# 1

## THE NATURAL LANDSCAPE

### Geology

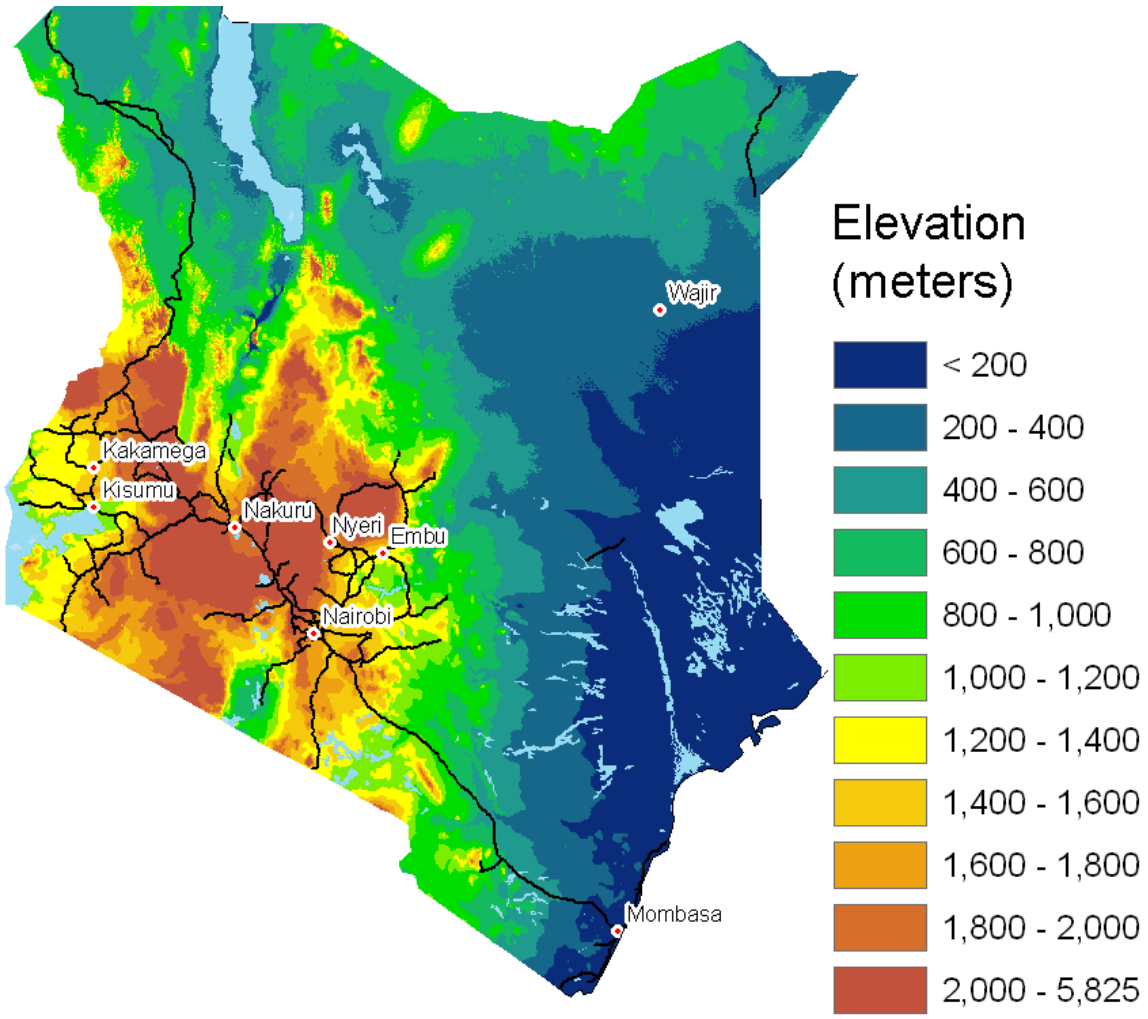
The African continent represents the interior of the world's original continental landmass, Pangaea, from which the other continents began to break away about 200 million years ago. This process, known as continental drift, continues today, and the African continent is splitting up into smaller segments. Kenya is part of a large portion of northeast Africa that is slowly breaking away from the rest of the continent and moving towards India. The break is marked by the Great Rift Valley, which represents a series of faults in the earth's surface. The Great Rift Valley extends 8000 km from Central Asia through almost the length of Africa, including 3500 km from the Red Sea to Mozambique. Eventually the Rift Valley will deepen and lengthen and once it connects to the ocean it will flood, forming a feature similar to the Red Sea (Photo 9).

**Photo 9: The Rift Valley**

Volcanic activity and earthquakes occur as part of this break up. Rocks of volcanic origin are common in Kenya, covering about one-third of the country's surface. There are two other major classes of rocks in the country. To the south and east of the volcanic rocks are ancient rocks that

form a spine that runs north-south through the center of the country, and relatively new sedimentary rocks cover much of the east of Kenya. The geology of Kenya is reflected in the elevation of the country with highland areas center and east of the country and scattered hills and uplands elsewhere (Map 2).

