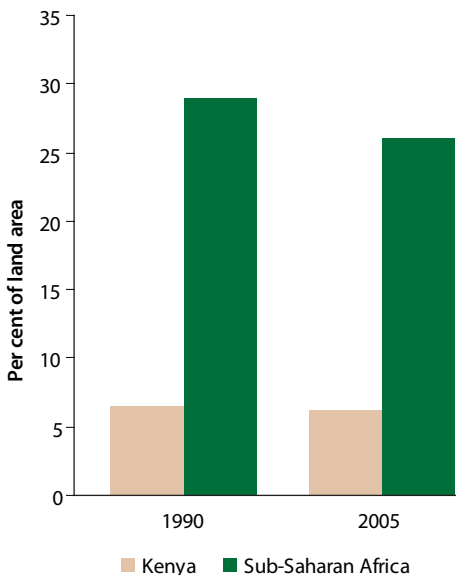

Figure 4: Forest and woodlands (Source: UNStats 2008)

Land area covered by forest

Kenya is one of the least forested countries in sub-Saharan Africa (UN 2008) with forests covering only 37.6 million ha—about three per cent of total land area (UNDP 2007). Between 1990 and 2005, the proportion of forested land in sub-Saharan Africa dropped by three per cent, from 29 per cent to 26 per cent. During the same period, Kenya's proportion of forested land decreased by 0.3 per cent (Figure 4).

Although Kenya's forests cover a small proportion of the total land area, they are home to 50 per cent of the nation's tree species, 40 per cent of large mammals, and 30 per cent of the nation's birds (KFWG 2008). Between 1990 and 2003, 186 000 ha of forest land was converted to other uses (UN 2007a). Biodiversity loss can have irreparable consequences for ecosystem services, food security, and tourism, all of which make significant contributions to Kenya's economy.

Clearing forest land for raising crops to support Kenya's growing population

Table 4: Indicators of Kenya's progress towards the MDGs, 1990s and 2000s.

Goals and indicators	Past[2] (1990s)	Present[3] (target) (2000s)
Goal 1: Eradicate extreme poverty and hunger		
1.1 Population below $1 (PPP) per day, percentage	-	52[(1997)]
1.2 Poverty gap ratio	-	-
1.3 Share of poorest quintile in national consumption, percentage	3.4	6[(1997)]
1.4 Growth rate of GDP per person employed, percentage	-4.69	3.02
1.5 Employment-to-population ratio (both sexes), percentage	63.9	63.1
1.6 Proportion of employed people living below $1 (PPP) per day, percentage	47.1	17.4[(1997)]
1.7 Proportion of own-account and contributing family workers in total employment	-	-
1.8 Prevalence of underweight (moderate and severe), children under 5, percentage	22.3	19.9
1.9 Undernourished population, percentage	39	31[(2002)] **(19)**
Goal 2: Achieve universal primary education		
2.1 Net enrollment ratio in primary education, percentage	64[(1999)]	76.2
2.2 Proportion of pupils starting grade 1 who reach last grade of primary, percentage	71.7	83.6 **(100)**
2.3 Literacy rate of 15-24 year-olds (male), percentage	-	79.8[(2000)]
2.4 Literacy rate of 15-24 year-olds (female), percentage	-	80.7 [(2000)]
Goal 3: Promote gender equality and empower women		
3.1 Gender Parity Index in primary level enrollment	0.96	0.97 **(1)**
3.2 Gender Parity Index in secondary level enrollment	0.77	0.93 **(1)**
3.3 Gender Parity Index in tertiary level enrollment	0.54[(2000)]	0.6 **(1)**
3.4 Seats held by women in national parliament, percentage	1.1	7.2
3.5 Share of women in wage employment in the non-agricultural sector	21.4	32.2[(1997)]
Goal 4: Reduce Child Mortality		
4.1 Under-five mortality rate, per 1 000 live births	97	121 **(32)**
4.2 Infant mortality rate, per 1 000 live births	64	79
4.3 Children 1-year old immunized against measles, percentage	78	77
Goal 5: Improve maternal health		
5.1 Maternal mortality ratio, per 100 000 live births	365[3]	560 **(92)**
5.2 Births attended by skilled health personnel, percentage	45.4	41.6 **(100)**
5.3 Contraceptive use among married women (15-49 yrs. old), percentage	32.7	39.3
5.4 Adolescent birth rate, per 1 000 women	118	116[(2001)]
5.5 Antenatal care coverage for at least four visits, percentage	-	52.3
5.6 Antenatal care coverage for at least one visit, percentage	94.9	88.1
5.7 Unmet need for family planning (total), percentage	36.4	24.5
Goal 6: Combat HIV/AIDS, malaria and other diseases		
6.1 People living with HIV, percentage	7.7[(2001)]	4.9
6.2 Condom use at last high-risk sex (female), percentage	14[(1998)]	25.4
6.3 Condom use at last high-risk (male), percentage	43 [(1998)]	46.8
6.4 Population 15-24 year-olds who have comprehensive correct knowledge of HIV/AIDS (female), percentage	-	34

[1] 1990-1993 unless otherwise indicated
[2] 2003-2008 unless otherwise indicated
[3] GoK (2008a)

(Source: UNStats 2008)

6.5 Population 15-24 year-olds who have comprehensive correct knowledge of HIV/AIDs (male), percentage	-	47
6.6 Ratio of school attendance of orphans to school attendance of non-orphans	0.94	0.95
6.7 Proportion of population with advanced HIV infection with access to antiretroviral drugs, percentage	27[(2006)]	38 **(100)**
6.8 Death reate associated with malaria, per 1 000	0.63[(2000)5]	1.35[4]
6.9 Incidences of malaria, percentage	14[(2000) 4]	27.7[4]
6.10 Death rate associated with tuberculosis, per 100 000 population	28.5	71.9
6.11 Incidences of tuberculosis, per 100 000 population	116.2	384.5
6.12 Prevalence of tuberculosis, per 100 000 population	132.9[(2000)]	334.1
6.13 Tuberculosis detection rate under directly observed treatment short course, percentage	56.6[(1995)]	70
6.14 Tuberculosis treatment success under directly observed treatment short course, percentage	74.7[(1995)]	82.4
6.15 Proportion of children under 5 sleeping under insecticide-treated bed nets, percentage	2.9[(2000)]	52[5]
6.16 Proportion of children under 5 with fever who are treated with appropriate anti-malarial drugs, percentage	40.4[(1998)]	26.5

Goal 7: Ensure environmental sustainability

7.1 Land area covered by forest, percentage	6.5	6.2
7.2 Carbon emissions, total (thousand metric tonnes CO_2)	5 826	10 588
Carbon emissions, per capita (metric tonnes CO_2)	0.2485	0.3054
Carbon emissions, kg CO_2 per $1 GDP (PPP)	-	-
7.3 Consumption of all ozone-depleting substances, ODP metric tonnes	452.3	134.8
7.4 Proportion of fish stocks within safe biological limits	-	-
7.5 Proportion of total water resources used, percentage	6.7	8.9
7.6 Proportion of species threatened with extinction	-	-
7.7 Proportion of terrestrial and marine areas protected to total territorial area, percentage	11.9	12.7
7.8 Proportion of population using an improved drinking water source, percentage total	41	57 **(82**)
7.9 Proportion of population using an improved sanitation facility, percentage total	39	42 **(78)**
7.10 Slum population in urban areas, percentage	70.4	54.8

Goal 8: Develop a global partnership for development

8.1 Average tariffs imposed by developed countries on agricultural products from developing countries	-	-
8.2 Average tariffs imposed by developed countries on clothings from developing countries	-	-
8.3 Average tariffs imposed by developed countries on textiles from developing countries	-	-
8.4 Net ODA as a percentage of OECD/DAC donors' GNI	-	-
8.5 Net ODA to LDCs as a percentage of OECD/DAC donors' GNI	-	-
8.6 ODA that is untied	-	-
8.7 ODA to basic social services as a percentage of sector-allocable ODA	-	-
8.8 ODA received by landlocked developing countries as a proportion of their GNI	-	-
8.9 ODA received by small island developing states as a proportion of their GNI	-	-
8.10 Agricultural support estimate for OECD countries as a percentage of their GDP	-	-
8.11 Debt relief committed under HIPC and MDRI Initiatives	-	-
8.12 Debt service as percentage of exports of goods and services and net income from abroad,	28.6	6.8
8.13 Developed country imports from developing countries, admitted duty free	-	-
8.14 Developed country imports from the LDCs, admitted duty free	-	-
8.15 ODA provided to help build trade capacity	-	-
8.16 Total number of countries that have reached their HIPC decision points and number that have reached their HIPC completion points (cumulative)	-	-
8.17 Population with access to affordable drugs	0.79	0.84
8.18 Telephone lines, per 100 population	0	20.91
8.19 Cellular subscribers, per 100 population	0	7.89
8.20 Internet users, per 100 population		

[4] GoK (2008b)
[5] GoK (2008c)

Reliance on fuelwood: a daunting challenge to stemming deforestation

Fuelwood accounts for over 70 per cent of the total energy consumption in Kenya (GoK 2004). This heavy reliance on wood for fuel and other livelihood needs such as timber, charcoal, building materials, and non-timber forests products, poses a major threat to existing forests. About 67 per cent of the national population depends on firewood for fuel (90 per cent for rural and 10 per cent for urban) with about 47 per cent of the national population depending on charcoal (82 per cent urban and 32 per cent rural) (GoK 2008).

Since 1930, Kenya has lost about 65 per cent of its original standing wood volume; Kenya's growing population threatens the few remaining forested areas and their ecosystem goods and services.

