

PART 1
ENVIRONMENT, PEOPLE
AND DEVELOPMENT

CHAPTER 1 ENVIRONMENT AND ECONOMIC DEVELOPMENT



Introduction

The natural environment refers to the entirety of all living and non-living things that occur naturally on earth (as distinguished from those that are human-made or artificial) and the context within which they exist and the various levels at which they interact. Kenya's environment comprises diffuse natural phenomena such as air and the climate as well as geographically identifiable ecological systems such as forests, woodlands, savannah, wetlands, mountains, lakes, rivers and oceans where the living and non-living components interact to form a stable system that provides a range of ecological services.

Although there is no universally accepted definition of economic development, it can be perceived as the long-term improvement of the standard of living of a country's citizens. As such, it comprises the policies, processes and activities by which a nation improves the economic, political and social welfare of her people. Kenya's long-term economic development aspirations are contained in Vision 2030 (GoK 2007) which was launched in 2007. Its overarching objective is to transform Kenya into a globally competitive and prosperous nation with a high standard of living for its citizens. This will be incrementally achieved through a series of five year medium-term rolling plans, the first of which covers 2008-2012. Kenya's development blueprint consists of several flagship projects and other priority programmes that are buttressed by the social, political and economic pillars. Figure 1.1

contains a thematic overview of Kenya Vision 2030.

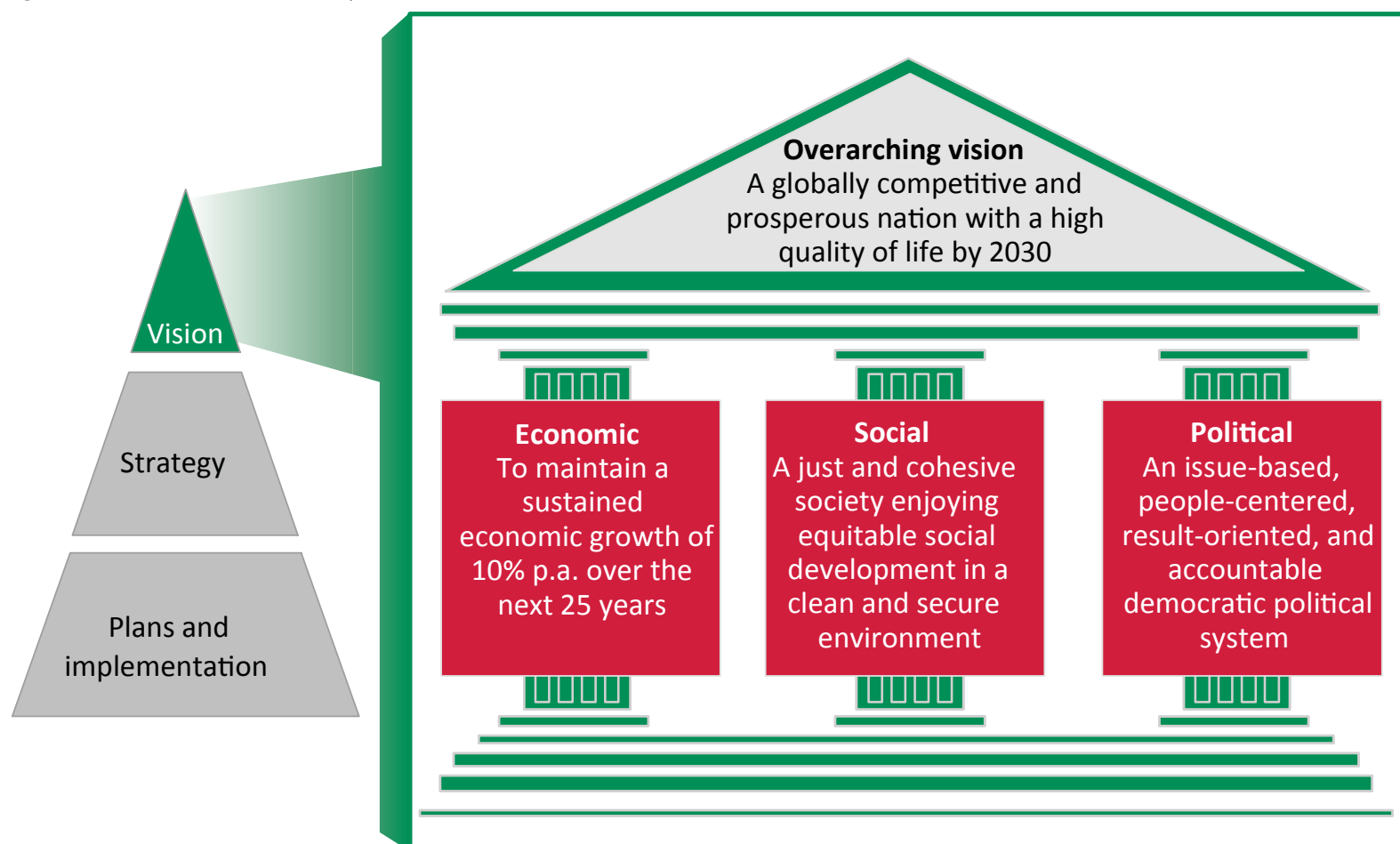
The primary goal of the social pillar is to build a just and cohesive society that enjoys equitable social development in a clean and secure environment. This will be achieved by transforming six essential social sectors which are education and training; health; water and sanitation; the environment; housing and urbanization; as well as gender, youth, sports and culture. The social pillar also aims to cater for the specific needs of Kenyans with disabilities and the marginalized communities in its quest for social equity and poverty reduction. The main goal of the political pillar is to consolidate the gains made in building a democratic society that respects individual liberties, freedoms of speech, association and worship, as well as the rule of law. This will be achieved through enacting legislation to enhance national governance, improving public service delivery and revolutionizing the judiciary to make it both more efficient and effective. The economic pillar aspires to attain and maintain an annual GDP growth rate of 10 percent by improving efficiency in six priority sectors. These are agriculture and livestock; tourism; wholesale and retail trade; manufacturing; finance; and business processing outsourcing/offshoring (BPO).

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Figure 1.1: Thematic overview of the Kenya Vision 2030

Source: GoK 2007





Nexus between environment and economic development

The World Commission on Environment and Development popularly referred to as the Brundtland Commission coined the term 'sustainable development' to draw the world's attention to the relationship between environmental factors and economic growth (WCED 1987). The upshot is that, in light of the intricate feedbacks that exist between the two arenas, charting Kenya's economic aspirations must be done in tandem with assessing the concomitant environmental impacts precisely because the production and consumption patterns that stimulate economic growth are dependent on use or extraction of natural resources and ecosystem services as well as waste disposal into landfills, water or the atmosphere. However, if these are left unbridled, there is a risk that excessive resources' extraction could lead to their depletion or outstrip their regenerative capacity while the accumulation of waste and concentration of pollutants could overwhelm the environment's carrying capacity, successively aggravating environmental degradation and eventually imperilling the citizens' wellbeing and the country's economic development. This is particularly worrisome given that, at the population growth rate of 2.9 percent per annum, Kenya's increasing ostentatious population of 38.6 million in 2009 (GoK 2010b) is projected to steeply rise to 70.3 million by 2030. Admittedly, Vision 2030 epitomizes the Kenya government's cognizance of the need to match economic development goals with ecological exigencies. The challenge therefore, is to translate these goals, first into actionable strategies and ultimately, into appreciable human welfare improvements and positive environmental outcomes.

Kenya's economy is linked to the environment in a myriad of ways. At the subsistence level, many rural households derive their livelihoods from the country's natural resources such as land, forests, woodlands, rivers, lakes, wetlands as well as coastal and marine resources. Business entities also depend on the environment for land which is one of factors of production, raw materials, energy and to dispose of their waste.

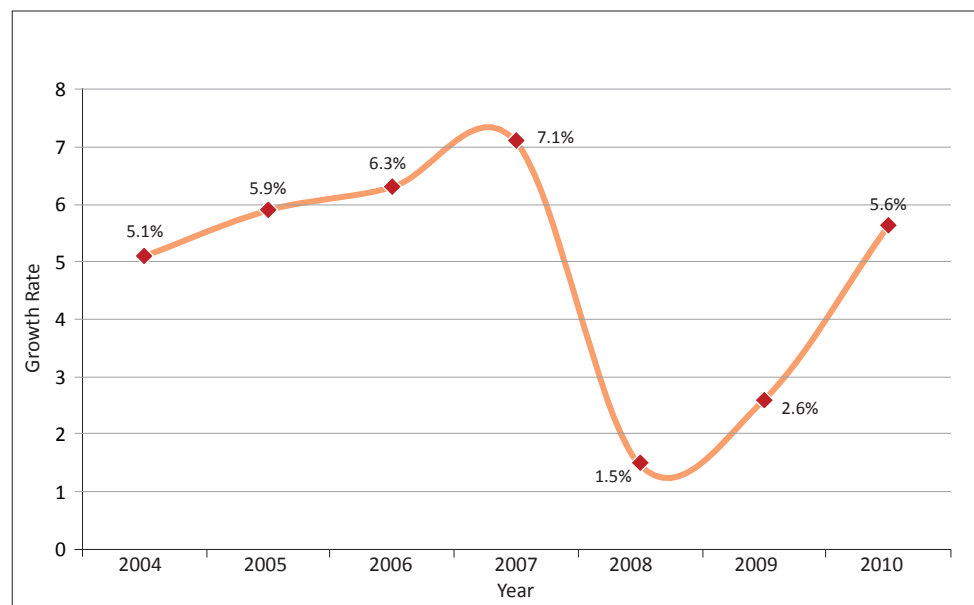
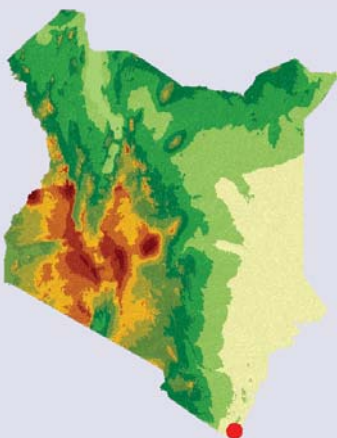
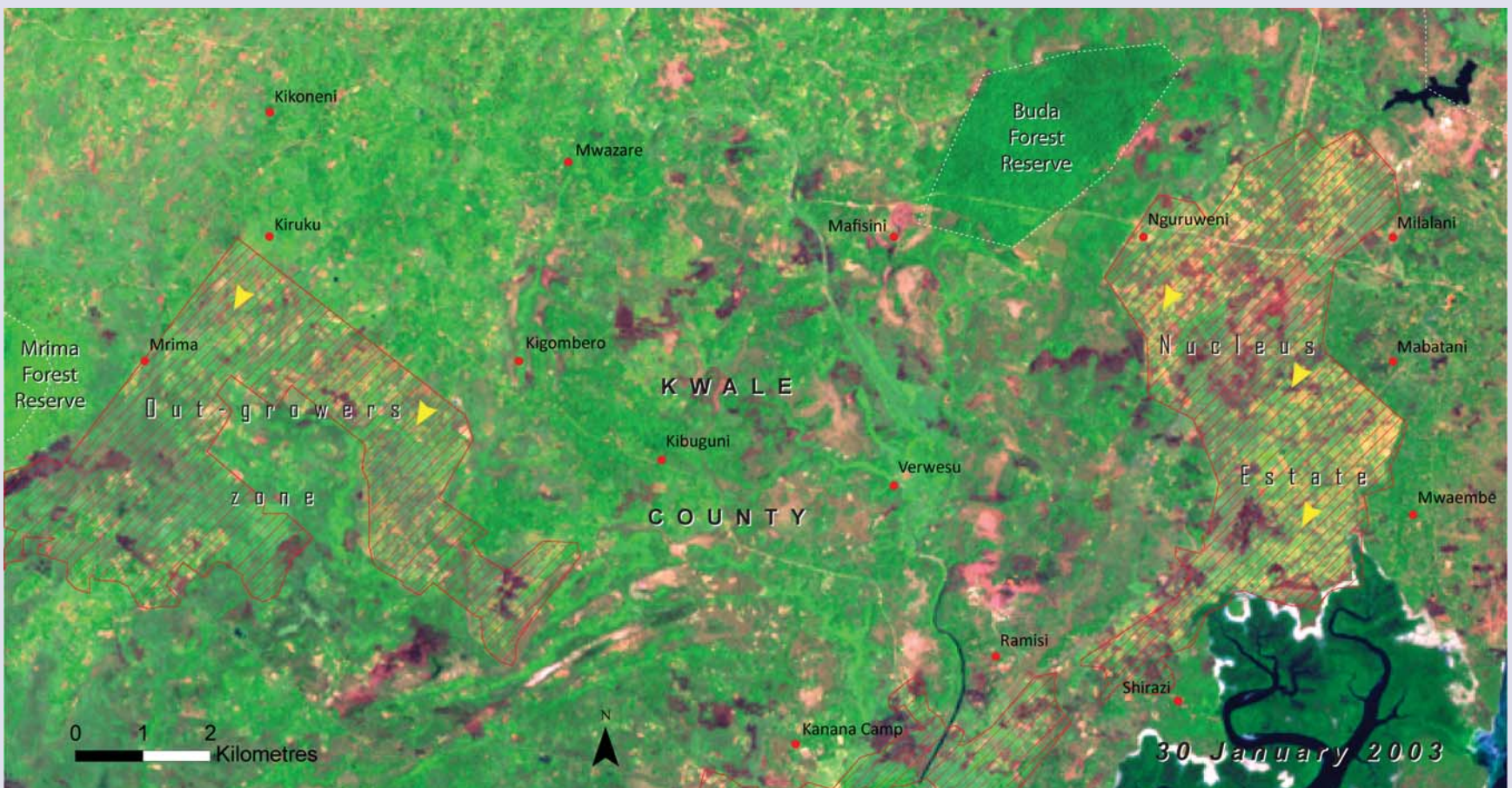
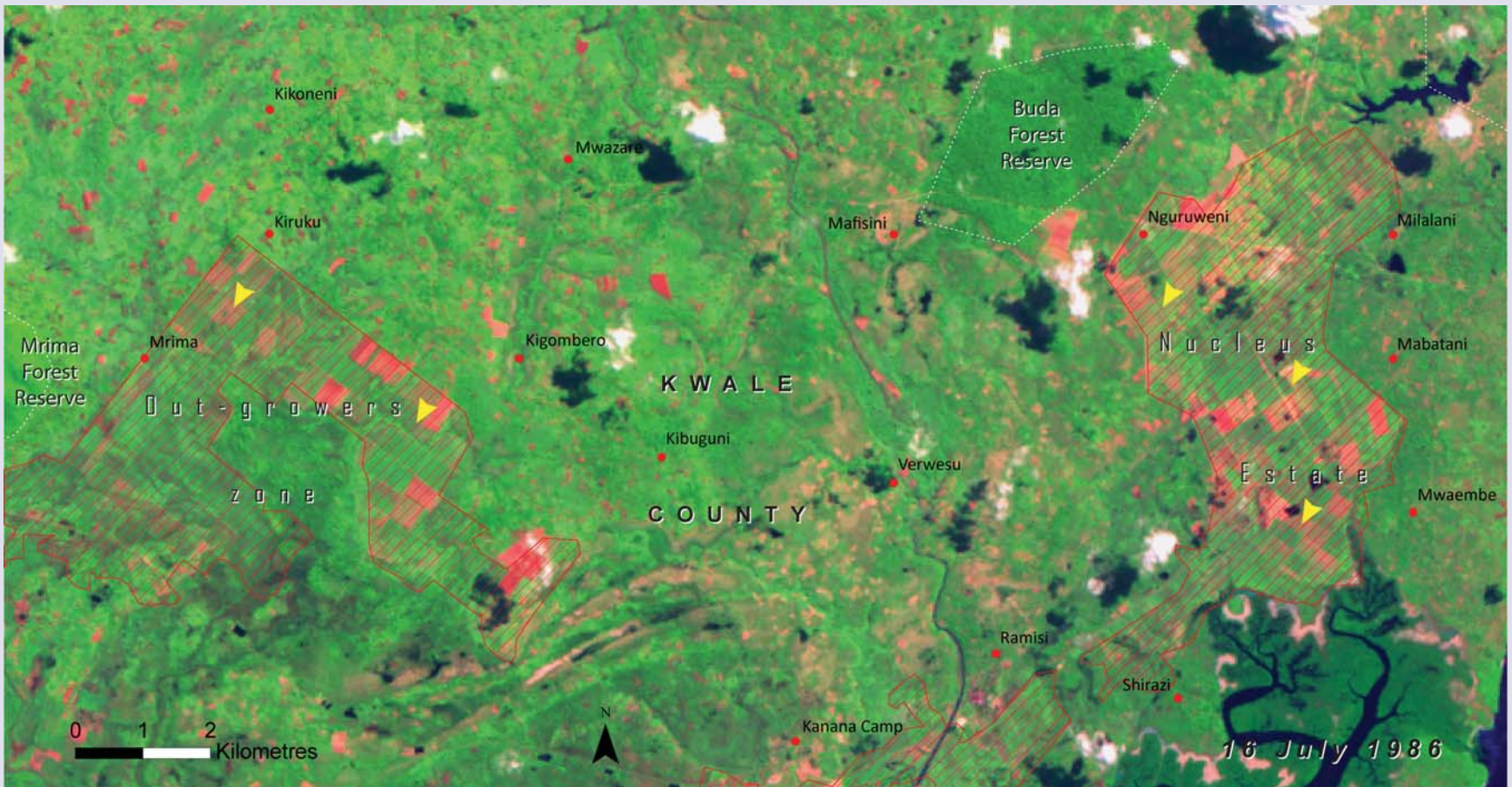