**Map 2: Elevation**




**Climate**

Generally, Kenya enjoys a tropical climate. It is hot and humid at the coast, temperate inland, and very dry in the North and North Eastern parts of the country. The country receives a great deal of sunshine all the year round and, while it is warm during the day in higher elevations it is often cool at night and early in the morning.

The country experiences two rainy seasons, the "long rains" from March to June and the “short rains” from October to December. The rainfall pattern of most of the country is associated with the monsoons of the Indian Ocean. The long rains are brought by southeasterly winds blowing off the Indian Ocean, while the short rains are carried by northeasterly winds that blow from India and across the Arabian Sea to Kenya. Western Kenya, which receives rain almost year-round, is also influenced by winds that blow across the Congo Basin, bringing rain in July and August (Photos 10 - 13).

**Photo 10: Savanna prior to rains, Kajiado District**

**Photo 11: The onset of the rains, Kajiado District**

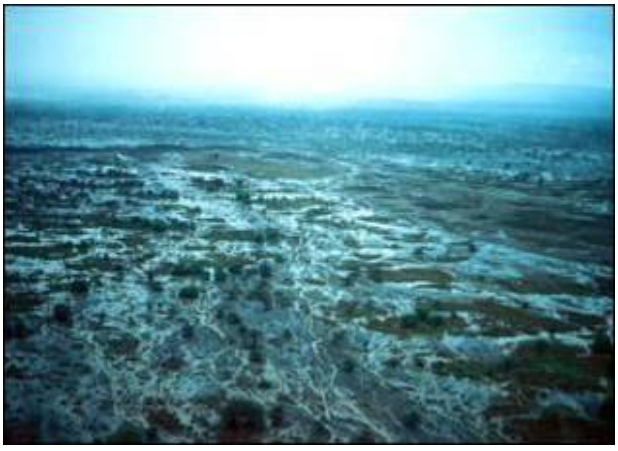


**Photo 12: The rains in the Savanna, Kajiado District**

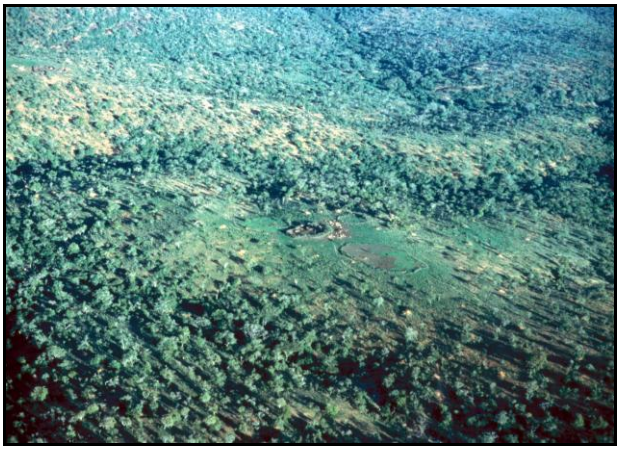
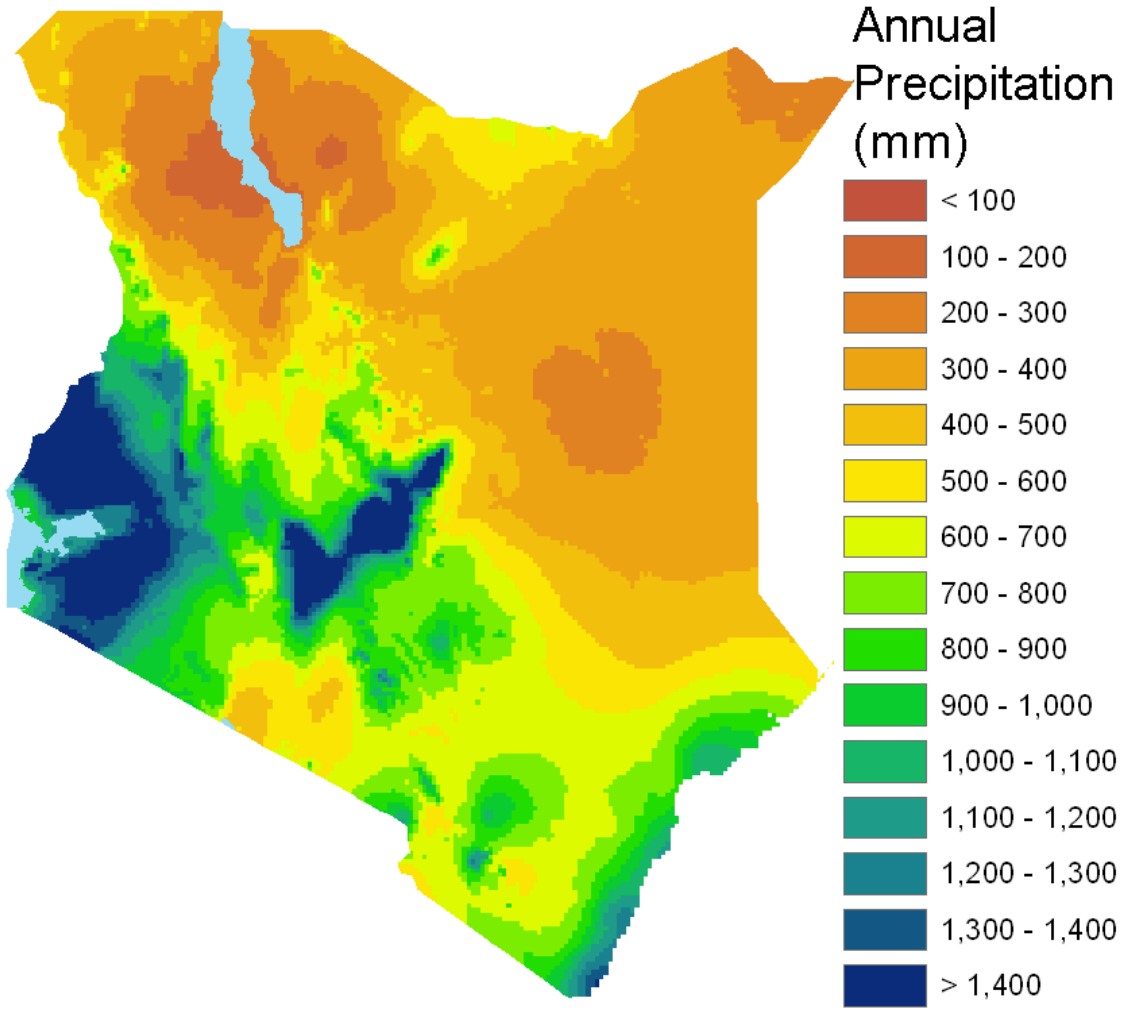