Among the strategies needed to increase forest areas is to reduce over-reliance on fuelwood consumption and increase access to alternative energy sources (GoK 2007) (Chapter 1).
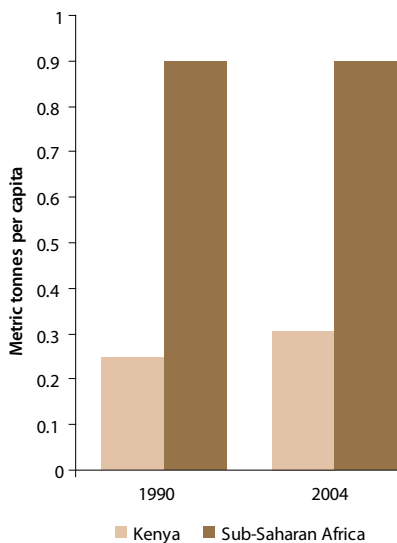
Carbon emissions

Worldwide, carbon dioxide (CO_2) emissions reached 2 900 million metric tonnes in 2004 and they continue to rise, as evident from increasing concentrations of CO_2 in the atmosphere. Per capita CO_2 emissions in sub-Saharan Africa were 0.9 metric tonnes between 1990 and 2004. This is less than one-tenth of the per capita CO_2 emissions in the developed world (UN 2007b). Kenya's per capita emissions are much lower than the sub-Saharan average (Figure 5), although there was a slight increase from 1990 to 2004 (UN 2008). Nevertheless, carbon pollution, resulting mainly from industries and the increasing number of motor vehicles on Kenyan roads, is one of the leading environmental health problems in the country affecting both rural and urban populations (GoK 2007).

Exhaust pipe spewing out carbon emissions which contribute to climate change
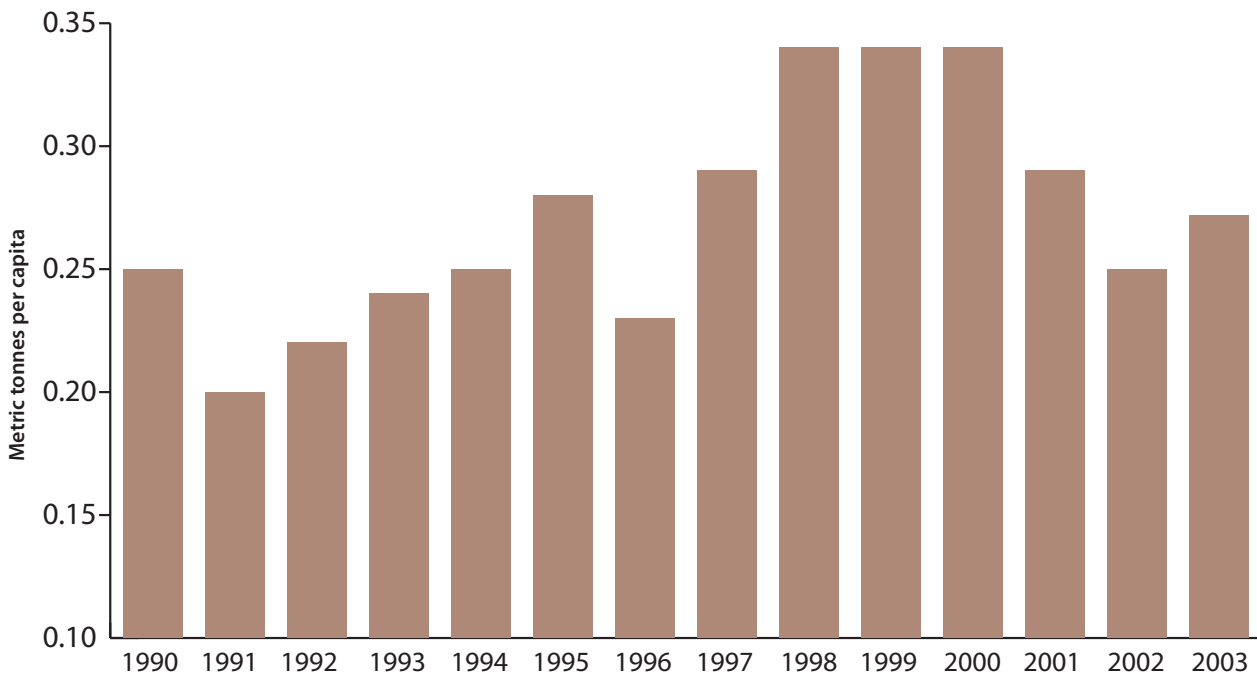

**Figure 5: Per capita carbon dioxide emissions
(Source: UNStats 2008)**

**Figure 6: Changes in per capita carbon dioxide emissions in Kenya, 1990-2003
(UNStats 2008)**

A crab blends in with its environment

The proportion of the total area set aside as terrestrial and marine protected areas

Kenya has 348 designated protected areas, representing 75 238 km^2 or 12.7 per cent of the nation's total territorial area (UNDP 2005). These include five Biosphere Reserves and three World Heritage Sites (Thaxton 2007).

Over 6 500 plant species are found in Kenya of which 260 are endemic. The nation also has more than 1 000 bird species and over 350 species of mammals, ranking it second highest among African countries in species richness for these animal groups (GoK 2007).
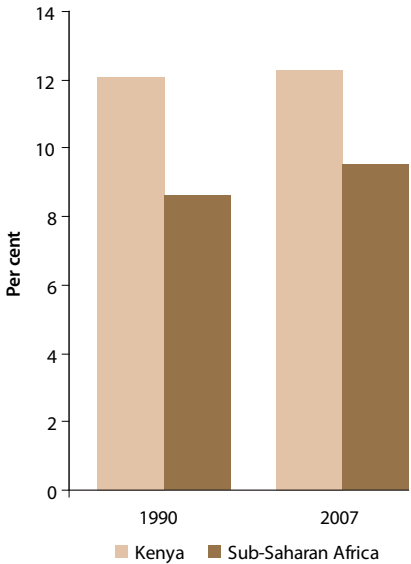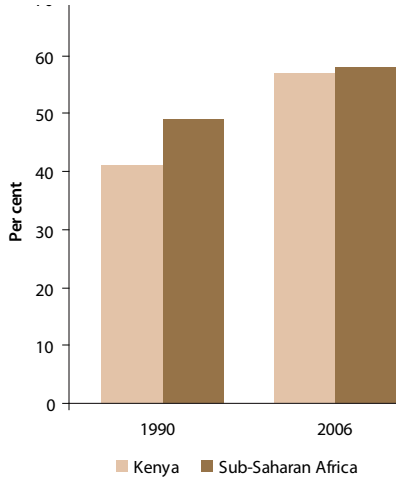

Figure 7: Protected area ratio to total territorial area (Source: UNStats 2008)

Figure 8: Proportion of the population using improved drinking water sources (Source: UNStats 2008)

In 2006, approximately 57 per cent of Kenyan households used water from sources considered safe.
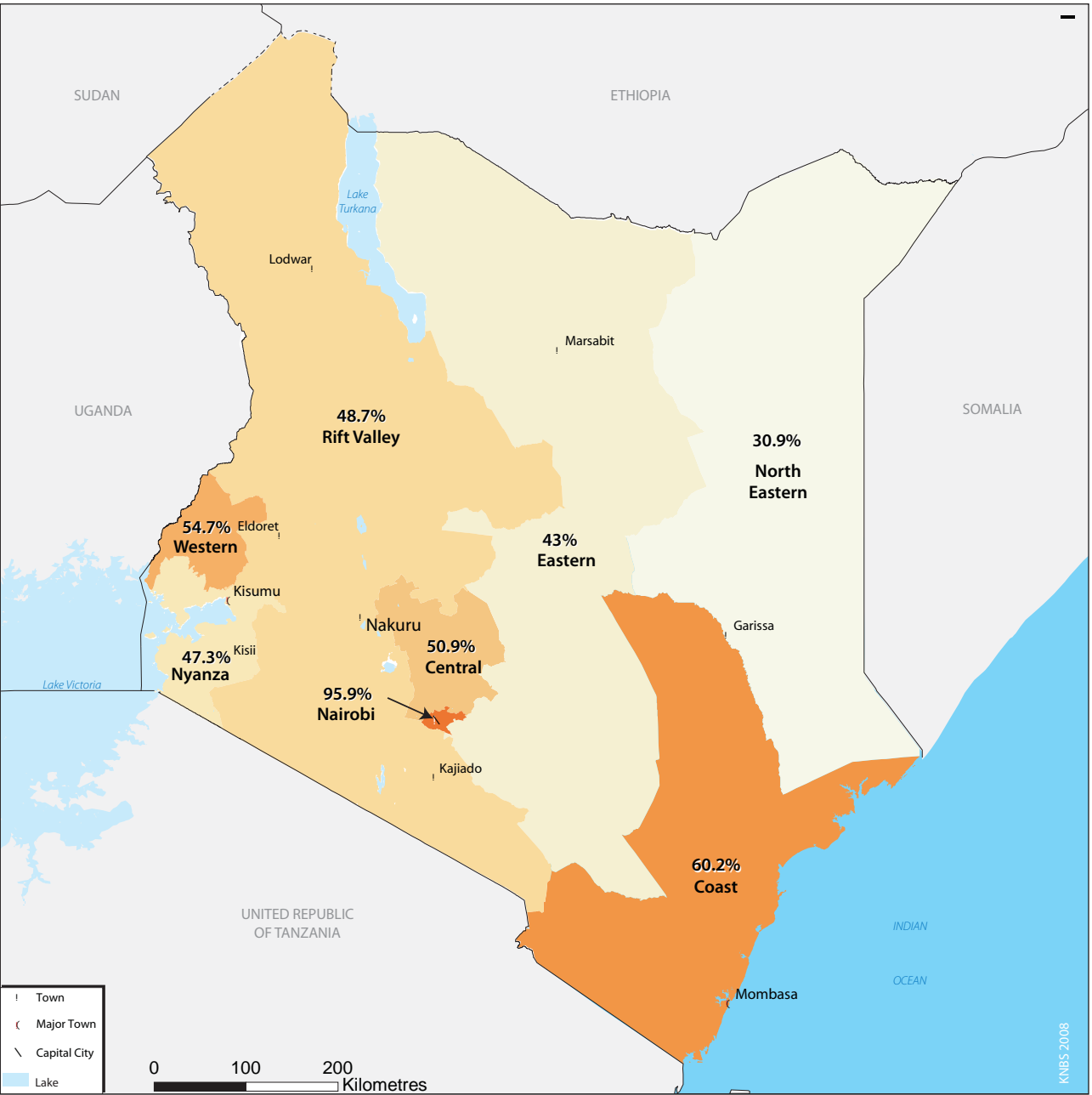

The proportion of the population using an improved drinking water source

Overall, Kenya has made progress since 1990 in providing its growing population access to clean drinking water—more progress than sub-Saharian Africa in general. In Kenya's urban areas, however, access had declined during that time. Much effort is still needed to reach the 2015 target of halving the number of Kenyans without access to clean drinking water.