Figure 1.2: Kenya's economic growth rates, 2004-2010

Source: GoK 2010a and GoK 2011b

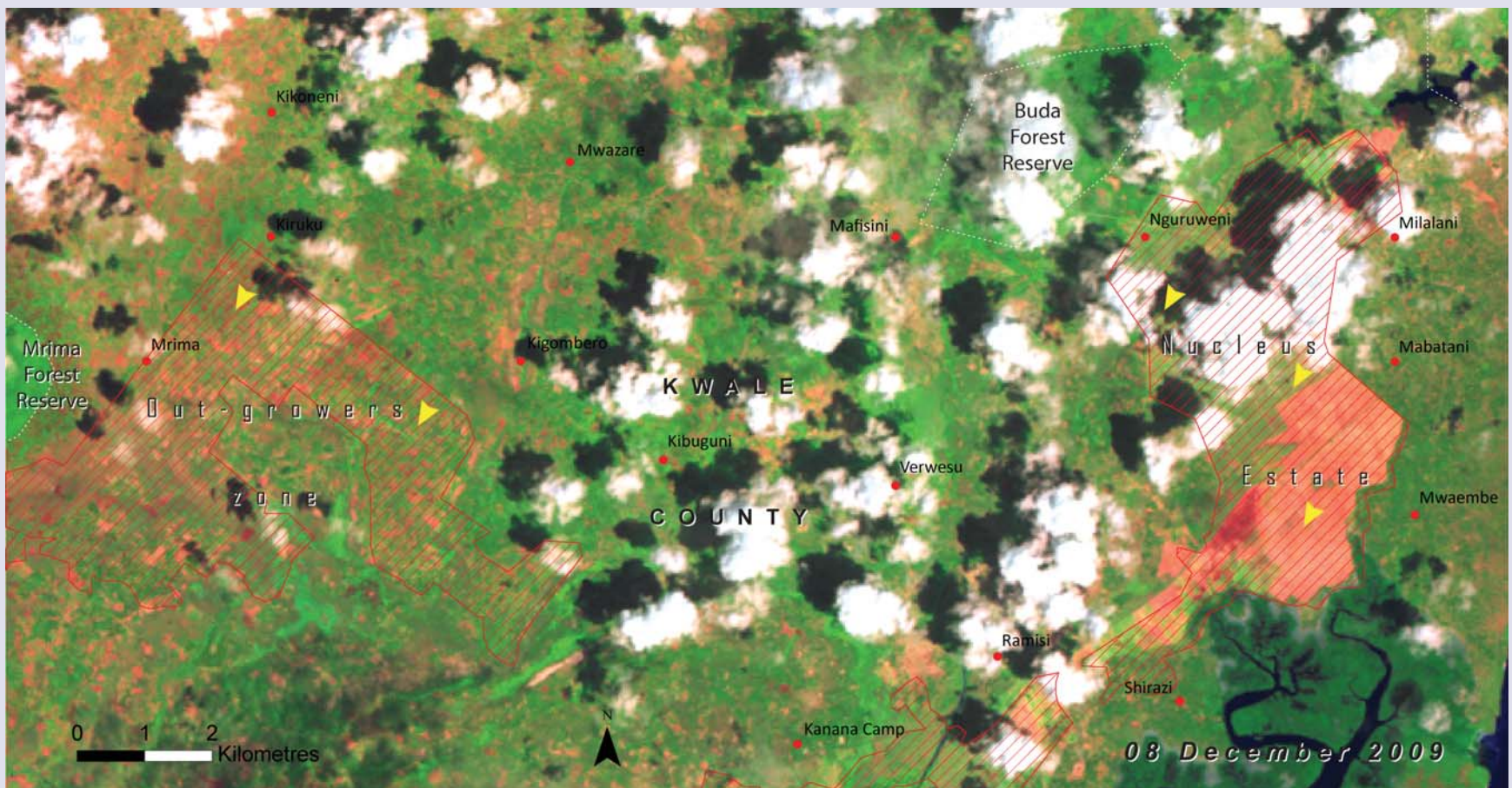
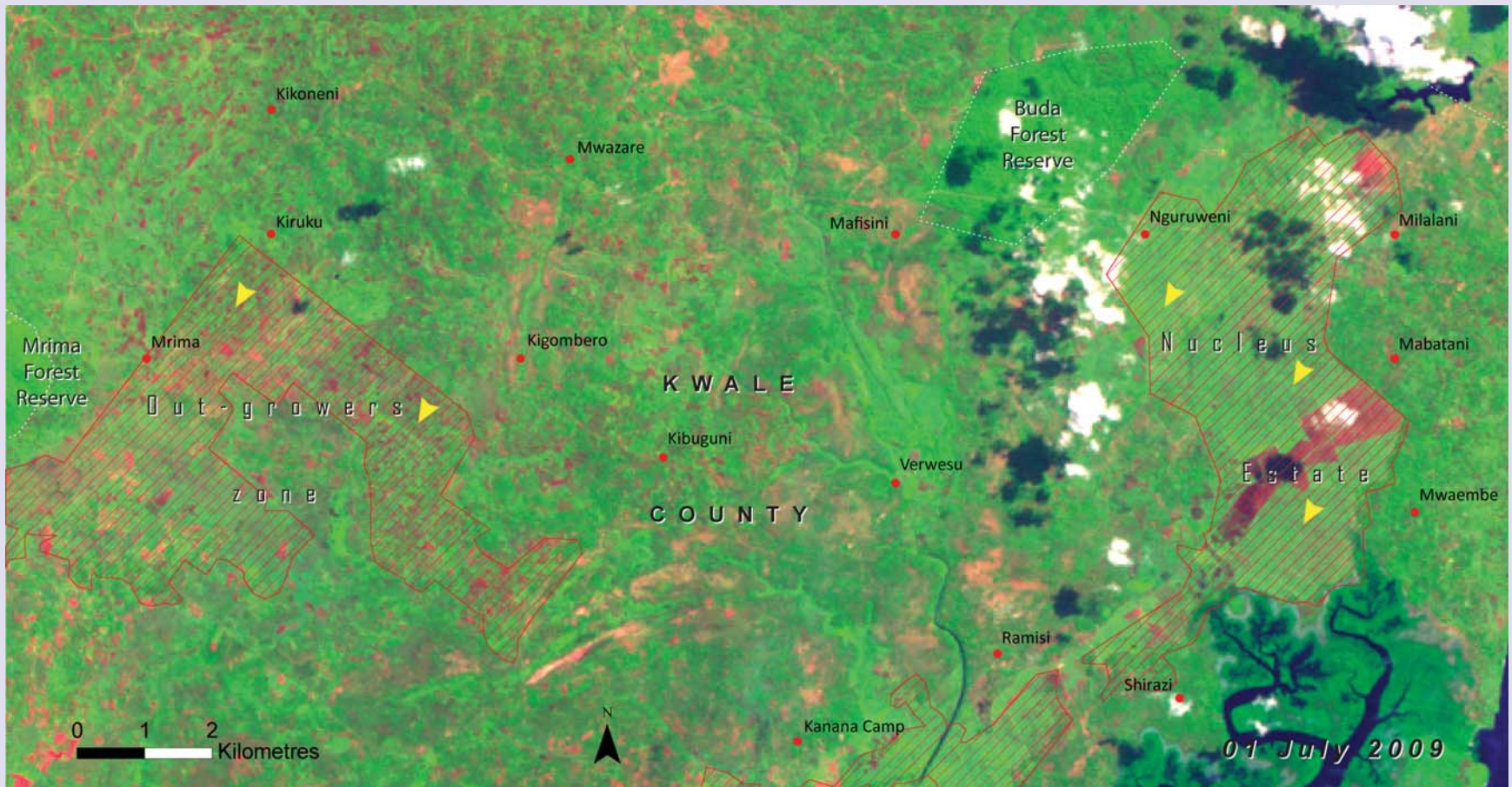
In 2010, Kenya's real GDP growth rate rose to 5.6 percent, up from 2.6 percent recorded in 2009. The improvement was attributed to a stable macroeconomic environment (such as low inflation), the implementation of the economic stimulus programme, increased credit to the private sector and favourable weather conditions (GoK 2011b). Figure 1.2 contains an illustration of the country's growth rates from 2004-2010. While the impressive 2010 growth rate is a testament to the buoyancy of the Kenyan economy, it is lower than the record 7.1 percent growth registered in 2007 before the effects of the spontaneous violence and reprisal attacks that rocked several regions of the country in the aftermath of the 2007 general elections and a severe global economic recession took their toll. Even more important for the purposes of this SoE report, the 5.6 percent growth rate is only a little over half of the 10 percent growth rate anticipated by Vision 2030 so giant strides need to be made in closing this gaping gap. As is evident from the discussion below, the country's economic growth continues to be weighed down by the sub-optimal performance of a number of important economic sectors and the volatility of several macroeconomic indicators.