**Photo 13: Savanna during the rainy season, Kajiado District**

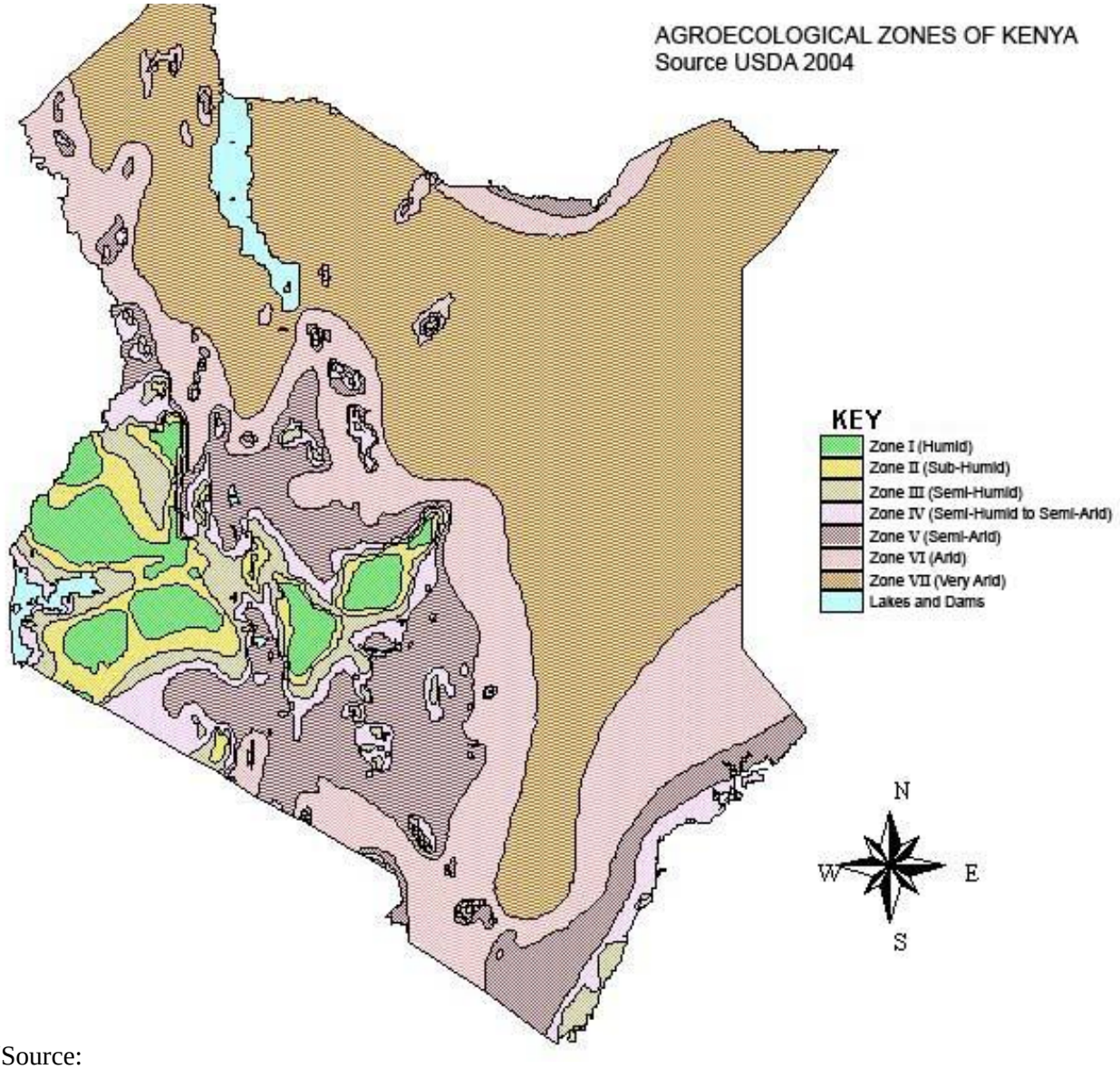
Map 3 shows the average annual rainfall and indicator that only about one fourth of the country receives enough rainfall to support rain-fed farming. The amount of rainfall varies considerably from place to place and from year to year. This means that people in different parts of the country have developed different economies and ways of life, and nearly everyone is vulnerable to the effects of droughts, which occur with depressing regularity.