Figure 9: Percentage of households (urban and rural) with access to safe water, 2005-2006
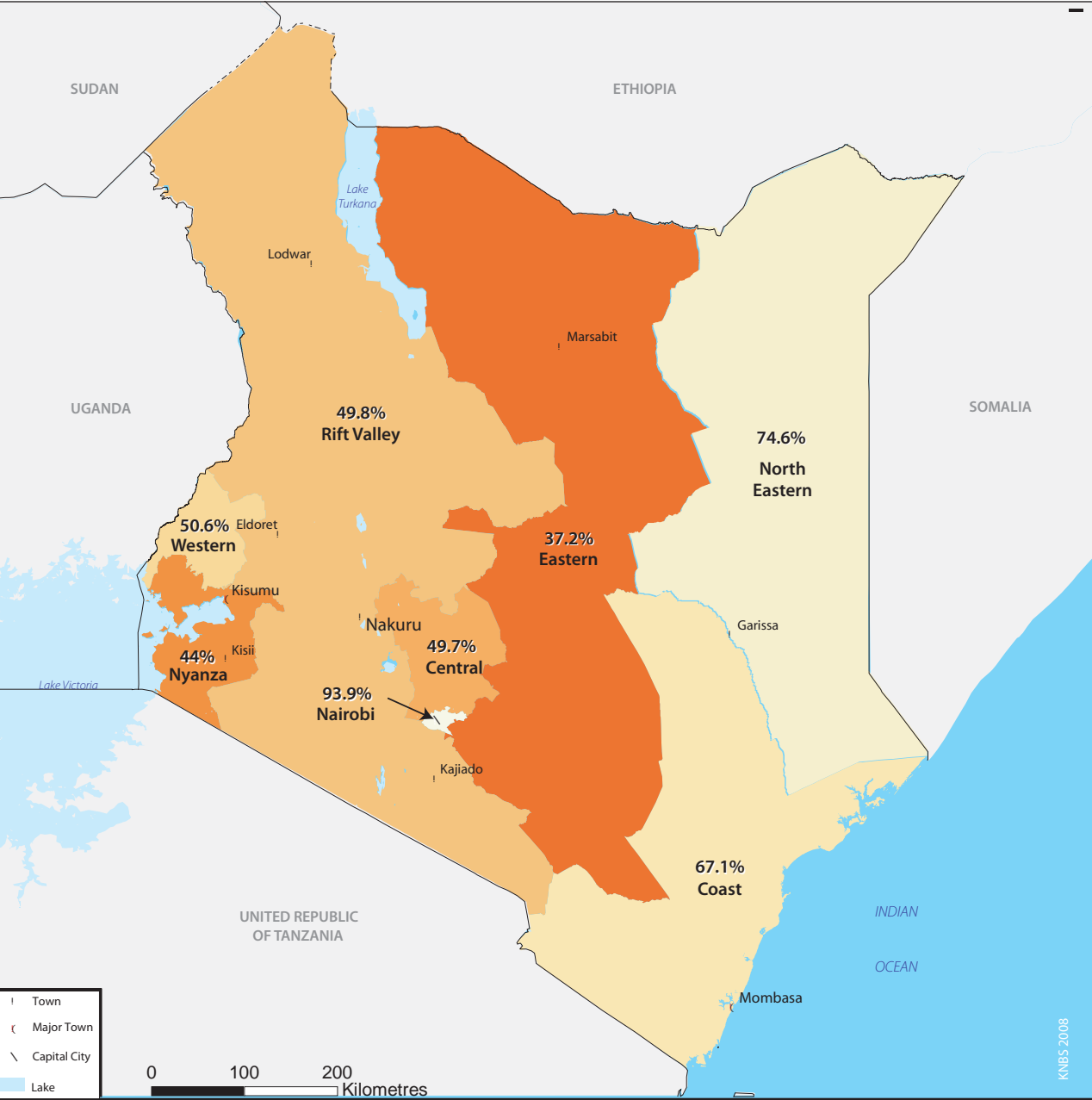
Figure 10: Percentage of households (urban and rural) with access to an improved water source

SUDAN

ETHIOPIA

Lake Turkana

Lodwar

Marsabit

UGANDA

49.8%
Rift Valley

SOMALIA

74.6%
North Eastern

50.6% Eldoret
Western

Kisumu

Nakuru

37.2%
Eastern

44% Kisii
Nyanza

49.7%
Central

Garissa

Lake Victoria

93.9%
Nairobi

Kajiado

67.1%
Coast

INDIAN

OCEAN

UNITED REPUBLIC
OF TANZANIA

Mombasa

KNBS 2008

Town

Major Town

Capital City

Lake

0   100   200
Kilometres

Safe drinking water pump at a local school

Angela Sevin/Flickr.com

### Increasing accessible water supplies tackles several MDGs at once

Kenya is below the international water scarcity threshold (1 000 m³ per person per year) with only 935 m³ available per person per year (FAO 2007), and population growth is forecast to reduce this figure to 359 m³ by 2020 (UN-Water 2006).

Kenya's water resources are unevenly distributed. Many of its arid regions receive only 250 mm or less of rain per year. Highly stressed water systems include Lakes Victoria, Nakuru, and Naivasha, as well as the Nzoia, Nyando, Turkwel, Kerio, Athi, Voi, Tana, and Ewaso Nyiro rivers. In addition, salinity levels in many water bodies, such as Lake Turkana, are too high for human use of the water. In arid regions, when they occur, rains come mainly in violent storms causing erosion and leaching nutrients from the soil.

Women have the main responsibility for managing their household's needs for water, sanitation, and health. In a number of regions, women and girls spend many hours a day fetching water. In the Samburu District of central Kenya, for example, some women walk more than nine kilometres daily to find water (Aguirre 2007). With the increased frequency of droughts, women's trekking distances for water are increasing. The time spent obtaining water is time that could otherwise be devoted to schooling, child-care, or to income-generating activities. In addition, women are confronted with personal security risks while away from home and they endure immense physical burdens, since 20 litres of water can weight about 20 kg (UNDP 2008) (Table 2).

Increasing the provision of clean, accessible water to communities can significantly decrease child mortality and fatal diseases and make it possible for children and women to go to school. Access to clean water is therefore crucial in attaining most of the MDG targets.
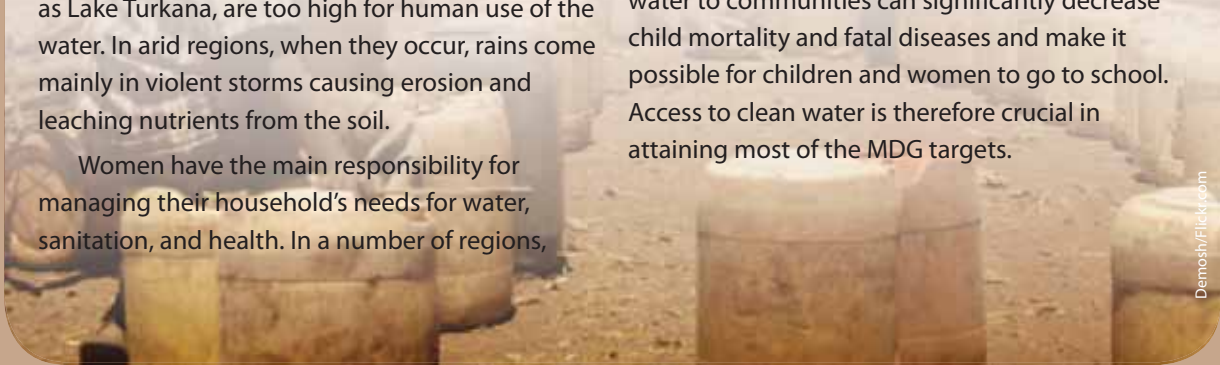
Demoth/Flickr.com

According to the Kenya Integrated Household Budget Survey, only 49 per cent of Kenya's rural population has access to clean water compared to 83 per cent in urban areas (GoK 2007). This disparity also exists between districts and regions (Figure 10). For example, access to safe water varies from a high of 96 per cent in Nairobi to as low as 14 per cent in Mwingi District (GoK 2007).