Ramisi Sugar Factory – Ramisi Sugar Factory was established in Ramisi, Kwale County, (south coast of Kenya) in 1927 but closed down its operations in 1989. During its operational days, sugarcane was grown in two major zones, the nucleus estate—owned and cropped by the company, and the out-growers zone operated by contracted small scale farmers (16 July 1986 image). After the collapse of the company, squatters occupied the nucleus estate and converted it to a patchwork of

small scale farms while similarly, the out-growers zone reverted to other small scale agricultural activities (30 January 2003 image).

In a bid to shore up sugar production in the country, a new company, Kwale International Sugar Company Limited (KISCOL) was recently licensed by the Government to revive the stalled sugar cane farming in Kwale County.



The project nucleus covers 15 000 acres in Ramisi, Kigwede, Kidzumbani, Koromojo, Kitaruni, Shirazi and Fahamuni. The proposed project will have sugar cane grown under irrigation on a nucleus estate of approximately 8 000 acres, and out-grower farms covering 12 000 acres. Other project features will include a sugar mill, a co-generation power facility with a capacity of 17 MW and an ethanol plant, among others.

The clearing and preparation of the nucleus estate is visible very clearly in the 01 July 2009 and the 08 December 2009 satellite images.

Note:

The white patches in the images are clouds.

Sugar growing areas are marked by red hatches and yellow pointers.



A small scale farmer's mixed crop farm of bananas and sweet potatoes, grown under irrigation in the semi arid Mpeketoni area, Lamu County.

Key sectors of Kenya's economy, Vision 2030 and the environment

Agriculture

Like most of the sub-Saharan African countries, agriculture is the backbone of the Kenyan economy. The agriculture and forestry sector's contribution to the real GDP (at 2001 constant prices) grew by 6.3 percent from KSh 299.4 billion in 2009 to KSh 318.4 billion in 2010. The agriculture component alone increased by 6.5 percent from KSh 288.3 billion in 2009 to KSh 307.1 billion in 2010 compared to contractions of 2.7 percent in 2009 and of 4.3 percent in 2008 (GoK 2011b). The combined share of agriculture and forestry in the country's GDP dropped from 23.5 percent in 2009 to 21.5 percent in 2010. The agriculture component's proportion of the GDP was 22.7 percent in 2009 and 20.7 percent in 2010 and accounts for roughly one-fifth of the economic activity in the country.

The improvement in agricultural production was due to good weather, provision of low priced and quality seed and fertilizer by the government and the economic stimulus programme one of whose projects was to increase food (maize and rice) production by increasing the acreage under irrigation in Bura, Hola, Pekera, Tana Delta, Kibwezi, Ahero, Bunyala, Mwea and Kano in order to reduce poverty and hunger (GoK undated). Maize, wheat, rice, tea and sisal production increased while coffee, tea, sisal, pyrethrum and tobacco recorded favourable international prices which boosted earnings. Table 1.1 contains the estimated production of selected agricultural commodities, 2006-2010.

Reviving the collapsed irrigation schemes in the country's arid and semi arid lands (ASALs) notably Hola and Bura are in line with the

Vision 2030 aspirations that are predicated on the realization that 9.2 million hectares in the ASALs have the potential for crop production if irrigated (GoK 2007). The increased agricultural production obviously went some way in assuring food security, improving household incomes and alleviating poverty in most of 2010. However these irrigation efforts need to be drastically scaled up if the country is to, in future, stave off famine on the devastating scale that is currently ravaging the greater Horn of Africa region.

Horticulture continued its declining trend that begun in 2008 primarily due to the continuing depressed demand in the main export markets given that these markets have not fully shaken off the effects of recession that dampened demand. Exports of cut flowers, fruits and vegetables all fell with cut flowers falling from 87 000 tonnes in 2009 to 67 700 tonnes in 2010. Exports of fruits reduced from 21 200 tonnes in 2009 to 19 300 in 2010 while those of vegetables decreased from 72 500 tonnes in 2009 to 60 100 tonnes in 2010 (GoK 2011b). Following a 33 700 tonne plunge in horticultural exports, earnings from the sector declined by a considerable KSh 9.2 billion in 2010 relative to 2009, forcing flower farms to lay off workers (Riungu 2009) which is contrary to Vision 2030's goal of stimulating employment creation.

Table 1.1: Estimated production of selected agricultural commodities, 2006-2010

Source: GoK 2011b

Crop	Unit	2006	2007	2008	2009	2010*
Maize	Million bags	36.1	32.5	26.3	27.1	35.8
Beans	Million bags	5.9	3.5	2.9	5.2	4.3
Potatoes ⁺	Million tonnes	2.7	2.8	2.2	2.6	3.1
Sorghum	Million bags	1.6	1.8	0.6	1.1	1.8
Millet	Million bags	0.8	0.9	0.4	0.6	0.6

* Provisional + Revised

As the largest sector of Kenya's economy, it is reasonable to assume that the environmental impacts of agriculture are considerable and exceed those of the manufacturing sector. Indeed, increased water requirements compound the water scarcity and the attendant user conflicts that the country already has to grapple with. Further, increased fertilizer requirements imply burning of more fossil fuels from which they are derived and directly contribute to climate change and variability whose effects in Kenya are discussed in Chapter 3. Agricultural pesticide and chemical runoff often pollute the country's watercourses and bodies and the Indian Ocean, with adverse effects for freshwater (Odada et al 2004) as well as marine and coastal biodiversity. For instance, the Mombasa and Lamu inshore waters as well as the Malindi Bay and Sabaki Estuary which contain excessive loads of microbiological, metal and nutrient loads from agricultural runoff have been categorized as pollution hotspots in the western Indian Ocean region (UNEP/Nairobi Convention Secretariat et al 2009). Moreover, besides biodiversity threats, pollution is associated with a range of human health risks arising from contact or ingestion of contaminated fish and seafood. It also adversely affects the livelihoods of artisanal fishermen. Marine pollution also reduces the attractiveness of Kenya's leading coastal tourist destinations and could well cause the Vision 2030 goal to make Kenya one of the world's top ten long-haul tourist destinations to recede beyond reach. This would have ripple effects on the attainment of the other goals of Vision 2030's economic, social and political pillars principally because tourism is the country's biggest foreign exchange earner and its continued growth is vital to shielding the country against the rising prices of vital imports such as crude oil.

Manufacturing

The real GDP attributable to the manufacturing sector grew by 4.4 percent from KSh 137 billion in 2009 to KSh 143 billion in 2010. The sector consists of food manufacturing which is the single largest subsector but also beverages and tobacco and miscellaneous manufacturing activity. The considerable challenges faced by the sector such as high production costs, high taxes, poor infrastructure and cheap imports were more than cancelled out by favourable weather, which assured manufacturers of a steady supply of primary raw materials and hydroelectric power. Both the bulk of the manufacturing sector and energy sources are weather-dependent which highlights the magnitude of the effect environmental forces have over Kenya's economy. Indeed, the poor performance of the sector in 2009 was, in addition to cheap imports and high production costs, primarily attributed to drought.

Although the manufacturing sector's higher growth rate in 2010 is commendable, it continues to display a lacklustre performance. This probably accounts for the fact that even though it was the second largest economic sector after agriculture in 1990, by 2009 it had slipped to fourth place. And, even the sector's 2010 growth rate was 1.2 percent lower than the average growth rate and therefore continues to drag down the overall real GDP growth rate. Yet, because the sector is capital-intensive and creates many synergies and linkages with other industries such as agriculture, financing and wholesale (which are themselves some of the economic pillar's priority areas), it is an important job and wealth creator. Its growth is also crucial to shrinking Kenya's growing trade deficit as it would help bridge the gap between the low value exports and high value imports. The manufacturing sector will also be vital to transforming the country into a rapidly

industrializing middle-income country by 2030 which is perhaps Vision 2030's most eloquent clarion call.

Given that the manufacturing sector's sustained double-digit growth rate is crucial to directly meeting the targets enumerated in the Vision 2030 economic pillar and to producing the resources for financing the identified social and political programmes, it is expected to come under pressure to reclaim its fast diminishing influence. It is therefore important to institute strong policy and legal mechanisms to ensure that the imminent increased manufacturing activity does not aggravate environmental degradation. This is partly because, due to intermittent power outages even at the best of times, a number of the country's industries increasingly rely on diesel-powered generators to meet production targets. Yet there is consensus among the scientific community that fossil fuel burning is responsible for emitting the largest proportion of greenhouse gases (GHGs) that are liable for climate change and variability (IPCC 2007). The suspended particulate matter from fossil fuel burning compromises air quality and causes diseases such as asthma and chronic bronchitis (Nel 2005). Although all the fuel that is sold in the country is unleaded, lead emissions from industrial processes (such as paint and battery manufacturing) contaminate crops and raise the risks of hypertension, heart attacks and strokes (Lovei 1998). In addition, a number of manufacturing entities pump untreated effluent into the country's rivers with this being largely responsible for the high pollution levels in the Nairobi and Ngong Rivers (UNEP 2007). These toxic and heavy metal-laden effluents alter the chemical composition of the rivers, giving off pungent smells which negatively affect human health. They also lead to loss of freshwater biodiversity and adversely affect the capacity of these watercourses to provide their traditional ecosystem services. The manufacturing sector should, under the auspices of its umbrella Kenya Association of Manufacturers (KAM) be encouraged to adopt lean production techniques that minimize waste and prevent pollution. These should complement command and control structures and other innovative measures such as targeted carbon emissions taxes that are already planned for implementation in developed countries such as Australia.

Over the last few decades, rising manufacturing activity has been associated with the increased use of plastic bags as the latter are often used to package manufactured goods but also to pack purchased groceries. Not only are plastic bags a source of aesthetic pollution—as these bags are dotted all over trees, parks and roadsides which negatively affects tourism—it is also a threat to biodiversity. Livestock and wildlife, for instance, get entangled or mistakenly ingest plastic bags while empty plastic bags that fill with rainwater are breeding grounds for malaria-carrying mosquitoes (UNEP 2005). Even though enforcement of the ban on the manufacture, importation and distribution of plastic carrier bags with gauges of less than 30 microns by both NEMA and the Kenya Bureau of Standards has helped to lessen the use of flimsy plastic bags, it has done little to encourage the recycling, reuse or proper disposal of the thicker plastic bags that are permitted by the law or even the use of the more readily biodegradable paper bags or conventional bags. The solution may therefore lie with imposing surcharges for consumers opting to use them (as is the case in Zimbabwe and Ireland) or imposing an outright ban on their use for packing goods in shopping outlets (as is the case in Rwanda).