**Map 3: Rainfall Distribution**



Climate and soils combine to create different agroecological regions (Map 4). The lowland areas are dry, except for a narrow strip of land that borders the Indian Ocean where winds blowing off the ocean bring a lot of rain. The desert areas of northern and eastern Kenya receive little rain.

**Map 4: Agroecological Regions**




(Source: http://www.fas.usda.gov/pecad/highlights/2004/12/Kenya/images/AEZ_production_system.htm)

The semi-arid plains in the south and the Rift Valley do not get enough rain to support rain fed agriculture. These areas are the home of peoples such as the Rendille, Samburu, Turkana, Galla and the Maasai who raise livestock for a living. They drink milk and eat meat from their animals and they sell animals to buy grains, like maize (corn). These people also practice nomadic life especially during the dry season. They move from place to place looking for grass and water points for their livestock. In places where water is available, crops such as vegetables, rice, and cotton are grown under irrigation. Many of Kenya's national parks are also located in these areas. Tourists who visit the parks are an important source of income for the country.

The mountainous areas of the center and the southwest of the country receive a lot more rain. These are the major agricultural areas of Kenya. Maize and beans are the principal food crops for these communities while coffee and tea are grown as cash crops (Photos 14-16). Some areas are also set aside as forests and national parks.

**Photo 14: Coffee tree**

**Photo 15: Bringing coffee beans to the Cooperative, Nyeri District**

**Photo 16: Farm growing maize & beans, Machakos District**
(Source: Ted Bernard)

Along the coast is a narrow strip of land that receives abundant rainfall. This is an area where a variety of crops such as fruits, nuts, and cotton are grown. It is also the location of Kenya's beautiful beaches. The tourist industry is very important, earning the country over $1 billion in 2007.

Temperatures vary from season to season and by elevation of the place. The lowlands are much hotter than the highlands. In the cool time of the year the highlands sometimes get frosts, and hail is quite common. Predictions of climate change made by global General Circulation Models (GCMs) are in broad agreement that by 2050 Kenya will be generally warmer and wetter. These trends may differ for specific areas. For example, in the highlands of Kenya, warmer temperatures are expected along with shorter but more torrential rainy seasons, while areas of north eastern Kenya are expected to see increases in rain that may lead to more vegetation and there is evidence from recent satellite measurements that this may already be underway. Although GCMs predict that Kenya will be warmer and wetter, different regions will likely have complicated responses because of mountains, lakes, human population size, and people's land use.

The highland areas of Kenya provide most of Kenya's food (like maize and beans) and mountain-grown cash crops (like coffee and tea). Warmer temperatures in the cool highland areas are expected to be too warm for coffee and tea, which will have to be moved to cooler and higher areas. The warmer temperatures will make the growing season shorter (better) for maize and other food crops, especially if rainfall stays about the same or increases.

Lowland areas are also predicted to be warmer, especially along the Indian Ocean coast. Although the models also predict more rainfall for lowland areas, too much warming will shorten the growing season for maize and many other crops that are grown there now. Farmers in lowland areas may expect to cope with these warmer temperatures by switching to more heat-tolerant crops.

**Photo 17: A farm homestead in lower Embu District, Kenya**
(Source: Jennifer M. Olson)

**Photo 18: Tethered goat on a farm homestead in Kiambu District, Kenya**
(Source: Ted Bernard)

Many other areas of Kenya do not have enough rainfall for agriculture, so herding is more common (Photos 17-18). These areas already have erratic rainfall from year to year. Although increased temperatures and more rainfall by 2050 may make farming theoretically possible, the characteristics of the rainy seasons (shorter and more torrential) may make farming too risky in all but a few places.