The proportion of the population using an improved sanitation facility

An estimated 1 600 million people will need access to improved sanitation over the period 2005-2015 to meet the MDG targets (UNEP 2008). Yet if trends since 1990 continue, the world is likely to miss the target by almost 600 million people. In Africa, only northern Africa is on track to halve the proportion of people without basic sanitation by 2015, whereas sub-Saharan Africa is set to achieve only half of the 2015 objective, with a small increase from 26 to 31 per cent between 1990 and 2006. To date, only 19 per cent of the Kenyan population living in urban areas has access to proper sanitation facilities (UnStats 2005). If this trend continues, Kenya is likely to miss the target.

Access to improved sanitation varies from region to region with the Western and Central provinces enjoying better sanitation coverage at 96.2 per cent and 99.7 per cent, respectively. The North Eastern
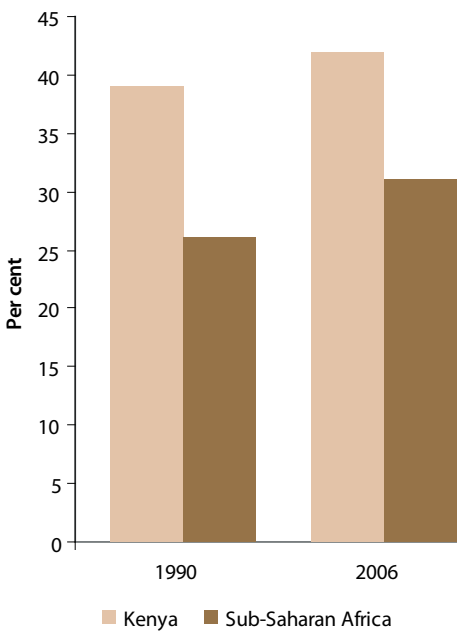

Figure 11: Proportion of total population using improved sanitation facilities (Source: UNStats 2008)
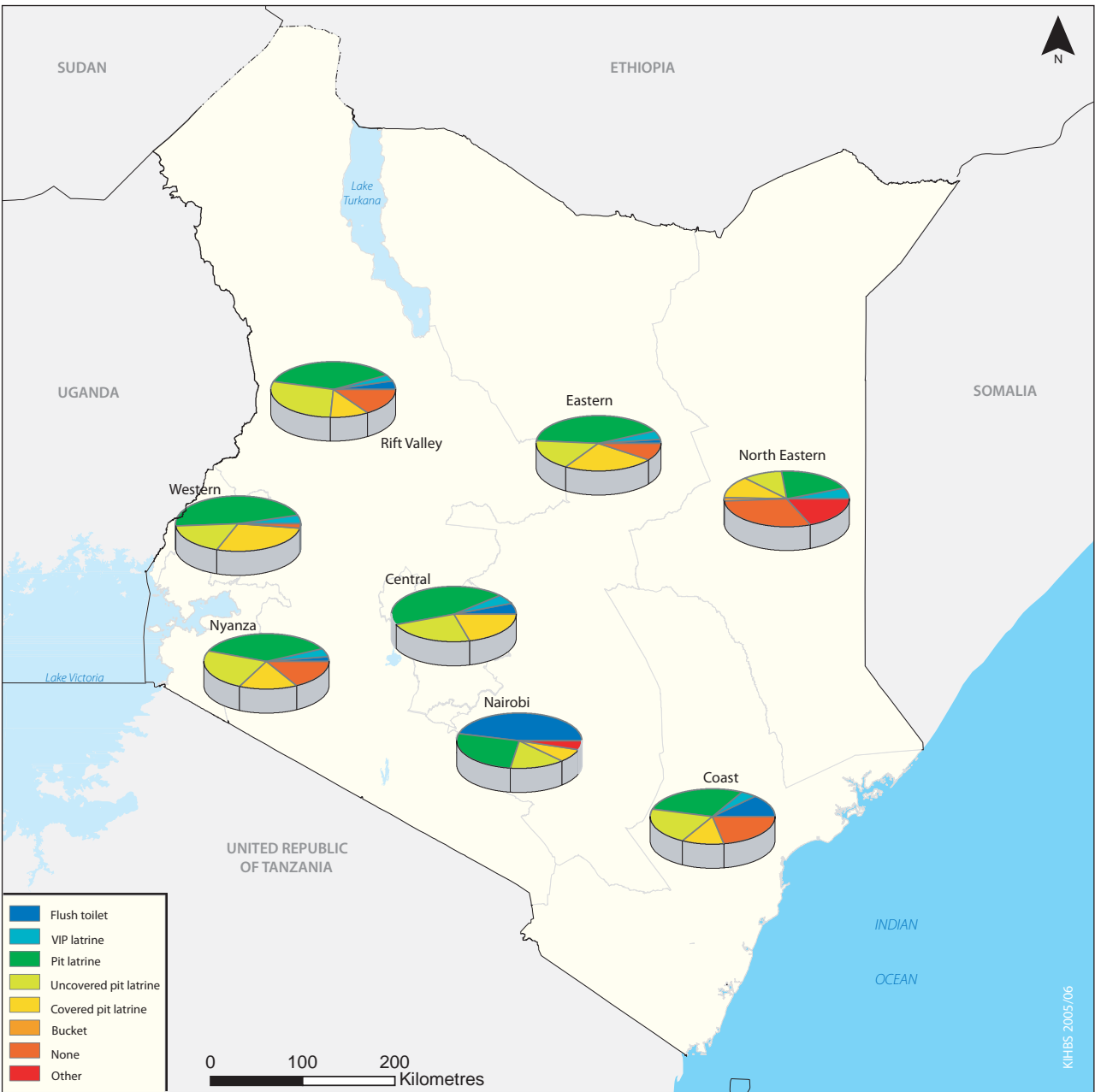

Figure 12: Percentage of households using main types of toilet facilities

Harvesting energy from human waste

In one part of the Kibera slums, a network of public latrines has been built featuring a facility that converts human waste to energy, which in turn is used for lighting and heating water. The human waste is put in an airtight biodigester from which methane gas is captured and filtered into an upper tank. During this process, solid waste is also treated and filtered through reed beds before being collected and sold as fertilizer. This is an excellent example in which simple technologies are applied in slum areas not only to improve sanitation, but also raise incomes and provide sustainable energy. (*Source: Houreld 2008*)

Province has the lowest access with only 36.7 per cent. Nationwide, Samburu and Turkana Districts are the most underserved with only 11.6 per cent and 17.7 per cent, respectively (GoK 2007). Pit latrines, whether improved or not, are the most widely used toilet facilities (Figure 12, page 51) and most sewerage collection treatment and disposal systems were constructed 20 to 40 years ago. Over the last 30 years, there has been inadequate funding to rehabilitate, upgrade, and expand water supplies and sewerage facilities (UNDG 2005).

A sewage treatment facility improves the health and well-being of Kenya's people

Michael Mwangi/UNEP
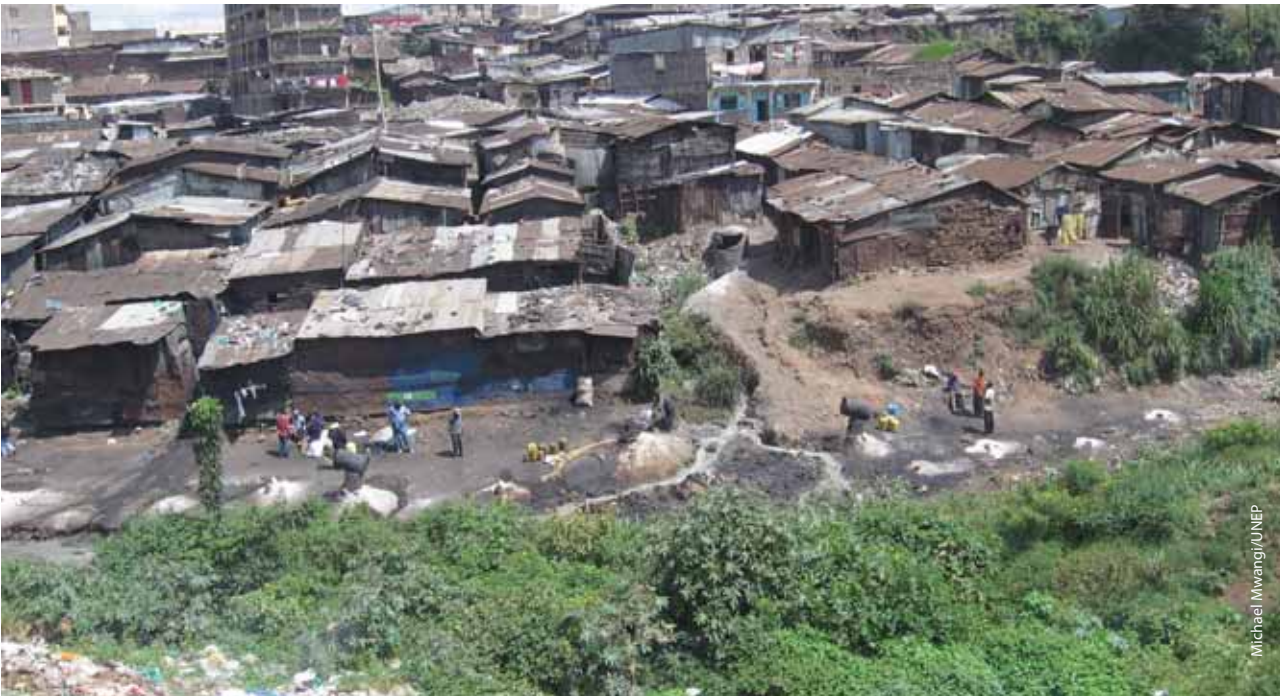
Ramshackle housing in a slum area

The proportion of slum populations in urban areas

By the end of 2008, half the world's population will live in cities and towns and by 2050, 70 per cent of people will live in urban areas. Both urban migration and rapid population growth continue to expand the number of urban dwellers, which will rise from 3 200 million people in 2008 to nearly 5 000 million by 2030, with most of the growth taking place in Africa and Asia (UNEP 2008).