	Unit	2006	2007	2008	2009	2010*
<i>Freight:</i>						
Tonnes	Thousand	1 891	2 304	1 628	1 532	1 572
Tonne-Km	Million	1 313	5 606	1 109	1 060	1 105
Revenue	KShs. Million	4 177	4 448	4 266	4 317	4 108
Revenue per tonne-Km	Cts	318	79	385	407	372
<i>Passenger:</i>						
Journeys	Thousand	4 348	4 500	3 226	8 861	6 049
Passenger-Km	Million	369	148	105	389	270
Revenue	KShs. Million	160	103	76	251	252
Revenue per passenger-Km	Cts	43	70	72	65	93

Table 1.2: Railway freight, 2006-2010

Source: GoK 2011b

Transport and communication

Transport

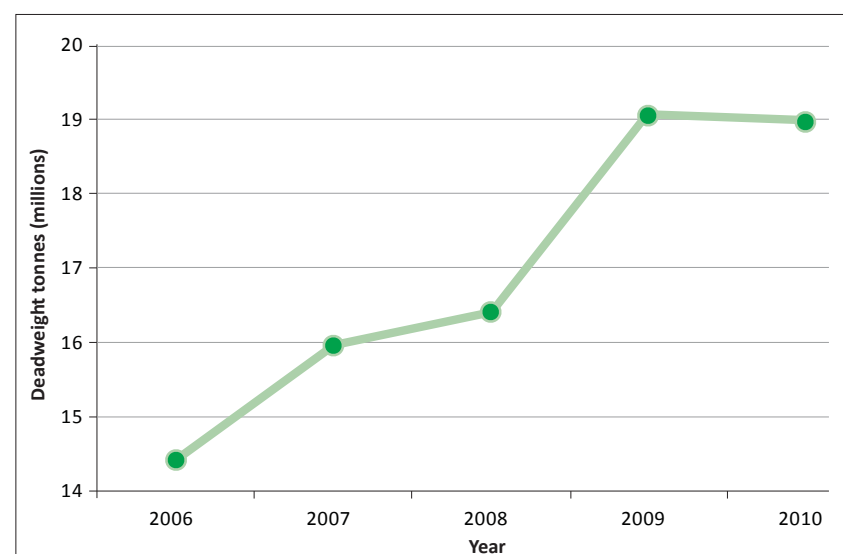
Growth in the country's transport and communications sector's contribution to the GDP slowed from 6.4 percent in 2009 to 5.9 percent in 2010 (GoK 2011b). The sector contributed KSh 172 billion to the real GDP in 2009 and KSh 182.5 billion in 2010. The sector comprises transport and storage, container handling at the port of Mombasa, air transport and the telecommunications subsectors which are fundamental to Kenya's economy and therefore to the attainment of Vision 2030. The century-old, 900km Kenya-Uganda railway line is recording falling or stagnant freight and passenger levels (see Table 1.2). This is because the railway line is dilapidated and is frequently vandalized, its rolling stock is obsolete and there is infighting among the shareholders of the Rift Valley Railways Consortium (RVR) which was awarded a 25-year concession to manage the railway in 2006. As a result, the burden of transporting bulk imports to the interior of the East African region is transferred to the country's road network. This causes heavy traffic congestion and frequent gridlocks on the roads leading into and out of the major cities, increased air pollution and exposure to traffic accidents. In addition, the roads wear out a lot faster and require more use of tar bitumen and cement concrete—whose manufacture is known to emit GHGs and other pollutants—because bulk goods are often transported in truckloads that exceed the legal axle loading limits.

The number of newly registered motor vehicles continued to grow. In 2010, 196 456 units were registered compared to 161 813 in 2009, which represented a considerable increase of 21.4 percent. From an environmental standpoint, this trend is worrying for a number of reasons. First, there is the likelihood of increased road accidents which in turn translate into higher family and state expenditure on injury-related medical care. In addition, the lives of many Kenyans are snuffed out at their prime, thrusting many of their families into poverty (and overreliance on natural resources) which is the very condition Vision 2030 seeks to stamp out. Second, the growing number of vehicles is likely to compound the already severe traffic congestions that the busier parts of the country experience. Completion of the construction of the Thika Superhighway and a number of by-passes should help to substantially ease this problem although it has been argued that by, for example bisecting the Nairobi National Park and the Ngong Forest, the southern bypass will irremediably disrupt the dynamics of the capital's biodiversity wonderlands. Third, more vehicles on roads obviously imply higher fuel consumption and the attendant air and

noise pollution. This is especially important given that most of these newly registered cars are in fact second hand imports from Asia and are not as fuel-efficient as the car models that have recently rolled off the production line. So while the debate on motor vehicles in the developed countries is gravitating towards using alternative fuels such as biofuels, ethanol, liquefied petroleum gas (LPG), liquefied natural gas (LNG), compressed natural gas (CNG), and increased use of hybrid and electric vehicles, this is unlikely to be the case in Kenya in the foreseeable future. Measures by the City Council of Nairobi to lower the number of vehicles entering the capital's central business district by raising the daily parking fee from KSh 140 first to KSh 300 and then to KSh 250 have stalled over a pending legal suit that is challenging the justification for the new rate. Unfortunately for Kenya's environment, as long as Kenya's public transport network—primarily consisting of minibuses (*matatus*), buses and the railway line—remains inefficient and insecure, the number of newly registered vehicles is likely to continue its steep upward trend in the coming years.

The Port of Mombasa is primarily used to handle Kenya and the East African region's bulk import needs. Traffic throughput has been on the rise and grew by 16.1 percent from 16.4 million tonnes in 2008 to 19.06 million tonnes in 2009. In 2010 however, it registered a marginal 0.4 percent drop to 18.98 million tonnes (see Figure 1.3 and Table 1.3). Despite the generally strong growth recorded in the last couple of years, the port is operationally inefficient by international standards. For example, in 2009 the 618 816 containers handled by the port was equivalent to only 25 percent of those handled by Durban and 2.5 percent of those handled by Hong Kong and Singapore, which are the world's busiest ports (World Bank 2010). The corollary is that Kenya's

Figure 1.3: Trend of the amount of cargo handled by the Port of Mombasa



Source: Adapted from GoK 2011b

	Unit	2006	2007	2008	2009	2010
Container Traffic	TEUs	479 355	585 367	615 733	618 816	695 600
Ships Docking	No	1 857	1 811	1 686	1 748	1 579
Imports	000'DWT					
Dry General	"	4 099	4 866	4 979	5 435	5 987
Dry Bulk	"	2 344	2 722	2 891	4 641	3 871
Bulk Liquids	"	5 043	5 474	5 441	6 432	6 386
Total Imports	"	11 846	13 062	13 311	16 508	16 244
Of which Transit In	"	3 473	4 042	4 471	4 612	5 004
Motor Vehicles landed	No.	65 348	73 818	87 284	95 798	95 604
Exports	000'DWT					
Dry General	"	1 810	2 102	2 295	2 220	2 410
Dry Bulk	"	313	205	200	62	70
Bulk Liquids	"	132	167	190	167	95
Total Exports	"	2 255	2 474	2 685	2 449	2 575
Of which Transit Out	"	335	381	404	368	377
Total Imports and Exports	"	14 101	15 536	15 996	18 957	18 819
Transhipment	"	318	426	419	105	158
Grand Total	"	14 419	15 962	16 415	19 062	18 977

Table 1.3: Traffic handled at Mombasa Port, 2006-2010

Source: GoK 2011b

vital coastal and marine resource is not being put to optimal use. Moreover, nearly two-thirds of the containers imported full are exported empty (World Bank 2010), highlighting the enormous opportunities that exist for the country's manufacturing industries. Scaling up manufacturing activity would ensure that these containers are exported full, helping the struggling manufacturing sector to pull its weight in meeting the ambitious 10 percent annual economic growth rate anticipated by Vision 2030. Further, exporting manufactured goods rather than unprocessed or semi-processed raw materials would also help to bridge Kenya's worryingly widening trade deficit.

Air passenger traffic rose by 9.2 percent from 6.9 million in 2009 to 7.5 million in 2010, primarily due to an expanded route network for Kenya Airways and an economic upturn in some of the source markets. This air passenger growth boosted tourism and can be construed as a vote of confidence in the country's political situation as the devastating effects of the negative travel advisories imposed in 2008 in the wake of the post-election violence continued to ebb away. Both of these bode well for Vision 2030's economic and political pillars. These air

passenger numbers are expected to soar when the new Unit 4 terminal at Jomo Kenyatta International Airport (JKIA) which is the country's busiest, is constructed. Upon completion, the new terminal is expected to offer 50 check-in counters, 8 air bridges for aircraft (including the gigantic double-deck, wide-body, four-engine Airbus A380 jet) to dock, 45 aircraft parking stands on the linked apron space, an additional runway and a multi-storey car park. The completion of the new terminal should help to cement Kenya's coveted position as the regional aviation and financial hub and accelerate delivery of the goals of Vision 2030's economic pillar.

However, aeroplanes are momentous polluters. Noise pollution both from the flying aircraft and the ground operations is an increasing problem for those who live, work and study around airports. The latter is a growing problem given that many university campuses are mushrooming around the Athi River area which is close to JKIA. Further, as aeroplanes traverse thousands of kilometres in a single flight and the aviation industry is rapidly growing, it is a significant emitter of CO₂ which accounts for the highest proportion of GHG emissions.

The Jomo Kenyatta International Airport, now under major expansion, is also home to one of Africa's largest airlines—Kenya Airways.



Nairobi-Thika Superhighway – Nairobi-Thika Superhighway is part of the international trunk road that connects Kenya with Ethiopia to the north and is located in the Nairobi and Central Provinces of Kenya. It starts in Nairobi on Uhuru Highway at three points namely Haile Selassie Avenue, University Way and Museum Hill Roundabout and converges at Pangani Roundabout on Thika Road. It then proceeds to Thika via Muthaiga, the General Service Unit (GSU) headquarters, Kasarani and Githurai Roundabouts onto Kenyatta University, Ruiru Town, Juja Town and terminates at the bridge adjacent to Blue Post Hotel. The total project length is 50.4 km.

The traffic flow along the old Nairobi-Thika Road is characterized by heavy traffic snarl-ups, necessitating expansion of the road that will result in increasing the road's lanes from four to eight. In addition, there will be provision of cycle tracks and footpaths.

Below are photographs of sections of the superhighway, taken on 19th July 2011.



A completed section of the Thika Superhighway express lanes, close to Garden Estate.



On-going construction on a stretch of the Thika Superhighway approaching the GSU headquarters. The large roundabout that existed in front of the GSU headquarters has been done away with.



A panoramic view of a completed section of the Thika Superhighway.



An overpass by GSU headquarters connecting the Thika and Outer Ring roads.



Excavation works for bridge construction over the Pangani/ Muthaiga River.



Construction of an underpass at Pangani.



Construction of an underpass at Pangani.



Construction of a flyover at Pangani.



The Museum Hill/Uhuru Highway interchange.



Construction of the Superhighway and drainage works at the Utalii College/ National Youth Service (NYS) area.



A major sewerline under construction at Ngara.



A flyover above the Nairobi River at the Globe Cinema roundabout.

Moreover, emissions at high altitude are proven to have a 2-3 times greater effect on climate change (Williams et al 2002) than those at ground level yet there is still no viable alternative to the Jet A1 and avgas fuel used by aeroplanes. Kenya Airways, the flag carrier, launched a carbon offset programme which enables passengers to pay an amount over and above their airfare to pay for emissions contributed by them which are computed by an inbuilt IATA carbon calculator. The amount is arrived at based on actual fuel burn, travel class, weight of the passengers and cargo. The proceeds are used to fund environmentally sustainable projects (Kenya Airways 2011). While this innovative measure is commendable, its effectiveness is limited by the fact that this programme is limited to Kenya Airways yet at least 26 airlines operate international flights from JKIA alone, and it is entirely voluntary. As such, passengers are not obligated to actually offset their carbon emissions.

Communication

The telecommunications subsector exhibited a strong expansion thanks to the continued growth of the mobile telephony segment. To be sure, Kenya's mobile phone connections leapt by 50.4 percent from 12.9 million connections in 2008 to 19.4 million subscribers in 2009 and by 28.9 percent to 25 million connections at the end of 2010. This resulted in a market penetration of 63.2 percent which was a significant increase over the 49.7 percent mobile penetration recorded at the end of 2009 (CCK 2011). This growth is largely attributable to the entry into the mobile telephony market by Telkom Kenya and Essar, the increasingly cheaper handsets, stiffer competition in the segment characterized by bundling and promotions and entry by the Airtel, Orange and Yu brands into the mobile money transfer service which was developed and previously monopolized by Safaricom. The sector is expected to grow further in 2011 as the industry competition intensifies following the completion of Bharti Airtel's takeover of the Zain Africa Group and the introduction of mobile number portability that enables customers to seamlessly switch operators without losing their telephone numbers and prefixes.

In addition, cheaper and faster internet access following the granting of sea cable landing rights to The East African Marine System (TEAMS) and Sea Submarine Communications Limited (SEACOM), connecting all the country's district headquarters via a fibre optic link and attractive financing facilities by commercial banks are driving demand for computers, particularly laptops. However, left unchecked, the ICT revolution also has the potential to accentuate environmental degradation. When the mobile handsets, desktops, monitors, printers, photocopiers, facsimile machines and televisions breakdown or are deemed obsolete, typically within 5 years, they are discarded (Schluep et al 2008) as ordinary waste given that there is no functional regulatory mechanism for safe disposal of the country's burgeoning electronic and electrical equipment waste (e-waste). This problem is compounded by the fact that, while Kenya is a signatory to both the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal as well as the Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa, electronic waste generated in the developed countries is increasingly ending up in Kenya, along with other developing countries (Hileman 2006). This is because e-waste consignments are falsely labelled and declared as functioning goods (not waste), second-hand equipment or equipment for repair.

Moreover, this problem is likely to be compounded in the coming years given that although the Regional Radiocommunication Conference (RRC-06) set June 2015 as the deadline for all countries to migrate from analogue to digital terrestrial broadcasting technologies, Kenya plans to complete this migration by the end of 2012. While most of the current Kenyan households' analogue television sets will be able to receive digital broadcasting using a set-top box, many may be required to discard their analogue television sets and invest in those with an integrated set-top box (called idTVs). The challenge will be whether the relevant agencies will be able to safely dispose of the considerable electronic waste.