The following diagrams represent the average distribution of temperature (the red lines represent the maximum and minimum daily temperatures, and rainfall represented by the blue bars). These clearly demonstrate the bimodal rainfall distribution over much of Kenya.

The following bar chart for Nairobi, Kenya shows the year's average weather condition readings covering rain, average maximum daily temperature and average minimum temperature.

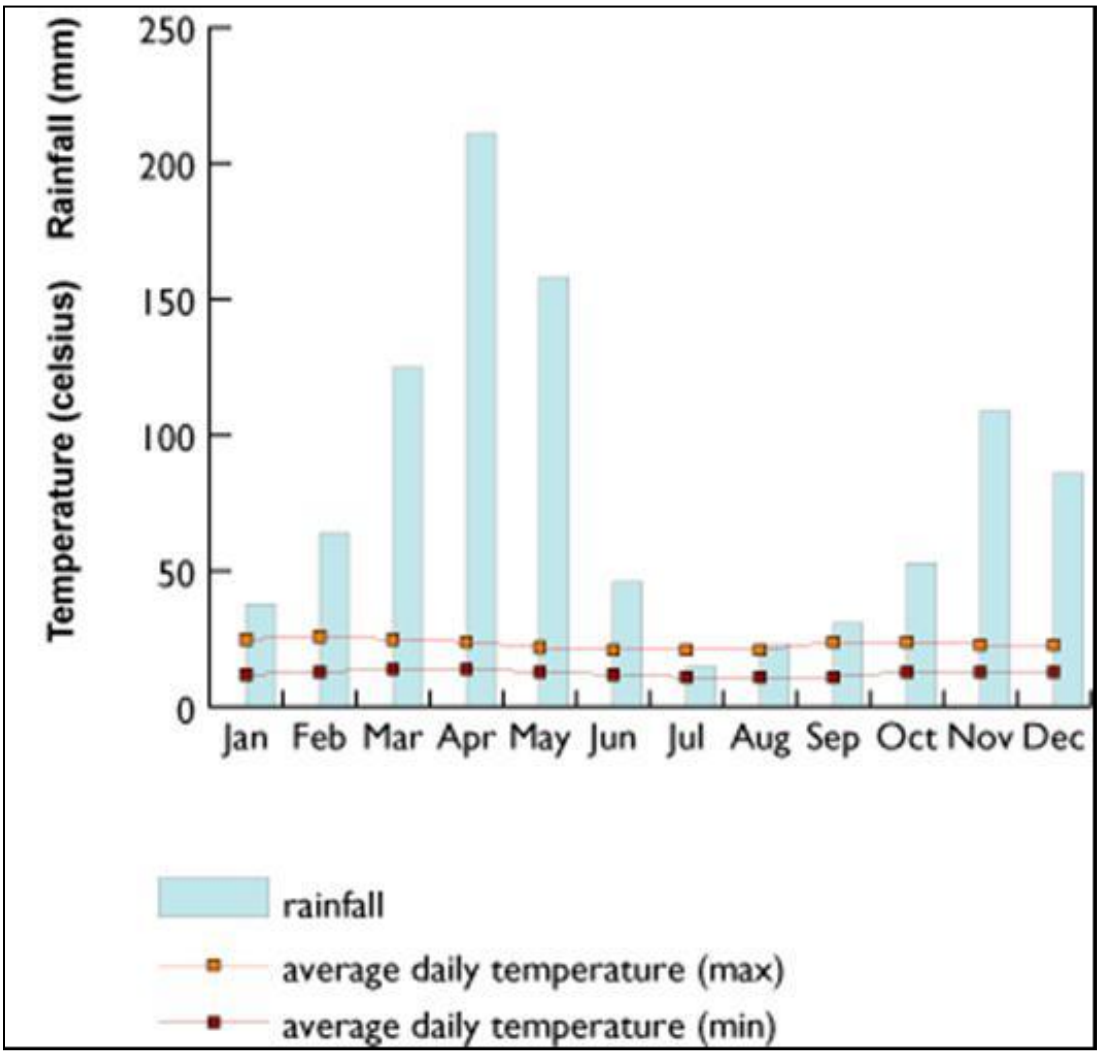



**Figure 1: Weather condition readings for Nairobi, Kenya covering rain, average maximum daily temperature and average minimum temperature.**
(Source: BBC Weather Centre) http://www.bbc.co.uk/weather/world/city_guides

The following bar chart for Mombasa, Kenya shows the year's average weather condition readings covering rain, average maximum daily temperature and average minimum temperature.