In 2005, one in three urban dwellers lived in slum conditions. This means they lacked at least one of the basic conditions of decent housing: adequate
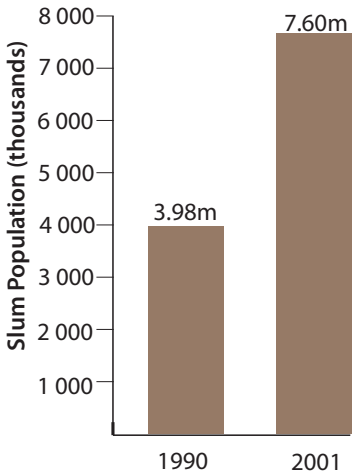

Figure 13: Slum population growth (Source: KNBS 2008)

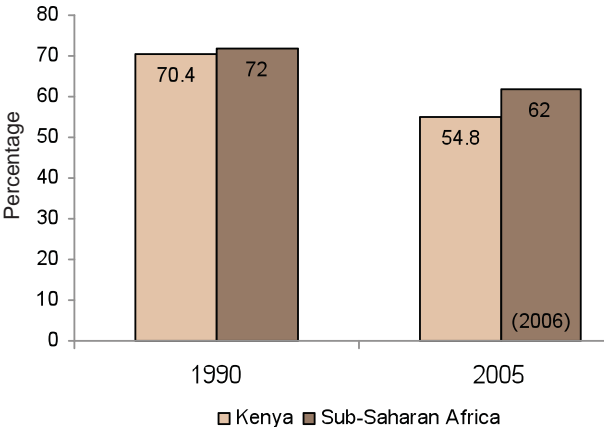**Figure 14: Proportion of households with access to secure tenure (Source: UNStats 2008)**

Aerial view of the Kibera slum

Christian Lambrechts/UNEP

Youth in the Kibera slum make solar panels

Kenya has one of the largest and most dynamic solar markets in the developing world. Some ten major companies import photovoltaic solar panels and there are an estimated 1 000-2 000 solar technicians. More than 200 000 systems have been sold in Kenya since the mid-1980s, three quarters of them to private households (ILO 2008).

The Kibera Community Youth Programme (KCYB) operates in one of the largest slums in sub-Saharan Africa. It provides employment for local youth in an assembly line making small and affordable solar panels. These panels power radios and charge mobile phones in Kibera, but their use has also spread to all parts of Kenya. Numerous groups from neighbouring countries have requested similar projects (Herro 2007).

sanitation, improved water supply, durable housing, or adequate living space. Sub-Saharan Africa remains one of the regions where the lack of adequate shelter among urban populations is most acute (UN 2007b). In Kenya there has been a decline in the proportion of urban people living in slums (a decrease of 15.6 per cent since 1990), although the actual number of slum dwellers only decreased by 88 059 during this time. In 2005, four million Kenyans still lived in slums (UNStats 2008). The annual urban population growth rate reached 3.2 per cent between 2000 and 2005, compared to 1.9 per cent in rural areas. Even with a decline in the growth rate of slum dwellers, rapid urban expansion makes it a challenge to improve living conditions quickly enough to meet the MDG target.

Slum upgrade project conducted by the government

The Environment and Poverty

Developing countries, such as Kenya, are still heavily reliant on revenues from exported natural resources such as agricultural commodities. For example, in the 1990s, 53 per cent of Kenya's export earnings were derived from agricultural products such as coffee, sugar, and flowers (Nyangito n.d.). Agriculture presently accounts for 26 per cent of Kenya's GDP (NEE 2008).

The distribution of poverty across Kenya varies from one province to another. Each province offers a unique blend of environmental, geographical, and infrastructure characteristics, which in turn influence poverty levels. Certain environmental factors can contribute to poverty alleviation (Figure 15).

Poor households rely heavily on expenditure-saving, labour intensive activities for their subsistence and survival, such as collecting water and fuelwood or grazing animals on common lands. Common property resources or open access lands are important sources of livelihoods for the poor, providing them with a variety of goods, which can include food, water, fuel, fodder, bamboo, resin, gum, oils, construction materials, honey, medicinal plants, and spices, among others.

Many poor households depend on their local environments for food security. Generally, food security depends on food availability and stability, accessibility, and use. Poor soils and low agricultural productivity, lack of control over land management, and competition from other users are some of the conditions that threaten household food security. Food security is closely related to the achievement of a number of other MDGs: for example, poor nutrition is implicated in more than half of all child deaths worldwide (Jolly 2001), showing the gains to be made by addressing food security in targeting goal 4, which calls for reducing child mortality.

Over 36 per cent of all the rural poor Kenyans live on marginal lands or areas that are particularly vulnerable to environmental degradation, such as floodplains, coastal areas, and degraded hillsides. Depending on such lands for food can render poor people vulnerable to periodic hunger. Environmental hazards and extreme events, such as droughts, floods, forest fires, and landslides, are more damaging in marginal and degraded ecosystems and the poor living there are least able to cope with their impacts. For all these reasons, achieving the first MDG—eradicating extreme poverty and hunger—requires renewed efforts towards achieving MDG 7, through the sustainable management of land, water, biodiversity resources, and the adequate provision of urban sanitation, potable water, and waste management.

Figure 15: The effect of six environmental factors on poverty, by province.

Studying the correlation of environmental factors with poverty can aid in designing poverty alleviation projects.

Source: Okwi and others 2007
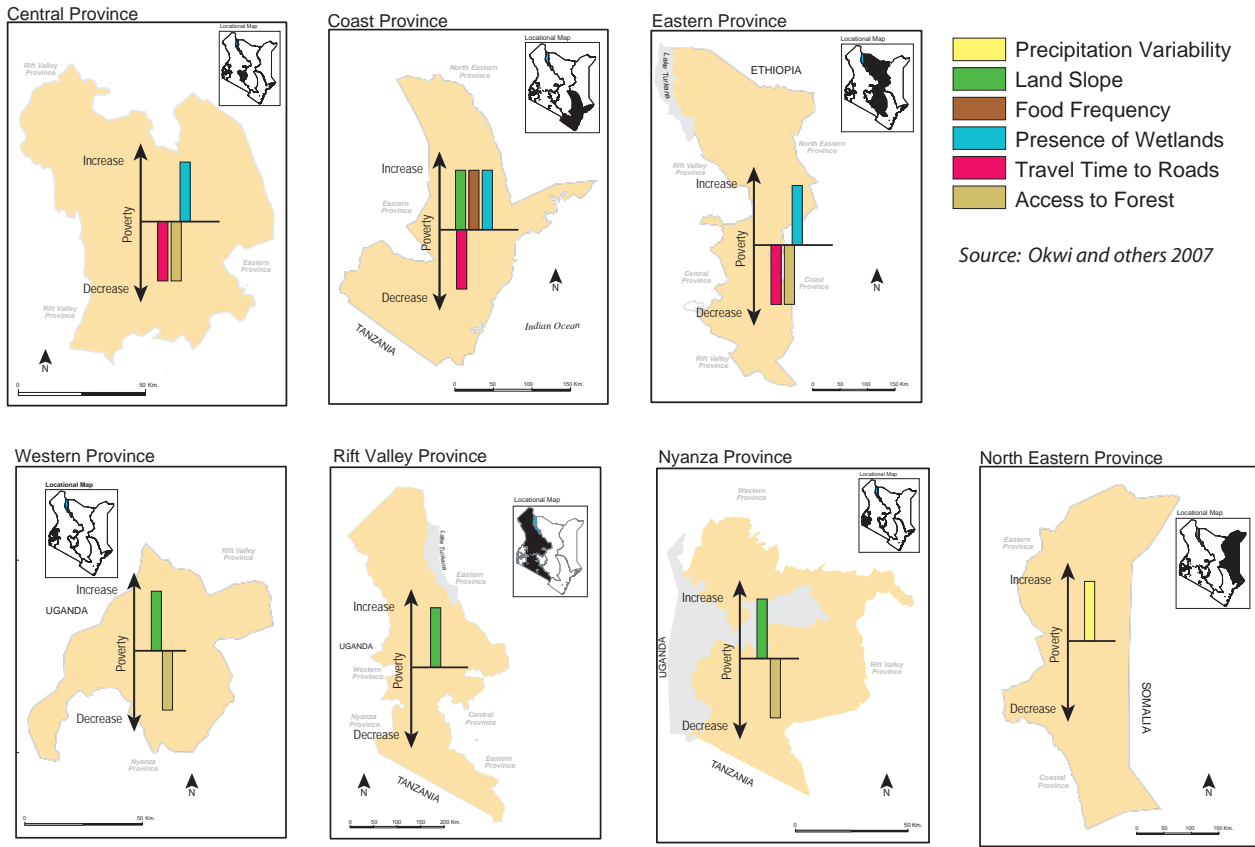
Severe impact of drought on livestock and livelihoods

Climate Change and the MDGs

Climate change refers to a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings, or to persistent anthropogenic changes in the composition of the atmosphere or in land use (IPCC 2008).

"The poorest countries and most vulnerable citizens will suffer the earliest and most damaging setbacks of climate change, even though they have contributed least to the problem" (UNDP 2008)

According to UNDP, the mean annual temperature in Kenya has increased by 1.0°C since 1960 representing an average rate of 0.21°C per decade. It is projected to increase by 1.0 to 2.8°C by the 2060s and by the year 2100, temperatures in Kenya could increase by about 4°C causing variability of rainfall by up to 20 per cent (Kabubo-Mariara 2007).