Tourism

The tourism sector witnessed a resurgence with earnings rising by 17.9 percent from KSh 62.5 billion in 2009 to KSh 73.7 billion in 2010 (GoK 2011b). The improved performance of the sector was thanks to an expanded international route network for Kenya Airways and successfully positioning Kenya as the destination of choice in the non-traditional markets of India, Russia, China and Middle East (GoK 2011a). However UK, USA, Italy, Germany and France remained the top five source markets in 2010. Kenya recorded 1.10 million holiday tourist arrivals in 2010. This represented a 3.7 percent growth over the 1.06 million arrivals registered in 2009 (GoK 2011b). The holiday tourist arrivals for 2005-2010 are illustrated in Figure 1.4. If this growth momentum is sustained, the country's unique and diverse wildlife and landscapes have the potential to become a major contributor to the 10 percent annual economic growth rate anticipated by Vision 2030.

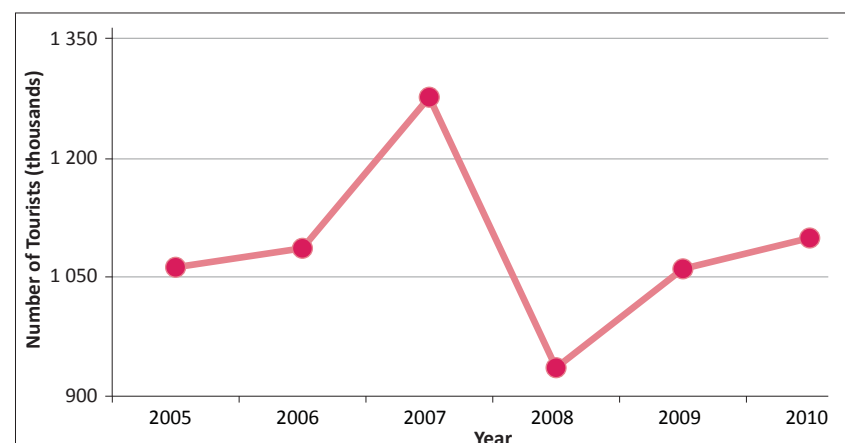


Figure 1.4: Trend in holiday tourist arrivals, 2005-2010

Source: GoK 2011b

Besides boosting government revenue through higher park entry fee collections, licences and taxes on the items consumed or rented by tourists, the tourism sector is an important source of employment (accounting for 9 percent of the formal employment in the country) and income for local communities. Tourism also has important interlinkages with Vision 2030's other priority growth areas such as manufacturing, agriculture and finance and its continued growth is bound to have positive knock on effects on these. The sector is also the leading foreign exchange earner for the country.

However, there is need to attenuate the relevant environmental pressures associated with rising tourist arrivals particularly during the critical breeding and migration seasons when off-road four wheel drive vehicles cause significant soil erosion, destroy tree roots, crush vegetation, animals, nests and burrows and cause physiological damage to fauna through noise pollution (Buckley 2004). Overuse of trails tramples soils and vegetation and occasions loss of biodiversity and other negative impacts that are tabulated in Table 1.4. Cigarette smoking by tourists heightens vulnerability to forest fires. The tents, lodges,



Alongside other abundant wildlife, birds—like these flamingos—are a major tourist attraction in Kenya.

hotels and resorts are also associated with a range of adverse environmental impacts. These accommodations aesthetically scar scenic landscapes and constrict wildlife dispersal areas. They also extract huge amounts of water from the environment for bathing, swimming pools and golf courses, compounding already severe water shortages in the country and degrading freshwater sources through saline intrusion into groundwater. In addition, the wood that is used for making fire to warm and prepare food for Mount Kenya's trekkers for example, is a major driver of deforestation (Mahaney 1986). Littering by tourists (Ikiara and Okech 2002) and improper waste disposal by tourist facilities also degrade the environment.

These are valid concerns, given that wildlife parks account for 75 percent of Kenya's total tourism earnings (GoK 2007) and visitors to the country's national parks and game reserves soared 46.6 percent from 1.63 million in 2008 to 2.39 million in 2009 and by 15.5 percent to 2.76 million in 2010 (GoK 2011b). Moreover, most of the wildlife tourism is concentrated in four parks namely the Maasai Mara National Reserve, Amboseli National Park, Samburu National Reserve and Lake Nakuru National Park. And it is reasonable to deduce that the Masai Mara would record far higher tourist figures if the Narok-Sekenani stretch of the road to the national reserve was not in such an appalling state. To gradually ease pressure on these four wildlife parks which are already threatened by severe droughts and floods that have led to substantial wildlife population decreases, the government should implement the entry and accommodation fee increases mooted by Vision 2030. Given the incomparable role of wildlife to Kenya's economy and culture and the calibre of the governance structures that are in place in some of the national reserves, it would probably be appropriate to initiate a national debate on whether the Maasai Mara and Samburu National Reserves should continue to fall under the jurisdiction of the local authorities or whether their management should be transferred to the Kenya Wildlife Service (KWS) which has the overall mandate to conserve and manage the country's wildlife, and to enforce the relevant laws and regulations.

Trampling impacts on vegetation	Trampling impacts on soil
Breakage and bruising of stems	Loss of organic matter
Reduced plant vigour	Reduction in soil macro porosity
Reduced regeneration	Decrease in air and water permeability
Loss of ground cover	Increase in run off
Change in species composition	Accelerated erosion

Table 1.4: Impacts of trampling on vegetation and soil

Source: Krumpal 1998

On a broader level, the thrust of the government's marketing campaign should be to reposition Kenya as a premium destination for ecotourism, high-spending tourists and as an ideal destination for the largely wildlife-neutral but lucrative conference and business tourism. This recommendation is predicated on the belief that if well thought through, tourism—particularly ecotourism—creates enormous opportunities for environmental protection and conservation. It can also be a vehicle for educating local and international tourists on the role of the environment, on environmental values and non-retrogressive cultural norms. Ecotourism is a more sustainable form of tourism because it attempts to prevent environmental degradation by recycling water, using renewable sources of energy such as solar in the national parks which are invariably off-grid, recycling organic waste in order to make fuel briquettes and composting green waste and using this in the tented camps' vegetable gardens (Ecotourism Kenya 2011). Ecotourism also often benefits local communities through improved infrastructure and better employment opportunities which in turn lead to less human-wildlife conflicts (Ogutu 2002). Segmenting the tourism product in line with the Vision 2030 aspirations (see Figure 1.5) will help to focus attention on the underutilized tourist destination categories.

Further, construction of hotels and other facilities in areas that are not on the sewerage line has deleterious environmental effects. In Mombasa for example, virtually all the beach resorts, along with public buildings and some households, have constructed onsite sewage management systems such as septic tanks and soakage pits. However, these often cause groundwater contamination because there are no

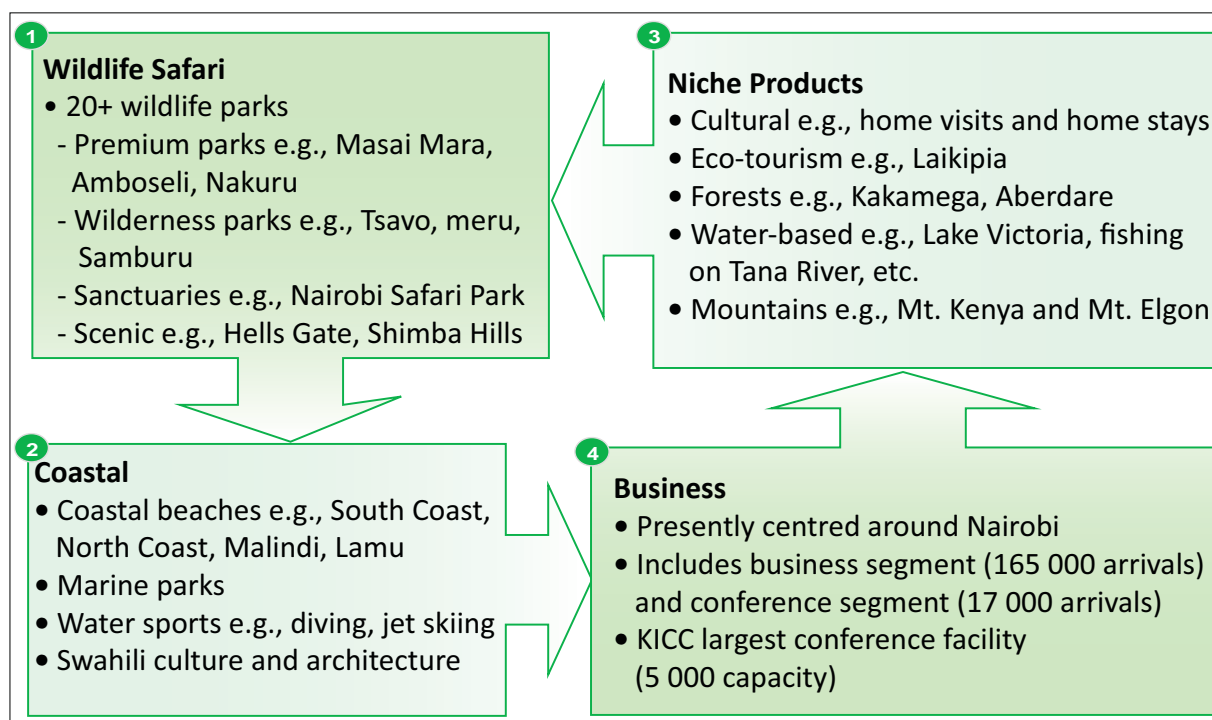


Figure 1.5: Anticipated segments of the country's tourism product

Source: GoK 2007

regulations to guide the construction of these systems (Munga et al 2006). Sewage runoff therefore causes considerable coral reef dieback, threatens the proliferation of marine life and can have serious consequences on human health.

Vision 2030 specifically highlights the need to develop a range of economic activities along the coast such as fishing and water sports, which are largely untapped. Indeed if well-regulated, these can appreciably boost tourism earnings as they would make the Kenyan coast an even more exciting tourist destination. From an environmental perspective however, there is need to exercise caution in developing anchoring, sport fishing, wind surfing, snorkelling, scuba diving and yachting because these activities often take place in and degrade fragile ecosystems such as coral reefs (Davenport and Switalski 2006). It is therefore important for KWS to as far as is practicable, ensure that the increased use of the country's coastal and marine resources is done in a manner that prioritizes environmental conservation.

Many of the above adverse environmental effects of tourism can be mitigated by formulating rigorous regulatory measures and ensuring their strict compliance. For instance, capping the number of visitors to the various wildlife parks to sustainable levels will obviously help to limit impacts that compromise these ecosystems' integrity.

Wholesale and retail trade

Vision 2030 identifies wholesale and retail trade as one of the sectors that can transform the economy by contributing to the delivery of the 10 percent annual economic growth rate. The long-term development blueprint envisages that this will be achieved through training, improving access to credit, eliminating inefficient intermediaries between producers and consumers and gradually formalizing the informal sector by creating formal market outlets for the sector's players.

Over the last five years, the wholesale and retail trade sector's contribution to Kenya's GDP has ranged from 9.3 percent in 2006 to 10.3 percent in 2010. In absolute terms, the sector's contribution to the real GDP grew from KSh 118.4 billion in 2006 to KSh 131.8 billion in 2007, KSh 138.1 billion in 2008, KSh 143.4 billion in 2009 and KSh 154.6 billion in 2010 (GoK 2011b). The potential of the sector is epitomized by the fact that it has been a key source of GDP growth

since 2006 and at 14.4 percent in 2010, was the second highest source of growth after agriculture which contributed 24.5 percent to the growth realized. In 2008 however, it accounted for 30.8 percent of the source of growth, the highest by any economic sector that year.

Wholesale and retail trade is key to particularly achieving Vision 2030's poverty alleviation goals because it accounts for roughly 10 percent of formal employment in the country. It is also easy to engage in because it is not as capital-intensive as manufacturing or tourism, for example. Yet it is easy for the sector to have a transformative effect on the environment. Supplying agricultural produce through formal supply chains on the basis of negotiated contracts would eliminate destabilizing price oscillations and encourage farmers to produce commodities using environmentally sustainable practises because they will be virtually assured of a ready market and good return for their produce. Farmers can themselves form producer groups and associations that would be better placed to act as internal watchdogs to ensure that set environmental standards in the production and processing of goods are met. Currently, due to wide price fluctuations, farmers are forced to hedge their bets by using wasteful production practises such as slash and burn agriculture which reduces soil fertility and cultivating economically unviable acreages due to market and price uncertainties.