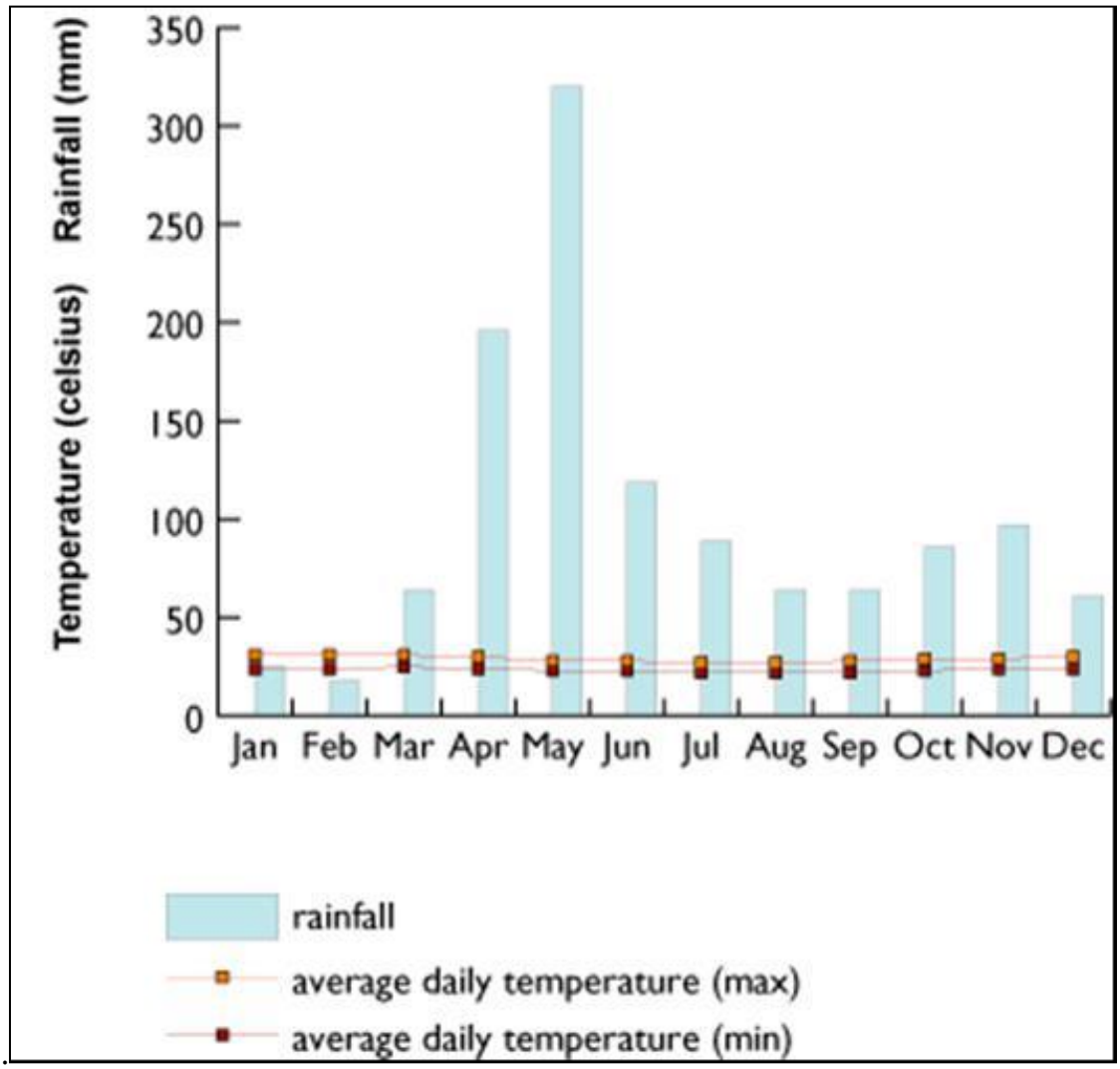



**Figure 2: Weather condition readings for Mombasa, Kenya covering rain, average maximum daily temperature and average minimum temperature.**
(Source: BBC Weather Centre) http://www.bbc.co.uk/weather/world/city_guides

The following bar chart for Kisumu, Kenya shows the years average weather condition readings covering rain, average maximum daily temperature and average minimum temperature.