Given that a large portion of Kenya is semi-arid with high temperatures and low precipitation, frequent droughts, water scarcity, and unpredictable climate variability will have the largest impacts on people living in these regions. The agricultural sector, which relies on predictable rainfall and temperatures, will suffer the most since it directly or indirectly supports 80 per cent of the population and agro-based industries support much of Kenya's economy (Kabubo-Mariara 2007). Kenya's high dependence on natural resources, its poverty levels and low capacity to adapt, and the existence of other significant environmental stress make it highly vulnerable to the impacts of climate change.

The impacts of climate change are linked with the achievement of key national development objectives and the MDGs including: poverty, food insecurity, health threats, environmental degradation, and loss of natural resources. Thus, the MDG's development objectives will be constrained by climate change impacts unless the capacity to adapt is strengthened.
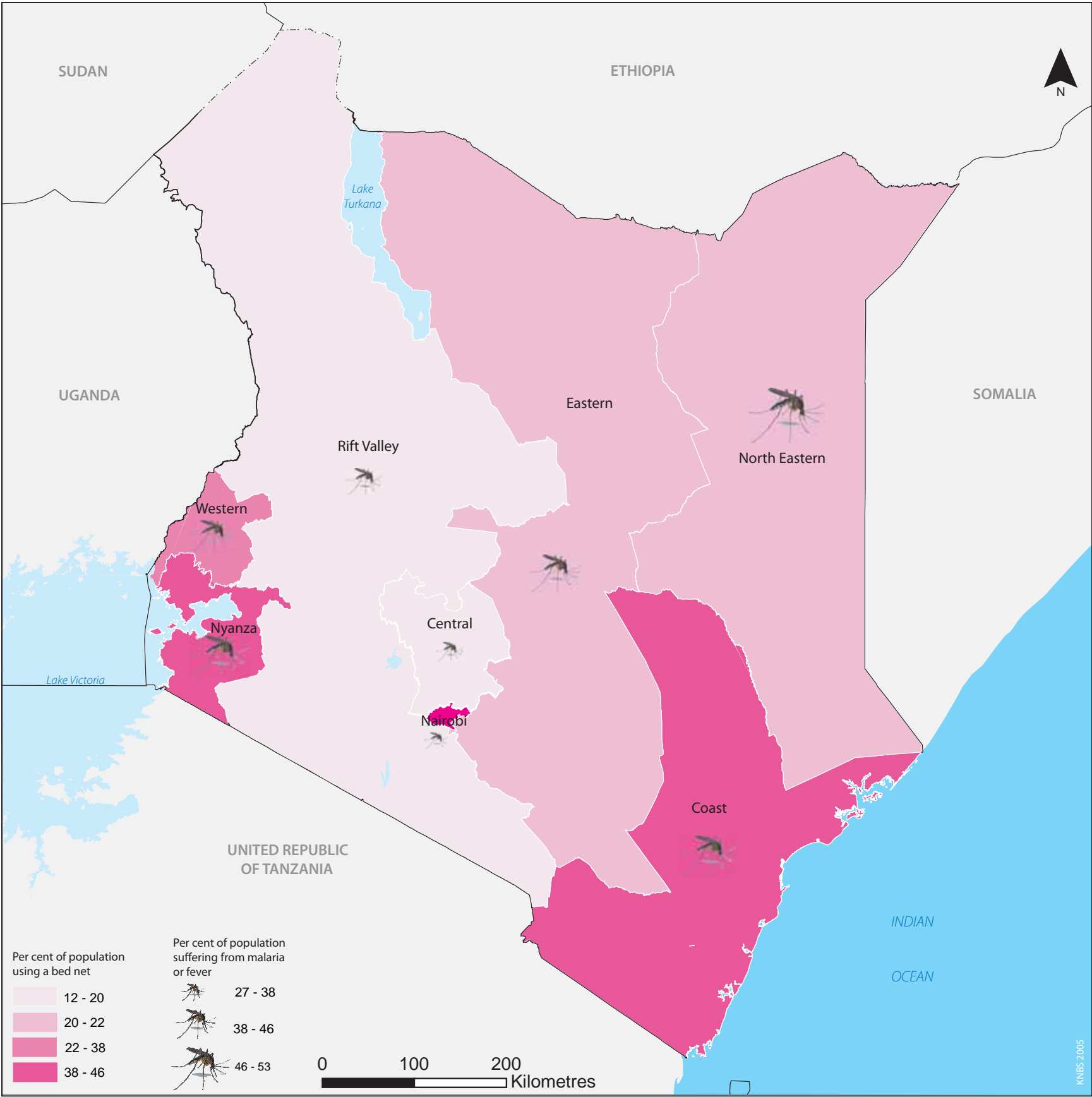
Credit constraints, poverty, and a lack of information, however, remain significant obstacles to adopting both short- and long-term adaptation measures. There is a critical need for governments to support climate change adaptation strategies, including monitoring climate change and disseminating information to farmers. Farmers will need to improve management approaches, including crop diversification; water harvesting, recycling, and conservation; and the irrigation and shading and sheltering of crops (Kabubo-Mariara 2007). The following section looks at the ways in which climate change is likely to affect incidences of droughts and floods, health, food security, natural disaster, and land degradation, which are key to the achievement of the MDGs in Kenya.

Climate Change and Human Health

Human health is likely to be affected by various climate change-related health factors, including the altered distribution of some infectious diseases and disease vectors (IPCC 2008). Projected trends in climate change-related exposures will increase malnutrition and consequent disorders; increase the number of people suffering from death, disease, and injury from heat waves, floods, storms, fires and droughts; and continue to change the range of some infectious disease vectors. The burden of diarrhoeal diseases will increase and the geographical range of malaria will expand in some places and contract in others (Confalonieri and others 2007).

Figure 16: The proportion of households using bed nets and the proportion suffering from malaria

Per cent of population using a bed net
- 12 - 20
- 20 - 22
- 22 - 38
- 38 - 46

Per cent of population suffering from malaria or fever
- 27 - 38
- 38 - 46
- 46 - 53

Malaria and the environment

In Kenya, malaria is estimated to cause one of every four childhood deaths (World Bank 2008). Since 1988, there has been an increase in the number of malaria outbreaks in the Kenyan highlands, where malaria was previously rare. Many studies on malaria vectors have linked environmental degradation and human activities with the increased counts of malaria infections.

For example, research shows that the survival rate of Anopheles gambiae (the vector of malaria) in the Kenyan highlands is higher in deforested areas than in forested ones (Afrane and others 2006). A study in Kisii District shows that where there is high vegetation density and older natural habitats there is a greater diversity of mosquito predators and a lower density of mosquitoes (Carlson and others 2004). Also, extensive lakeshore areas in Kenya have been deforested for fuel and agriculture, destroying habitats of mosquito predators (Sulaiman 2007).

Given this relationship between vector development and environmental conditions, increasing forest protection, especially in the Kenyan highlands where the vectors are controlled by vegetation cover as well as by humidity and temperature, could help prevent malaria epidemics by providing unsuitable environments for malaria vector development. In addition to helping prevent malaria, protected forest cover contributes to carbon sequestration and biodiversity, reduces soil erosion, and protects water resources.

Moreover, the increased frequency of floods and droughts are likely to increase the incidence of malaria by creating stagnant pools suitable for mosquito proliferation. Therefore, addressing the issue of climate change worldwide will in turn help reduce the risk of increased malaria rates in Kenya.
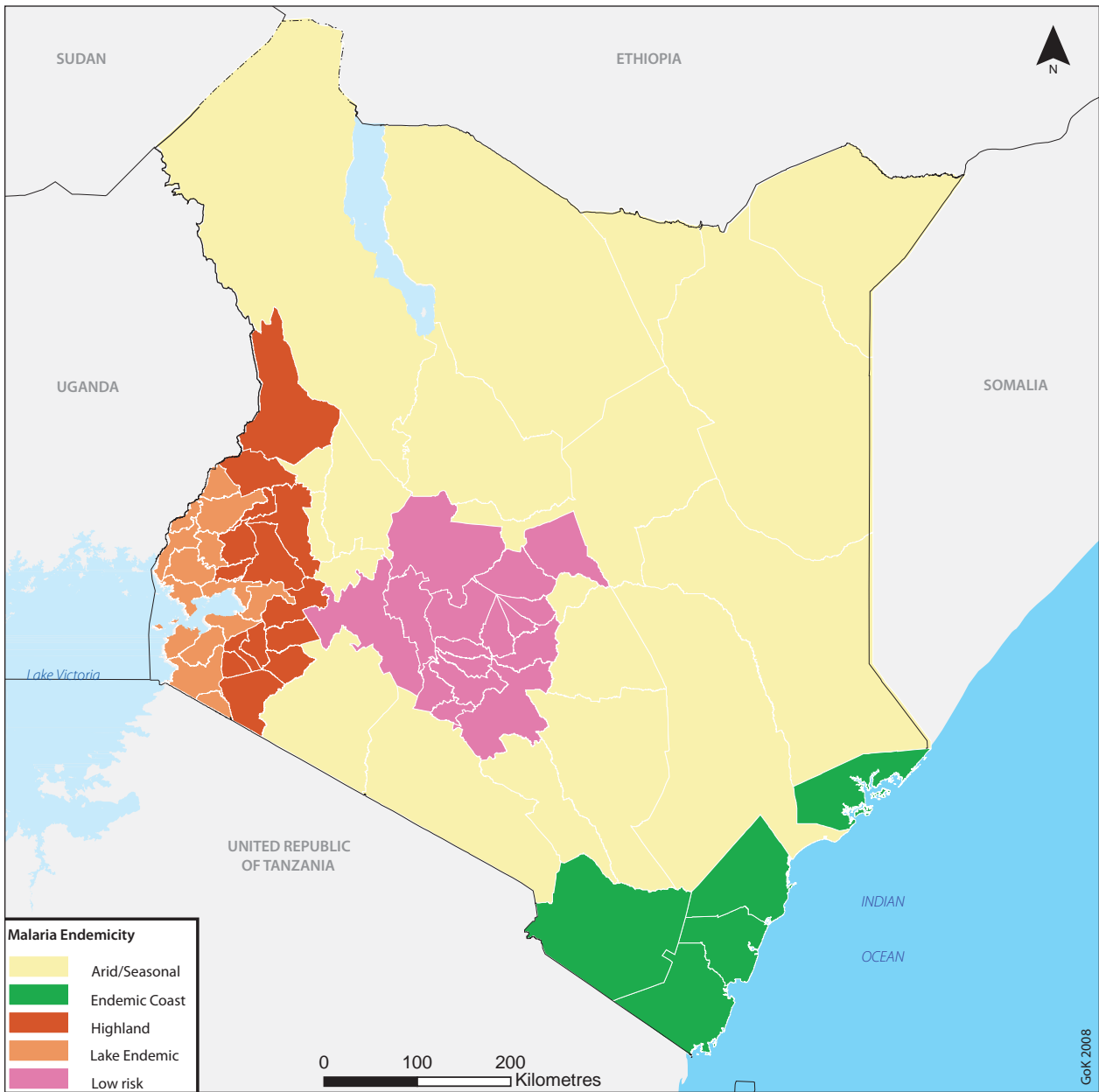