Environmentally-conscious retail traders can also use their direct interaction with consumers to influence product choice by educating consumers about the relative environmental merits of the range of products on offer. In addition, the retail trade segment can be a focal point for effecting attitudinal change towards plastic bags by offering alternative packing materials such as paper bags and cardboard boxes. As big generators of waste (from spoilt food, expired products and discarded packaging materials), they can change ways in which their waste is handled by sorting it into recyclable and non-recyclable components and awarding waste collection contracts to firms that promote a range of environmental norms such as recycling and composting organic waste.

However, the wholesale and retail trade sector is associated with a range of daunting environmental challenges. As the sector is largely unregulated and consists of hundreds of thousands of disparate actors



A building under construction in Nairobi. Construction's contribution to the real GDP grew from 49.1 billion in 2009 to 51.4 billion in 2010.

who are dispersed all over the country, it is particularly difficult to enforce environmental laws and regulations. Transporting goods in small consignments using pick-ups, *matatus* or half-empty trucks due to lack of financial and logistical resources generates more air pollution and creates inefficiencies which unnecessarily push up retail prices and burden the final consumer. Government would therefore be well-advised to offer a range of fiscal incentives to encourage larger investments in the sector as these would reap the benefits of economies of scale. It would also be easier for agencies with an environmental mandate to regulate fewer but larger wholesale and retail traders.

Construction

Construction's contribution to the real GDP grew from 49.1 billion in 2009 to 51.4 billion in 2010 (GoK 2011b). Although the sector's growth fell from 12.4 percent in 2009 to 4.5 percent in 2010, the outlook remains bullish. For example, cement consumption increased by 16.2 percent from 2 671 million tonnes in 2009 to 3 104 million tonnes in 2010 and was attributed to the flourishing building and road construction sector. Indeed, the index of government's expenditure on roads rose substantially from 312.9 in 2009 to 394.8 in 2010. The number of private buildings under construction around the country also went up. The value of building plans approved by Nairobi and the other towns witnessed an upward trend in 2006-2010 as is illustrated in Figure 1.6. Construction is an important sector of Kenya's economy and development of modern physical infrastructure is indispensable to the delivery of Vision 2030. An efficient road network keeps production costs in check, opens up hitherto inaccessible markets and creates new employment opportunities. The number of wage earners employed by the sector rose by 8.5 percent to 101 300 in 2010 so the sector is a significant contributor to the employment creation and poverty alleviation initiatives set forth in Vision 2030.

Construction also has several positive ripple effects on other sectors of the economy such as manufacturing, wholesale and retail trade, and the financial sector. For example, the growth in the

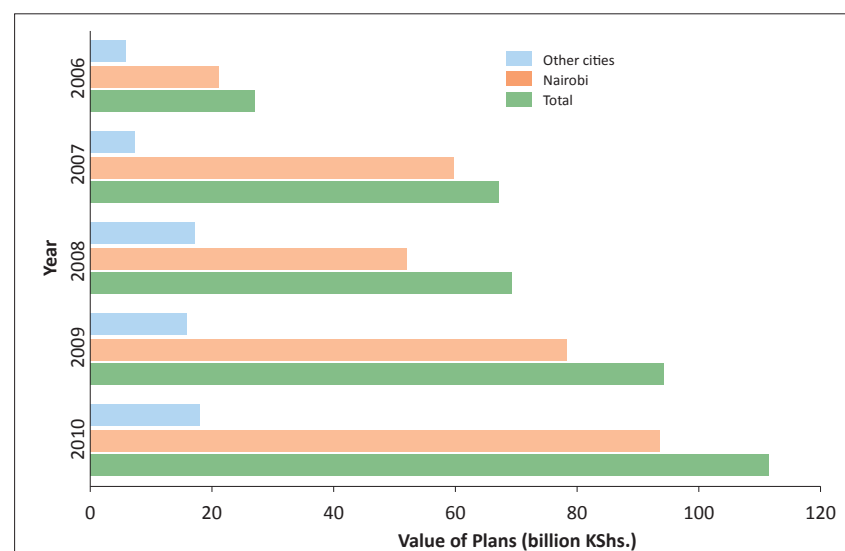


Figure 1.6: Value of building plans approved by Nairobi and the other towns, 2006-2010

Source: GoK 2011b

construction sector was accompanied by a 7.3 percent rise in the loans and mortgages from commercial banks and these grew from KSh 30.4 billion in 2009 to KSh 32.6 billion in 2010 (GoK 2011b).

Despite the construction sector's commendable contribution to the realization of the goals of Vision 2030's economic pillar, a number of environmental safeguards need to be instituted. In fact, owing to its sheer size, the construction industry isn't just one of the largest users of material, water and energy resources, it is also a momentous air, water and noise polluter (Horvath 2004). A range of adverse environmental effects have been catalogued to result from processes for obtaining local construction materials such as sand, limestone and stones from quarries. Abandoned quarries are not only aesthetically unappealing, they are safety hazards for human beings and wildlife and fill up with water which acts as breeding grounds for malaria-transmitting mosquitoes. As a result, the meagre household and government financial resources are used to treat the disease instead of being invested in productive activities. Severe malaria also keeps employees from work and results in loss of man hours that could have

Year	Quantity ('000 Tonnes)					Value (KSh Million)				
	2006	2007	2008 ⁺	2009 ⁺	2010 [*]	2006	2007	2008 ⁺	2009 ⁺	2010 [*]
IMPORTS										
Crude petroleum	1 643.2	1 598.7	1 773.3	1 627.9	1 551.5	55 015.6	49 240.8	81 452.9	54 495.4	72 598.0
Petroleum Fuels	1 402.7	1 999.9	1704.5	2 259.0	2 071.9	55 807.2	70 204.8	112 786.7	96 621.3	119 462.5
Lubricating Oils	2.6	0.0	12.4	17.0	3.0	73.1	10.8	614.1	588.2	123.4
Lubricating Greases	124.4	93.2	118.6	265.0	218.2	2 823.6	2 319.6	4945.5	8 487.6	8 596.1
TOTAL	3 172.9	3 691.8	3 608.8	4 168.9	3 844.6	113 719.5	121 776.0	199 799.2	160 192.5	200 780.0

* Provisional + Revised

Source: GoK 2011b

Table 1.5: Quantity and value of imports of petroleum products, 2006-2010

been used to fulfil the Vision 2030 promises. Further, modern roads and buildings often require the importation of large amounts of steel and finishing components which are often transported to Kenya by ships which can pollute the ocean and have devastating implications for marine biodiversity. These issues can hamper realization of the Vision 2030 underlying goal of growing the economy and improving the welfare of Kenyans without compromising environmental integrity. Road contractors and developers of commercial and residential buildings should therefore be encouraged to use local materials wherever possible and to adhere to internationally recognized green building certification processes. Some of these processes provide rigorous third-party verification that a building was designed and built using a suite of environmentally sustainable construction standards.

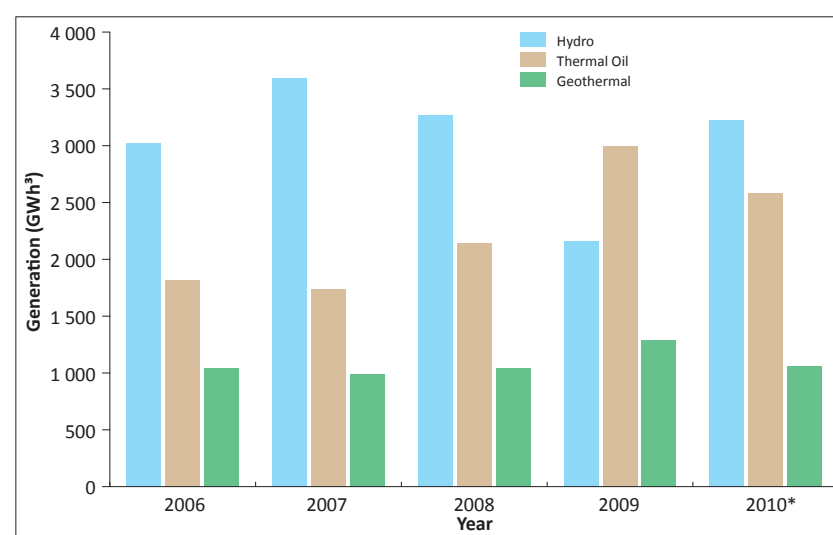
Construction activity also seems to be skewed to catering for the affluent segment of the population and little progress is being made in meeting the housing needs of the low income Kenyans. This implies that the recent real estate boom masks systemic inequities as decent housing remains an elusive dream for many Kenyan households given that there is an annual demand for 150 000 housing units in Kenya against an annual supply of less than 35 000 units (OECD et al 2011). The poor Kenyans therefore have to make do with sub-standard housing. Yet squalid living conditions lower the dignity of the affected and due to the associated inhospitable environment, make the inhabitants more susceptible to waterborne, water-related and sanitation-related diseases. The government should therefore formulate a range of incentives to encourage development of affordable housing and also ensure that the lower income cohort of the population has access to reasonably priced mortgage facilities.

Energy

The quantity of petroleum products imported into the country declined by 7.8 percent from 4.2 million tonnes in 2009 to 3.8 million tonnes in 2010 (see Table 1.5). Nevertheless, the total import bill of the petroleum products rose by a considerable 25.5 percent from KSh 160.2 billion in 2009 to 200.8 billion in 2010 (GoK 2011b) principally due to the increased oil prices on the international market. Petroleum products are an important source of government revenue because they attract excise duty, petroleum development duty and road maintenance levy which are vital to funding government activities and to consequently meeting a number of Vision 2030 goals. Most of the petroleum products imported into the country are used as fuel for the growing number of vehicles and in the production processes. As such, their rising prices have fuelled inflation and put many basic commodities out of the reach

of many Kenyans, pushing them into—rather than out of—the poverty bracket, contrary to the Vision 2030 promises. As discussed in Chapter 2, the poor cohort tends to overexploit natural resources with this exacerbating environmental degradation. In addition, due to poverty and squalor, natural catastrophes disproportionately affect the poor and compound their marginalization.

The pervasive use of petroleum products in the country results in a range of negative health and environmental consequences. Human health consequences include respiratory diseases such as asthma, lung cancer and eye diseases such as conjunctivitis which particularly affects the young and elderly (Mulaku and Kariuki 2001). Environmental effects of petroleum fuel use include smog, acid rain and the aggravation of climate change and variability (IPCC 2007) which is discussed in more detail in Chapter 3. More localized problems include the toxic sludge from the petroleum refineries at Changamwe that is considerably degrading the country's coastal and marine environment.



* Provisional

Source: GoK 2011b

Figure 1.7: Generation of electricity by source, 2006-2010

Hydroelectric power represented 56.8 percent and 50.6 percent of all the power generated in 2007 and 2008 respectively. However, due to acute drought which lowered the dam water levels, hydropower production plummeted from 3 267.0 GWh in 2008 to 2 160.0 GWh in 2009, when it constituted only 33.2 percent of the country's energy portfolio and was displaced by thermal oil power, which accounted for 46.3 percent of the power generated, as the leading source of energy. In 2010 however, hydropower reclaimed its position with a total of 3 224 GWh and accounted for 46.2 percent of the power generated while the comparable figure for thermal oil was 2 586 GWh

which accounted for 37.1 percent (GoK 2011b). The generation of electricity over the last five years is displayed in Figure 1.7. The bulk of Kenya's hydroelectric power is generated by five power plants namely; Gitaru, Kiambere, Turkwell, Kindaruma and Masinga which have a combined installed capacity of 555MW. Figure 1.8 contains the geographic distribution of Kenya's power plants by category. Energy is one of the foundations on which Vision 2030's economic, social and political pillars are anchored so it is a major driver of Kenya's long term economic development.

Large and medium commercial and industrial establishments are collectively the largest consumer of electricity and in 2010 accounted

for 55.7 percent of the electricity consumption with domestic and small commercial consumption accounting for 37.7 percent of the consumption. Demand for electricity under the rural electrification programme (REP) grew by 14.3 percent from 254.4 million KWh in 2009 to 290.8 million KWh in 2010 and is in keeping with Vision 2030's plans to scale up the number of rural households that are connected to the national grid or the off grid installations. To be sure, REP is one of the key projects under the energy segment that are earmarked for implementation in 2008-2012. Ensuring that a critical mass of rural households in the country has access to electricity would lessen the pressure on the country's forests and woodlands and allow them to regenerate. There is therefore need to radically scale up implementation

Figure 1.8: Geographic distribution of Kenya's power plants by category

Source: KenGen 2011



of the REP. This would concomitantly reduce the incidence of acute respiratory infections caused by indoor air pollution that is associated with using biomass fuels (Ezzati and Kammen 2001) which the majority of the rural and urban households in Kenya rely on.