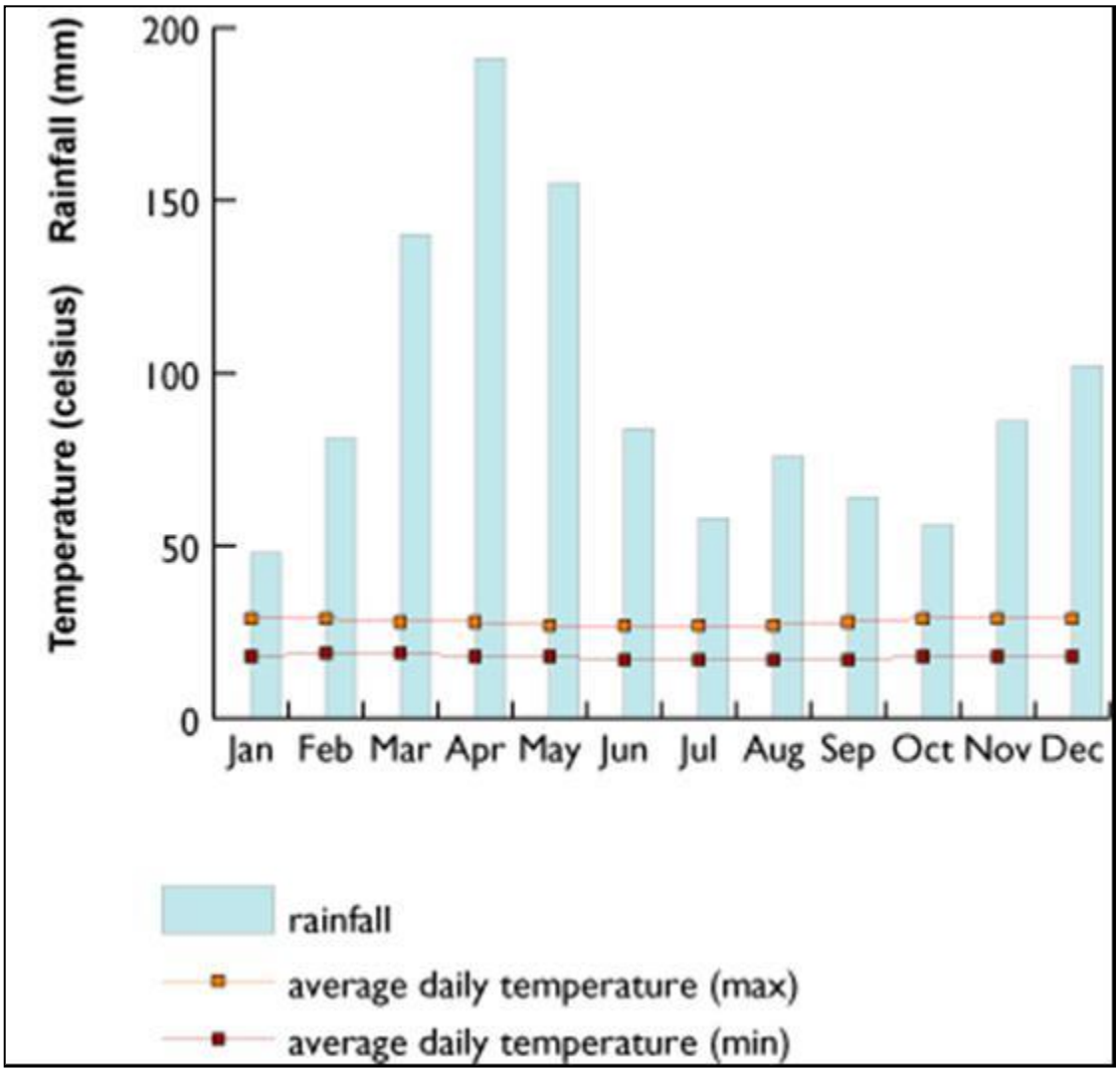



**Figure 3: Weather condition readings for Kisumu, Kenya covering rain, average maximum daily temperature and average minimum temperature.**
(Source: BBC Weather Centre) http://www.bbc.co.uk/weather/world/city_guides

**Soils**

Many factors contribute to soil formation, including the original rock, the climate, the slope and height of the land, and the activity of living organisms. With its diverse landscapes and environmental conditions, Kenya has many different soil types. Some are sandy, some clays, and others are very stony. Their characteristics vary according to drainage and original rock matter; some are well drained while others become waterlogged during the rains. Kenyans are very aware of these characteristics, and farmers and herders vary their use of the land to take account of these differences.

**Hydrology**

Kenya has many large lakes and a number of rivers. The largest lake, Lake Victoria that is shared with Tanzania and Uganda, covers 67,493 square kilometers. Others include the Rift Valley lakes that run from Lake Magadi in the south to Lake Turkana in the north. These lakes are important to Kenya's economy. The birds and animals that the lakes attract support an important tourist industry.

The longest river in Kenya is the Tana River. It rises on Mount Kenya and flows for 700 km to the sea 50 km north of Malindi. The Athi River that rises in hills near Nairobi joins the Galana River and after 550 km flows into the Indian Ocean near Malindi. A third major river is the Ewaso Ngiro. This is a seasonal river. This means that it only flows along its whole 530 km course across the dry lands of northeast Kenya into Somalia during the rainy seasons. Other important rivers are the Turkwell and Kerio, both of which flow for about 350 km before entering Lake Turkana. A number of shorter rivers flow into Lake Victoria.

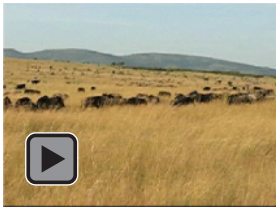
**Wildlife**

A remarkable feature of Kenya's natural resources is the wildlife. Wildlife have survived largely because the Kenyan people did not hunt them for fun but deliberately preserved them. The Maasai, for example, believe that their god made them custodians of all animals, wild and

domestic. Today a large proportion of the country has been set-aside as national parks and national reserves. These are areas within which the wildlife is protected and in which dry season grazing and water is found. Among these are Lake Nakuru, known for its flamingos, Amboseli famous for its elephants, and Maasai Mara where the spectacular annual migration of the wildebeest takes place (Photo 19).