Figure 17: The geographical spread of malaria

*Malaria outbreaks follow changing climatic factors due to human and natural alterations of the environment.*

Malaria Endemicity
- Arid/Seasonal
- Endemic Coast
- Highland
- Lake Endemic
- Low risk

Maize is an important crop for food security in Kenya

Climate Change and Food Security

Some 57.6 million ha in Kenya are devoted to agriculture. Of this, only 9.4 million ha or about 17 per cent of the total land area is classified as having high to medium potential for farming (DRSRS 2008, FAO 2000). The arid and semi-arid lands (ASALs) cover over 48.0 million ha, accounting for about 83 per cent of the total land area. In the ASALs, about 9 million ha can support some form of agriculture while 15 million ha are just adequate for livestock keeping. The rest, amounting to 24 million ha, is dry and only suitable for nomadic pastoralism. Productivity in lands of high to medium potential is declining in the face of growing demands for food and other agricultural products. Soil erosion, loss of soil fertility, flooding, and biodiversity loss are increasing in all areas (Survey of Kenya 2003).

Changing environmental factors related in part to climate change have already had an impact on household food security for the many Kenyans who would benefit from reliable forecasts, increased water availability, and improved soil fertility to sustain their livelihoods.

Figure 18: Food security distribution
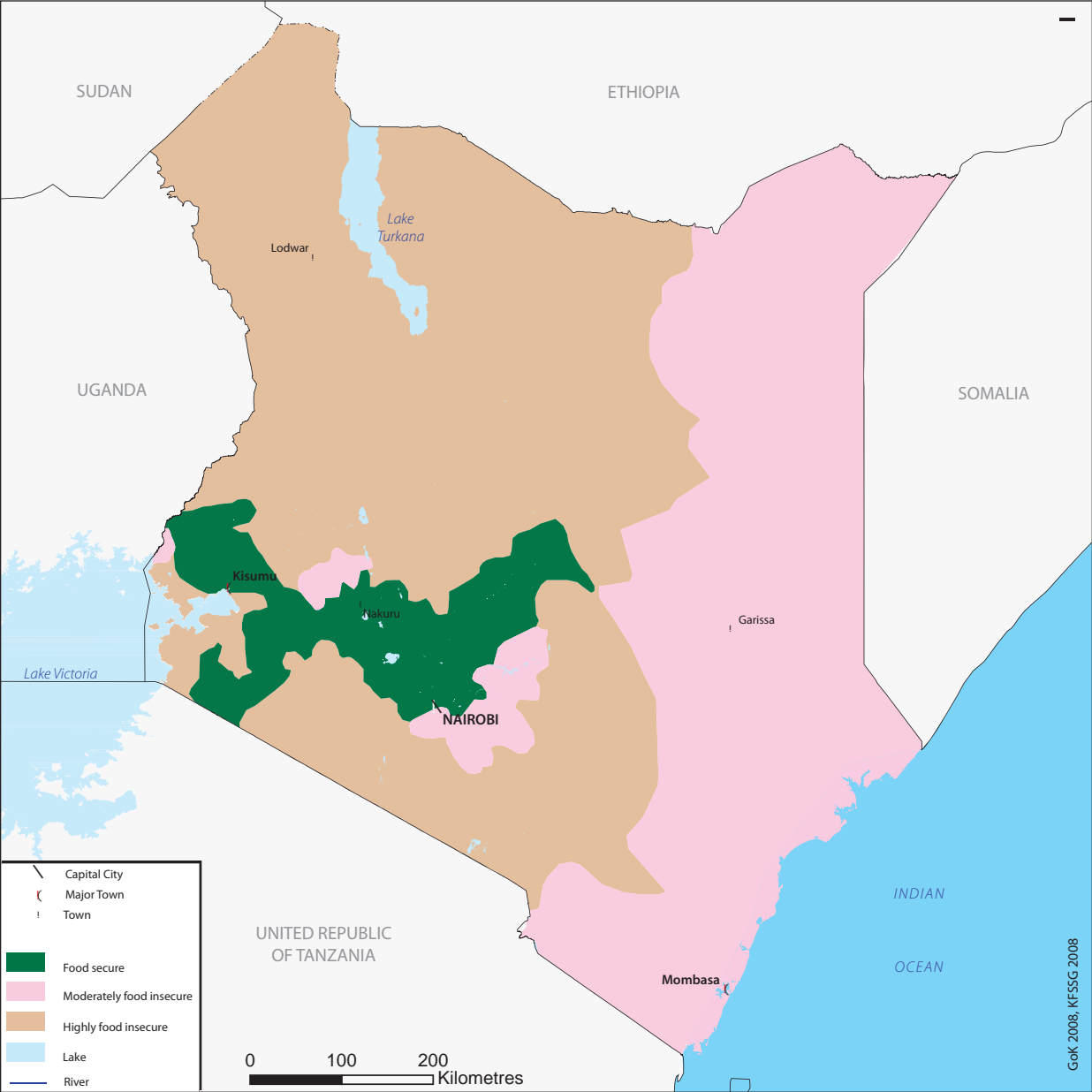
Life in the desert. Note the use of woody vegetation for constructing shelter

In some places, climate change has been implicated in decreased water resources, which has had a cascading effect: increased trekking distances and water costs; more competition for declining water supplies; failed crops; increased food prices; earlier livestock migrations; weaker livestock, predisposing them to disease; and food insecurity as families are left without milk and animal products (KFSSG 2008). Its effects on agriculture will be more pronounced in medium and low potential zones than in zones of high agricultural potential (Kabubo-Mariara 2007).

Climate Change and Floods and Droughts

Climate change is a likely factor in the increased intensity of El Niño events, resulting in more severe and frequent floods and droughts. El Niños occur when a large area of the central and eastern equatorial Pacific becomes warmer than normal. Recent research indicates that El Niños have been more intense since 1900 than at any time in the last 130 000 years (WHO n.d.).

In Kenya, droughts tend to occur every three years and last for one to two years, depending on the climate zone. There has been an increased frequency of floods and droughts in Kenya over the past 10 years: 1996-1997; 1999-2001; and 2003-2006. These droughts decimated livestock populations and crop harvests, and because they recurred so soon, households lacked sufficient time to recover during intervening years (USAID 2008).

Floods are also a major concern for Kenya's food security. Lakeshore and coastal districts are vulnerable to recurrent floods that lead to loss of life and crops, displacement of households, and destruction of homes.

The impacts of drought on livestock and livelihoods

Climate change is threatening the livelihoods of thousands of Kenyans. One of the hardest hit communities is the Maasai in the Magadi area of southern Kenya. Up to 80 per cent of the Maasai in this region have lost their cattle due to increasingly frequent drought, thought to be a result of climate change. Water is becoming harder to find and in many places grass has stopped growing, leaving no food for cattle, the main source of food and income in this community of around 4 000. While some attempts have been made to supply them with water, experts say the effects of global warming are outstripping these efforts (IRIN 2008).