However, even though hydroelectric power is considered to be a cleaner source of energy than its thermal oil counterpart, its reliance on the vagaries of weather has often led to domestic and industrial power rationing as well as rising electricity bills. These put electricity out of the reach of many Kenyans by stymieing implementation of REP and threatening to undermine Kenya's coveted position as the regional economic giant. Manufacturing companies are extremely sensitive to energy costs and unless remedial measures are urgently instituted, they could relocate to neighbouring countries which are better endowed with water resources as they would be assured of cheaper and more reliable hydroelectric power. This will obviously force many Kenyans out of work and make it harder for the government to deliver the economic and social pillar goals and the higher standards of living promised by Vision 2030.

Nonetheless, dams that have conventionally been constructed to create water reservoirs for hydroelectric power plants have been associated with a number of adverse environmental impacts which range from slowed river flows, loss of biodiversity to destruction of upstream riparian habitats (Mainji and Marsh 2002). In an attempt to address this problem, the 60 MW Sondu Miriu hydropower plant is a run-of-the-river plant that does not rely on damming but the natural flow of the Sondu Miriu River into Lake Victoria (KenGen 2004). Nevertheless critics have argued that even without damming, the construction of the hydropower plant polluted the river's waters, led to the disappearance of streams and springs and the extinction of endemic fish species like Okoko (*Synodontis sp.*) (International Rivers Network 2000).

Other adverse environmental impacts relate to the thermal oil power plants operated by the Kenya Electricity Generating Company Limited (KenGen), the Independent Power Producers (IPPs) and Emergency Power Producers (EPPs). As these generate electricity by burning large amounts of fossil fuels, they are major emitters of carbon dioxide (CO₂), nitrous oxide (NO_x), sulfur oxide (SO_x) and chlorofluorocarbons (CFCs)—which are some of the GHGs that are responsible for the climate change and variability that the world is grappling with—and particulates which, in addition to causing a range of pulmonary diseases, are carcinogenic. Going forward, it will be important for Kenya to reduce her reliance on both hydroelectric and thermal power by developing untapped potentials in geothermal and wind energy. In addition, it is important for the government to offer attractive fiscal and non-fiscal incentives in order to encourage rural and urban households to reduce their reliance on the national grid by investing in cleaner, renewable sources of energy such as solar, wind and biogas.

Larger electricity generators such as KenGen and wholly private sector actors should also harness the country's considerable geothermal potential. They could do this by scaling up their access to resources under a series of climate change mitigation initiatives such as the Clean Development Mechanism (CDM) which is provided for by Article 12 of the Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC). Admittedly, all the three CDM projects

that have been registered in Kenya relate to energy. These are the Ol Karia II Geothermal Expansion project; the Ol Karia III Phase II Geothermal Expansion project; and Lake Turkana 310 MW Wind Power project (UNFCCC 2011). The challenge is for players in the power industry to tap the enormous CDM financial resources before the Kyoto Protocol's first commitment period expires in 2012 as the future of this legal regime is uncertain.

In 2010, Kenya announced plans to venture into nuclear energy. As such, the country intends to commission her first 1 000 MW nuclear power plant by 2017 in order to diversify energy sources and rein in rising energy costs. The magnitude of the recent Fukushima nuclear disaster—which is evocative of the Chernobyl catastrophe—and its immense environmental fallout appear to demonstrate that conventional safeguards cannot adequately proof atomic plants against natural disasters such as earthquakes and tsunamis. In this regard, Japan plans to gradually phase out its nuclear reactors which account for 30 percent of its energy portfolio. Germany also plans to phase out nuclear energy, which accounts for 40 percent of that country's energy needs by 2022. Kenya's Nuclear Electricity Project committee will therefore need to carry out thorough due diligence on the viability of this form of energy in Kenya. Should it recommend that the country embark on the path to the cheap but extremely risky atomic energy, it will need to ensure that these nuclear plants can operate safely, conform to the standards set by the International Atomic Energy Agency (IAEA) and can withstand even the severest of natural disasters. It would follow that the country would need to quickly secure the requisite technology transfers that would sufficiently mitigate the attendant risks.

Fishing

The quantity of fish landed rose by 8.2 percent from 133 600 in 2009 to 144 505 in 2010. However, earnings from fishing, largely from the country's freshwater bodies rose by 36.2 percent from KSh13 billion in 2009 to KSh 17.7 billion in 2010. The jump in earnings was both because of higher catches and better domestic and export prices (GoK 2011b). As is evident from Table 1.6, Lake Victoria accounted for the largest quantity (78.7 percent) and highest value of fish landed by freshwater body. Admittedly, Vision 2030 does not specifically identify fishing as one of the priority sectors. However, it is an important subsector because it is a major source of livelihood for communities which live on the shores of Lake Victoria, Lake Turkana and Lake Naivasha, and those who live near the Tana River and Indian Ocean. It also meets the protein needs of the country's poor and can significantly contribute to the growth of the tourism and manufacturing sectors. Indeed, fishing in Lake Victoria, River Tana and the Indian Ocean have the potential to become important components of the water-based tourism niche which is grossly under-utilized. Setting up fish processing facilities in Kisumu and at the coast in line with the Vision 2030 targets will also contribute to the growth of the manufacturing sector, with positive outcomes for Vision 2030. This is because it will increase the value added component of the sector and also stimulate the growth of offshore fishing, which is largely untapped.

Nevertheless, a number of environmental challenges need to be addressed. Agrochemical runoff, lakeshore leaching by mining tailings, disposal of industrial, medical and chemical waste as well as expired pesticides (some of which are highly carcinogenic) and sludge result in eutrophication of the country's freshwater bodies such as Lake



A mature fish (tilapia) captured in Ramisi River, Kwale County.

Victoria (Odada et al 2004). In addition, abusive fishing practises, such as using pesticides to catch fish (Canter and Ndegwa 2002, Henry and Kishimba 2006) have raised questions over the sanitary condition of the country's fish and whether it is fit for human consumption and resulted in the EU imposing a ban on the import of chilled freshwater fish from East Africa in 1999. Moreover, freshwater fishing is, of course, directly dependent on the availability of freshwater and the water scarcity that Kenya is experiencing and which is projected to worsen as detailed in Chapter 7 is likely to pose further threats to the sustainability of the subsector. In addition, the Kenya-Uganda standoff over the jurisdiction of Migingo and Ugingo Islands of Lake Victoria whose waters abound with Nile perch and tilapia does not augur well for the subsector which is dominated by fishing from the lake or indeed for achievement of the political pillar targets of Vision 2030. Because of the clear relationship between the environment and political stability, efforts to amicably resolve this turf dispute should be intensified.

Financial services

The financial sector in Kenya consists of banking and quasi-banking institutions such as savings and credit cooperative organizations (SACCOs), microfinance institutions (MFIs)

Table 1.6: Quantity and value of fish landed by freshwater body, 2006-2010

Source: GoK 2011b

Quantities – Tonnes	2006	2007	2008	2009	2010*
<i>Freshwater fish</i>					
Lake Victoria	143 908	117 231	111 369	108 934	113 041
Lake Turkana	4 559	5 122	8 070	9 445	8 123
Lake Naivasha	189	203	225	688	693
Lake Baringo	68	173	262	191	198
Lake Jipe	109	96	109	109	111
Tana River	1 024	1 112	1 302	584	596
Fish Farming	1 012	4 245	4 452	4 895	12 153
Other areas	842	706	883	828	869
TOTAL	151 711	128 888	126 672	125 674	135 784
<i>Marine fish</i>					
Marine fish	6 023	6 355	7 561	7 024	7 600
Crustaceans	436	618	578	407	549
Other marine products	500	494	597	495	572
GRAND TOTAL	158 670	136 355	135 408	133 600	144 505
<i>Value – KShs. Million</i>					
Freshwater fish	8 071	8 029	10 718	12 274	16 905
Marine fish	335	422	541	557	614
Crustaceans	123	145	147	127	173
Other marine products	38	43	49	44	50
TOTAL	8 567	8 640	11 455	13 002	17 742

and development finance institutions (DFIs), insurance, capital markets and pension funds. Financial services are also one of the six priority areas of the economic pillar. Vision 2030 seeks to create a vibrant and globally competitive financial sector that encourages a high ratio of savings to income that will then be used to finance Vision 2030 and other projects. It proposes to achieve this through carrying out legal and institutional reforms, consolidation of small banks, streamlining informal finance organizations and strengthening capital markets to play a critical role in the mobilization of resources for equity finance, for issuance of long-term bonds including those for funding infrastructure as well as for tapping international debt capital markets.

The financial intermediation sector contributed 5.5 percent to the GDP in 2009 and 5.6 percent of the GDP in 2010, which was considerably higher than its 4.0 percent contribution in 2006. The sector posted an 8.8 percent growth rate in 2010 compared to a 4.6 percent growth rate in 2009. Its contribution to the GDP rose from KSh 64.1 billion in 2006 to KSh 88 billion in 2007; KSh 97.8 billion in 2008, KSh 129.9 billion in 2009 and KSh 143.6 billion in 2010 (see Figure 1.9). Although Kenya has 40 banks, the industry is dominated by 5 banks. Short term interest rates witnessed a downward trend in line with the falling Central Bank rate. For example, the interbank rate and the 91-day treasury bill interest rate declined by 1.77 percent from 2.95 percent in December 2009 to 1.18 percent in December 2010. However, high commercial lending rates (in double digits) and insistence on fixed asset collateral imply that the majority of Kenyan businesses are unable to obtain credit.

As is the case with other service industries, the emission of toxic chemicals, energy consumption and generation of hazardous wastes is substantially lower for the financial services sector than it is for the manufacturing sector (Rosenblum et al 2000), for example. In addition, many of the country's commercial banks are encouraging customers to withdraw money at the automated teller machines (ATMs) rather than at the counter by imposing punitive surcharges for the latter. Further, some of the banks no longer mail paper statements to their customers but email e-statements instead. Both of these developments have reduced the use of paper (which in turn slows the rate of deforestation) and the energy previously used to print, post and transport these statements. Most of the banks have also introduced e-banking and mobile banking and customers don't have to drive to banks in order to obtain their balances, saving both fuel and the country's ambient environment that is already under pressure from the rising vehicle numbers.

While all these innovative practises are commendable, banks can play a more significant role in saving Kenya's environment. Their due diligence on potential projects should entail rigorous review of environmental impact assessments (EIAs) while the credit approval processes should subject the proposed project's design and operations to meticulous assessment on whether these will adhere to accepted environmental norms. In addition, fiscal incentives should be instituted to encourage banks to embrace the concept of green financing which could for example, target developers of environmentally sustainable buildings, wind, solar, biofuel and other emerging energy options as well as responsible waste handling and energy-efficient technologies. With skyrocketing fossil fuel prices and dwindling world oil reserves,

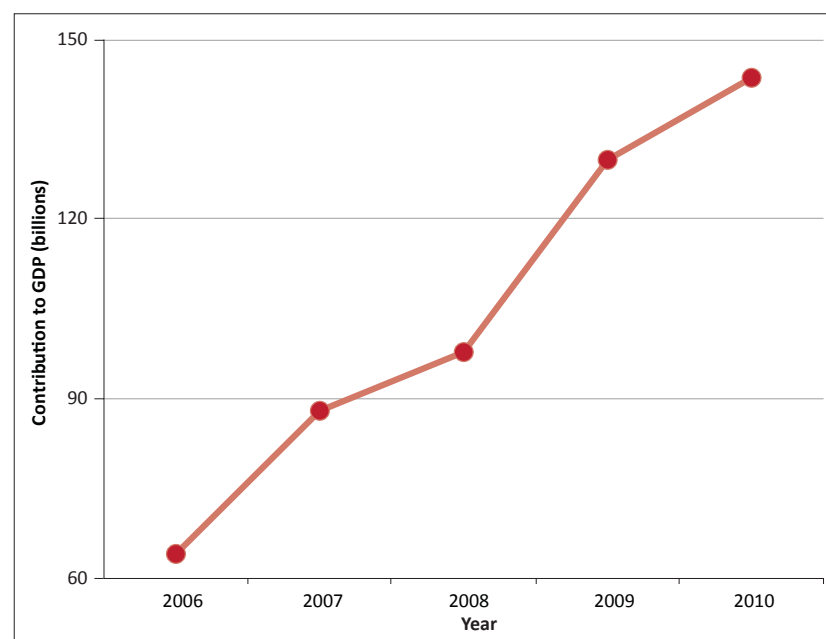


Figure 1.9: Financial intermediation sector's contribution to the GDP, 2006-2010

Source: GoK 2011b

and growing interest by citizens and policymakers in tackling climate change and variability, the business case for green financing has never been stronger and it is in the sector's own long-term interest to kindle corporate interest in green financing.

Macroeconomic indicators

Macroeconomic stability is obviously indispensable to attainment of the goals enumerated under the economic, social and political pillars of Vision 2030. This is because the assumptions made for growths of the priority sectors outlined above are predicated on stable economic fundamentals otherwise inflationary pressure would, for example, more than cancel out any gains made. This section interrogates the consumer price indices and inflation, exchange rates, interest rates, capital market, and foreign exchange reserve macroeconomic indicators and their implications for the delivery of the Vision 2030 goals from an environmental standpoint.