Click on the arrow below to play the wildebeest migration video. Right click on the video screen and select Disable Content to close the video.

**Video Credit: Owen Campbell**



Wildebeest migration

**Photo 19: Masai Mara Reserve: Wildebeest migrations**

Kenya has many wildlife species, and over a thousand different birds. The animals range from the "Big Five" - elephant, rhinoceros, buffalo, lion, and leopard - (Photos 20-25) to numerous antelope including the world's smallest antelope, the dik dik. One of the strangest of animals is the rock hyrax, which is about the size of a rabbit yet is related to the elephant!

**Photos 20-25: The Big Five.**
**From upper left: Elephant, lioness, buffalo, rhino, mature leopard in tree, baby leopard**

**Flora**

Given the diversity of ecological conditions in Kenya, it is not surprising that the country's flora is spectacular in its variety. The range of flora can be experienced by imagining a trek from the summit of Mt. Kenya down to the floor of the Rift Valley and across the lowlands to the coast. At the summit of Mt. Kenya are glaciers, and species able to survive in great cold are found, such as alpine flowers and grasses. The descent takes you through highland rain forests and bamboo forest into the savannas with their euphorbia trees, baobabs, and acacias. The drier areas have sparse vegetation with occasional thorny bushes and cacti. Along the coast, the damp winds from the ocean support lush vegetation including palm trees and coastal rain forest.

**Major Environmental Regions**

Kenya has an exceptionally varied environment (Map 5). It has forests and deserts, mountains and plains all so close to each other that you can go from snow-capped Mount Kenya to the near-desert in under 150 kilometers. Along the coast of the Indian Ocean are glorious white sand beaches and coral reefs teeming with colorful fish.

*The Lake Victoria Basin*

Lake Victoria, the world's second largest freshwater lake, covers 67,493 square kilometers, and is bordered by Kenya, Uganda, and Tanzania. The lands on the shore are flat and fertile and around them rise mountains with rain forests that receive year-round rainfall. The Basin is one of Kenya's most productive agricultural areas, with sugar the principal cash crop. The lake is the location of an important fishing industry, though the variety of fish has declined markedly since the introduction of the very competitive Nile Perch, which has replaced many species.

*The Central Highlands*

These upland areas rise above 1500 meters and include Mt. Kenya (Photo 26), the Aberdares, the Cherangani Hills, and the Mau Escarpment. These are among the most densely settled and agriculturally productive areas of the country. Farmers produce maize (corn), beans, and bananas

as staple food crops; tea and coffee, and in some areas horticultural crops for export. The higher locations are enclosed in National Parks such as the Mt. Kenya and Aberdares parks, and are the home of many wildlife species.

**Map 5: Kenya**


(Source: wkitravel.org)

**Photo 26: Mount Kenya**
(Source: Turaco Tours and Safaris. http://www.turacosafari.com/)

*The Rift Valley*

A spectacular feature of the Kenyan landscape, the Great Rift Valley, divides the Highlands. A number of freshwater and soda lakes are found in the floor of the Rift Valley. These include Lake Magadi, where the soda is mined commercially, Lakes Elementaita, Bogoria (Photo 27), and Nakuru, where large populations of flamingos are found, Lake Baringo which has an important fishing industry and in the north, Lake Turkana, where many of the exciting discoveries about the origins of the human race were made by Kenyan archaeological expeditions.

*The Lowlands*

Kenya's dry lowlands cover about 80 percent of the land area. They extend from the deserts of the north that border Sudan, Ethiopia, and Somalia, south and east to the semi-arid savannas that border Tanzania. They form an undulating plain, broken only by a few highland outcrops such as Mt. Marsabit, a volcano with a spectacularly beautiful lake in its crater. These dry areas are the home to Kenya's nomadic people such as the Turkana, Rendille, Boran, and Gabbra. Their livelihoods depend mainly on the herding of camels, cattle, sheep, goats, and donkeys. These are

among the most isolated and poor areas of the country. In the southeast of Kenya are two of the country's most famous national parks, Tsavo and Amboseli, which adjoin the territory of the Maasai people.

**Photo 27: Hot Springs at Lake Bogoria**
(Source: Matembo Tours & Safaris)
http://www.matembotours.com/lake%20bogoria.htm

*The Coast*

Kenya's coastline extends for nearly 450 kilometers from the border with Somalia in the north to Tanzania in the south. The coast receives rains from winds blowing off the Indian Ocean, and the coastal plain has a productive agricultural economy including coconuts, bananas and other fruits, and nuts. The coast is fringed by coral reefs that have spectacular fish life. The coastal ports were part of an ancient trading network that extended across the Indian Ocean to Arabia, India, and China. Mombasa, one of these ancient ports, remains the leading seaport on the east coast of Africa. The beaches, climate, and historic sites are the basis of a tourist industry that attracts hundreds of thousands of tourists each year.