The impact of higher temperatures on tea production in Kenya

Kenya's principal cash crops are tea, horticultural produce, and coffee. In 2005 horticulture accounted for 23 per cent and tea for 22 per cent of the country's total export earnings. Kenya is the world's fourth-largest tea producer and second-biggest exporter. The tea industry directly or indirectly employs three million Kenyans or about eight per cent of the population. A changing climate is likely to affect harvests, livelihoods, and the economy (See chapter 1, page 9, for a map of Kenya's tea growing areas and their relationship to the country's five water towers).
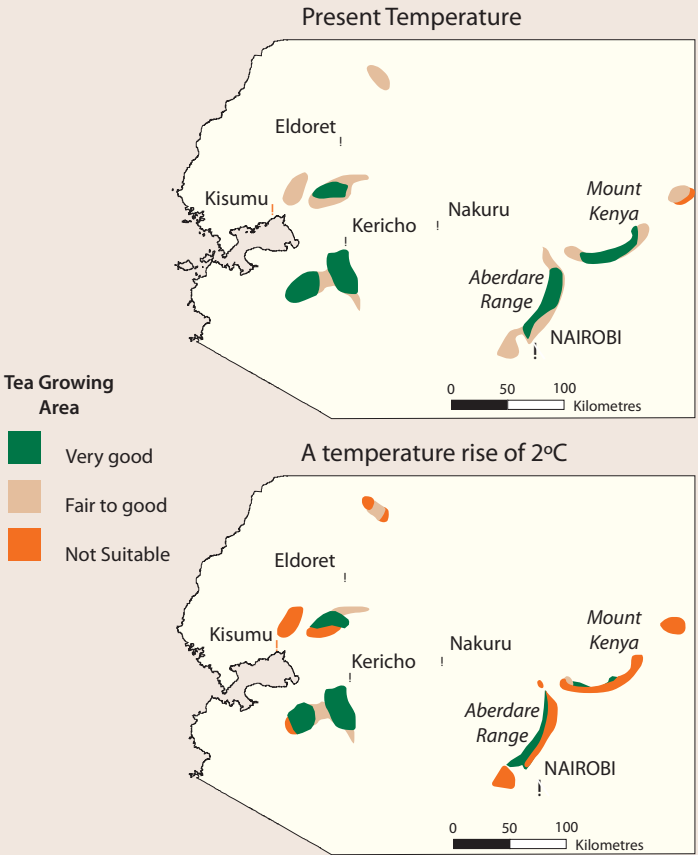
Figure 19: The effect of a temperature rise on tea growing areas

If temperatures rise by 2°C, large areas of Kenya currently suited to growing tea would become unsuitable, with enormous impacts on the Kenyan economy and especially on the poor. Some 400 000 smallholders grow 60 per cent of the country's tea, with large estates growing the rest. While large tea estates can likely afford extra irrigation and other inputs to cope with the effects of climate change, smallholders face difficult challenges in adapting.

Source: WGCCD 2005

Climate Change and Land Degradation

Floods and droughts can trigger or exacerbate the processes of land degradation, such as desertification, erosion, and landslides, affecting the amount and quality of land available for agricultural activities. Resource depletion and poverty lead to further land degradation and unsustainable land use.

The increased frequency of extreme weather events (such as floods and droughts) has adversely affected Kenya's agricultural sector, especially in areas of highest farming potential and in the arid and semi-arid lowlands (ASALs) (Kabubo-Mariara 2007). When nutrient-rich land for farming is lost, food insecurity

Young goat herder. Goats provide needed milk and meat for villagers, but overgrazing may lead to land degredation

Eroded land

deepens. In addition, when vegetation re-growth in pastoral and marginal agricultural areas is limited, in times of high rainfall the run-off cannot accumulate as effectively for water-storage purposes (USAID 2008). Finally, faced with degrading lands, farmers may move their activities into natural habitats such as forests at the expense of floral and faunal diversity.
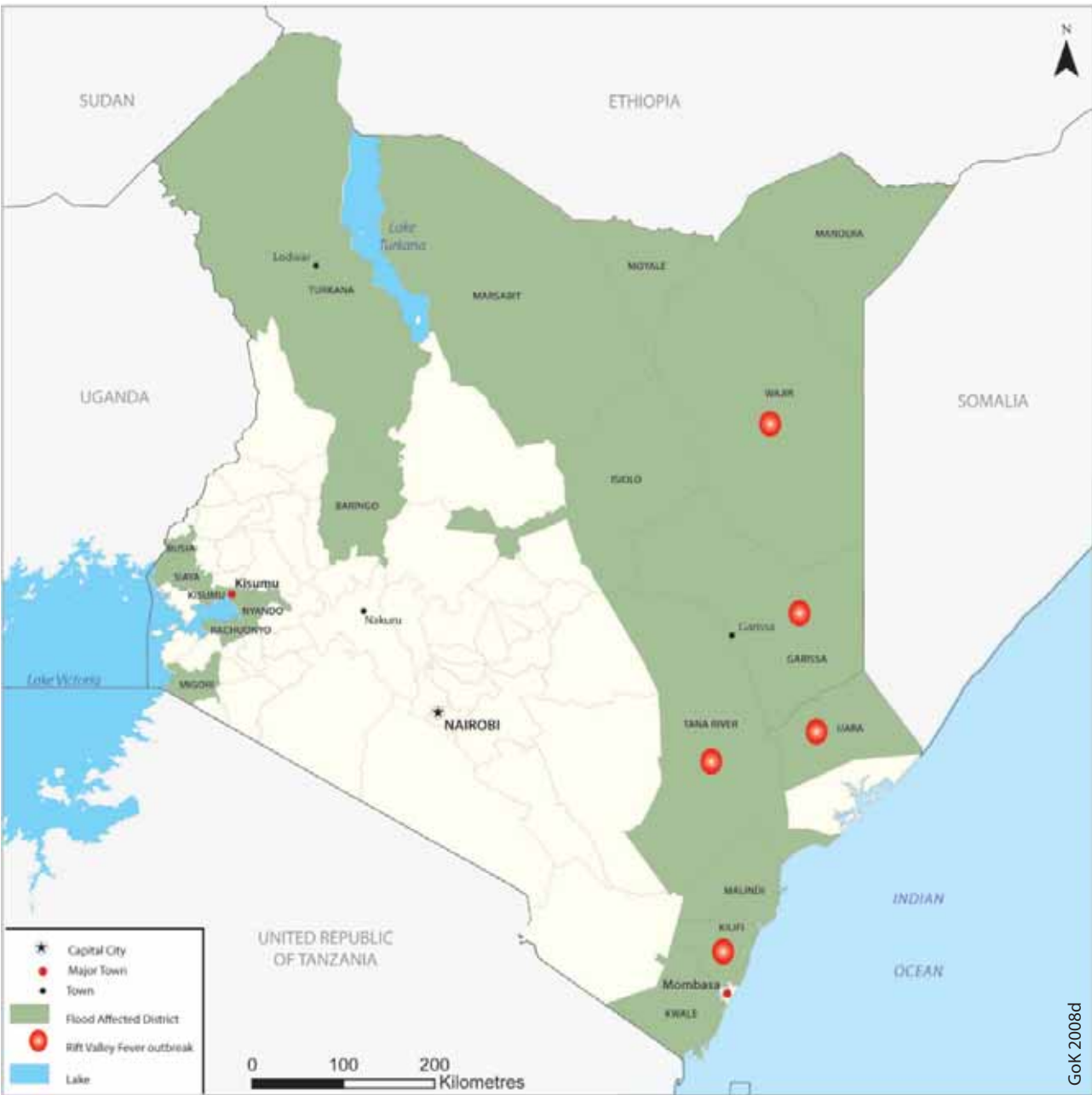

Figure 20: Regions of Rift Valley Fever outbreaks are located wihin flood affected areas

Achieving the MDGs

Case Study: Kenya's Sauri Millennium Village Project

In July 2004, Sauri, Kenya was selected to be the first Millennium Research Village. Sauri is a town of about 5 000 people located in Siaya District, Nyanza Province.

The Millennium Villages Project is a United Nations initiative to empower 12 impoverished rural communities in 10 African countries to achieve the Millennium Development Goals within a ten-year time frame. The villages represent each of Africa's 12 principal agro-ecological zones and farming systems. People in the selected villages work with a wide range of experts, scientists, and local development professionals in agriculture, nutrition, health, education, energy, water, communications, and the environment. Some of the projects include rainwater harvesting and improved springs; improved sanitation through the construction of pit latrines; distribution of treated mosquito nets and a malaria prevention communication campaign; planting indigenous tree species around springs; and establishing community tree nurseries. While the projects benefit from the knowledge and skills of international experts and large financial inputs, the Sauri project is providing valuable lessons on population, health, and environment integration (Mutuo 2007, Millennium Promise 2008).

Notable project achievements include the following:

- In 2004, 85 per cent of the population was experiencing food insecurity; improvements in agricultural production helped reduce food insecurity to 18 per cent by 2007.

- Maize production in Sauri has more than tripled — from 1.9 tonnes/ha to 6.2 tonnes/ha, with the help of inputs such as fertilizer and improved seed.

- A school-feeding program has been implemented in all 28 primary schools across the Sauri cluster and is now providing lunch to 17 514 students. By offering nutritious, locally produced food, the program has directly led to increased school attendance and better academic performance.

- Out of the district's 385 primary schools, Bar Sauri Primary School is now one of the top academic performers, jumping from a rank of 195th to the top 10.

- Malaria prevalence in Sauri is down from 55 per cent to 13 per cent due to the distribution of insecticide-treated bed nets and improved clinics that can now facilitate malaria diagnosis and treatment.

Climate Change and Pests

Climate change will affect the nature and distribution of agriculture pests, diseases, and weeds, with impacts on livestock and human health and in turn, on livelihoods, food security, and the economy. Temperature increases may extend the geographic range of some insect pests, for example, with the tsetse fly distribution and human disease vectors most affected. The spread of the highly virulent peste de petits ruminants (PPR) disease, which has a livestock mortality rate of 50 to 80 per cent, would exacerbate insecure food supplies (KFSSG 2008).

Excessive rainfall promotes the reproduction of the Rift Valley Fever (RVF) mosquito and severe infection outbreaks have typically followed El Niño events (WHO 2008). RVF outbreaks in the past have worsened food insecurity among eastern pastoralists already suffering from severe drought and floods (USAID 2006). Figure 20 shows the geographical distribution of Rift Valley Fever outbreaks and flooded areas in Kenya during such an outbreak at the end of 2006.

Mosquitoes can spread highly virulent diseases such as Rift Valley Fever and malaria

Gerald Yuvallos/Flickr.com

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