Consumer price indices and inflation

The consumer price indices (CPI), which were based on the new CPI basket formulated in February 2009 (see Table 1.7), were 76.25 in 2006, 79.50 in 2007, 92.36 in 2008, 102.10 in 2009 and 106.26 in 2010 (GoK 2011b). The basket's top five heavily weighted items are food and non-alcoholic beverages (36.03 percent), housing, water, electricity, gas and other fuels (18.3 percent), transport (8.67 percent), clothing and footwear (7.43 percent) and household maintenance (6.16 percent). Each of these has striking interlinkages with the environment for example, road and building construction is often attended by heavy water and other resources use as already discussed. The food and non-alcoholic beverages portion of the index rose by 5.9 percent in 2010 relative to 2009. The availability and cost of food is dependent on environmental factors such weather, water availability, pest and diseases as well as land degradation. Scaling up efforts to protect Kenya's environment will therefore help to rein in adverse changes in the most heavily weighted component of the CPI. The availability of water and hydro power generation—which is the dominant source of electricity use in Kenya—are also positively related. On the other hand, the 10.3 percent drop in the communication index for 2010 relative to its 2009 counterpart highlights the fact that consumers are beginning

Broad Item Group	Weights (%)	Annual Average Index 2009	Annual Average Index 2010	% Change
Food and Non-Alcoholic Beverages	36.03	103.28	109.35	5.9
Alcoholic Beverages, tobacco, and Narcotics	2.06	103.72	111.48	7.5
Clothing and Footwear	7.43	101.54	104.97	3.4
Housing, Water, Electricity, Gas, and other Fuels	18.30	101.8	105.09	3.2
Furnishings, Household Equipment, and Routine Household Maintenance	6.16	100.81	104.07	3.2
Health	3.13	101.73	106.16	4.4
Transport	8.67	102.52	107.92	5.3
Communication	3.83	99.62	89.32	-10.3
Recreation and Culture	2.25	100.62	101.85	1.2
Education	3.14	100.03	101.38	1.4
Restaurant and Hotels	4.49	102.53	106.68	4.0
Miscellaneous Goods and Services	4.52	101.45	103.70	2.2
Weighted Average of all Items	100	102.10	106.26	4.1

Table 1.7: CPI and inflation by commodities, 2009 and 2010

Source: GoK 2011b

to reap the benefits of the stiff competition in the mobile telephony subsector. However, as discussed earlier in this chapter, while lower telephone tariffs and internet charges are important to increasing the mobile telephone penetration, to transforming Kenya into the knowledge economy and to tapping the potentially lucrative business process outsourcing (BPO) opportunities that Vision 2030 envisages, this has several environmental downsides. Increasing numbers of obsolete handsets and IT equipment are likely to compound the growing e-waste problem in the country as already discussed and a legal and policy framework needs to be urgently instituted.

Inflation decreased from 10.5 percent in 2009 to 4.1 percent in 2010, which was even better than the government target of keeping this macroeconomic indicator below the five percent mark. A low inflation rate is essential to creating a stable economic climate as it improves the purchasing power of the poor. This in turn reduces the dependence of this cohort on the environment, allowing natural resources such as forests and fish stocks to recover. Low inflationary pressure also encourages the private sector to make long-term investments that create employment opportunities which reduce poverty and improve the people's wellbeing, accelerating attainment of the poverty alleviation goals of Vision 2030. In addition, resources become available for investment in environmental conservation resulting in a better environment.

However, a number of internal and external shocks are threatening to reverse the gains made in taming inflation which stood at 6.0 percent in 2006, 4.3 percent in 2007, 16.2 percent in 2008, 10.5 percent in 2009 and 4.1 percent in 2010 (GoK 2011b). The annual inflation rates for 2006-2010 are illustrated in Figure 1.10. The projected inflation rate of 10 percent for 2011 could turn out to be a gross underestimate due to a range of domestic and external shocks. While the domestic shocks emanate from the persistent drought that has led to scarcer and pricier agricultural commodities, the external shocks relate to increases in international crude oil prices (CBK 2011) in the wake of the Arab Spring.

These issues highlight the interlinkages between inflation and the environment, including natural resources.

Exchange rates

The Kenyan Shilling depreciated against two of the world's major currencies. The shilling depreciated against the US dollar by 6.5 percent from KSh 75.82 as at December 31, 2009 to KSh 80.75 at the end of 2010. The shilling depreciated against the Sterling pound by 2.4 percent from KSh 121.89 in 2009 to KSh 124.77 at the end of 2010. The shilling however appreciated against the Euro by 1.2 percent from KSh 108.94 in 2009 to KSh 107.63 in 2010 (CBK 2010).

A depreciating shilling improves export earnings but makes imports more expensive. So while a weakening shilling will likely improve the welfare of the country's exporters of tea, coffee and horticultural produce, this may encourage farmers in this sector to increase production using environmentally unsustainable practises such as excessive use of pesticides which have a range of adverse effects on human health and also degrade the country's soil and water resources unless proper regulatory and enforcement mechanisms are in place. On the other hand, because Kenya does not have proven fossil fuel reserves, all her fossil fuel needs are met by imports and a depreciating shilling will make these more expensive. Fuel, notably kerosene which is used by the country's poor for lighting and cooking, is then priced out of reach. In order to meet its cooking and energy needs, this segment of society consequently exerts more pressure on the country's diminishing forests and woodlands for wood fuel, fuelling their deforestation.

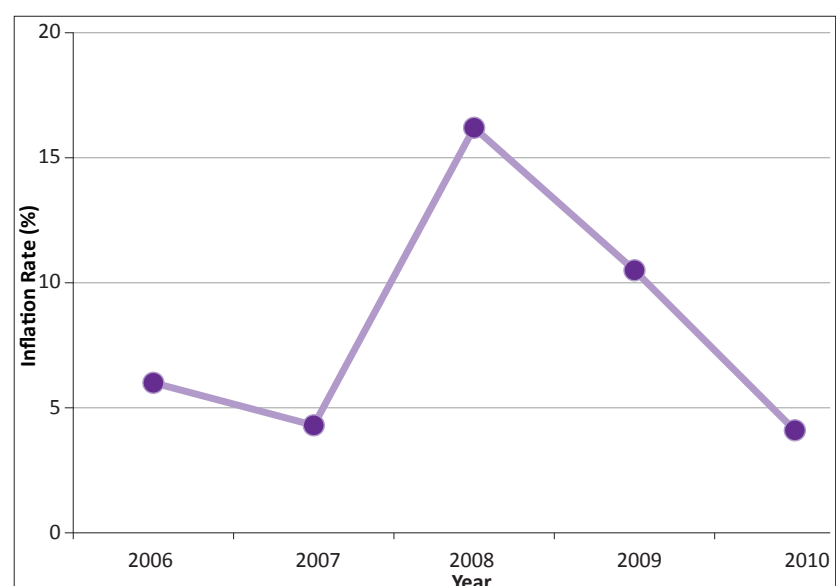


Figure 1.10: Annual inflation rates, 2006-2010

Source: GoK 2011b

Interest rates

The average yield rate for the 91-day treasury bills, which is a benchmark for the general trend of interest rates, has recorded a mixed performance over the last 7 years. As illustrated in Figure 1.11, this stood at 8.29 percent in 2004, 8.14 percent in 2005, 5.73 percent in 2006, 6.87 percent in 2007, 8.59 percent in 2008, 6.82 percent in 2009 (GoK 2010c) and 2.3 percent in 2010 (GoK 2011b). The interest rates commercial banks

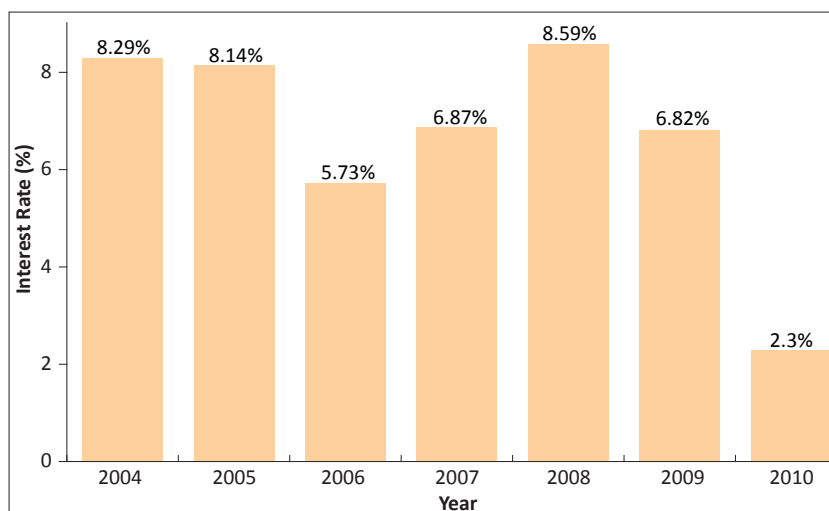


Figure 1.11: Trend in interest rates, 2004-2010

Source: Adapted from GoK 2010c and GoK 2011b

pay on savings is dismally low and has ranged from 1.4 percent to 1.7 percent over the last five years (GoK 2011b).

Yet despite the low cost of money to the country's financial intermediaries, commercial bank base lending rates—which are invariably marked up by several percentage points—have ranged from 13.3 percent to 14.8 percent in the last five years which is quite high. In the period of high interest rates—which is exacerbated by onerous fixed asset collateral requirements—Kenyans cannot, for instance, afford to borrow in order to make investments required for environmentally sound mechanised agriculture and are instead more likely to engage in slash and burn agriculture that depletes soil fertility. Equally, due to the pertaining high interest regime, manufacturing entities are unlikely to borrow in order to invest in cleaner production technology or energy-efficient vehicles, with adverse consequences on Kenya's environment.

Capital markets

The Nairobi Stock Exchange share index (NSE 20) increased by 36.5 percent from 3 247 in 2009 to 4 433 points in December 2010. As seen in Figure 1.12, although the index was the highest in three years in 2010, it is still considerably lower than the indices of 5 646 and 5 445 recorded in 2006 and 2007 respectively. The total value of shares traded surpassed the KSh 100 billion mark and stood at KSh 110 billion, which reflected a 189.5 percent increase over the KSh 38 billion total value of shares in 2009. The total number of shares traded hit an all time high of 7.5 billion, more than double the 3.2 billion shares traded in 2009. Market capitalization also exceeded the trillion shilling mark and closed the year at KSh 1.17 trillion. In comparison, market capitalization was KSh 792 billion at the end of 2006, KSh 851 billion in 2007, KSh 854 billion in 2008 and KSh 834 billion at the end of 2009.

Share price movements continue to be largely driven by profitability earnings or projections to the exclusion of environmental imperatives. In order to root environmental considerations more firmly, the Capital Markets Authority (CMA) should consider developing an environmental stock market index by drawing on the expertise of the country's environmental economists. This would aim to provide a quantitative measure of the environmental damage caused by the companies in an index and in turn subject the environment-friendliness of the listed companies' operations to public scrutiny.

Bonds worth KSh 479 billion were traded in 2010, which was a 331.5 percent increase over the bonds worth KSh 111 billion traded in 2009. Implementation of bond reforms, automation of bond trading and settlement, and issuance of large infrastructure bonds by

government are credited with the phenomenal growth. However, Kenya's environment would be much better off if potential investors were provided with sufficient information on the environmental friendliness of the projects for which the bonds are issued to enable them to make informed, eco-friendly decisions. This is particularly important for the large infrastructure bonds that have the potential to irredeemably degrade the environment by ensuring that rigorous, third party-verified environmental impact assessments are carried out. In addition, conducting integrated environmental assessments of all plans, policies and programmes (GoK 2009) of which these projects are part, in accordance with the National Environment Action Plan (NEAP) 2009-2013, would enhance rather than vitiate sustainable development that is crucial to the delivery of the goals of the economic, social and political pillars of Vision 2030.

Broad money supply (M3), a key indicator for monetary policy formulation, expanded from KSh 653.0 billion in December 2006, KSh 777.6 billion in 2007, KSh 901.1 billion in 2008, KSh 1.05 trillion in 2009 and by 21 percent to KSh 1.27 trillion in December 2010. Money and quasi-money (M2) grew from KSh 553.9 billion in 2006 to KSh 666.9 billion in 2007, KSh 766.4 billion in 2008, KSh 898.1 billion in 2009 and by 22.4 percent to KSh 1.1 trillion in 2010. As broad money supply is well correlated with the strength of the economy, it is evident that from the 2010 figures, the economy's underlying fundamentals are strong. Given the interconnectedness of the economy and the environment, future economic growth at the ambitious levels envisaged by Vision 2030 should be assured by paying due regard to environmental imperatives.

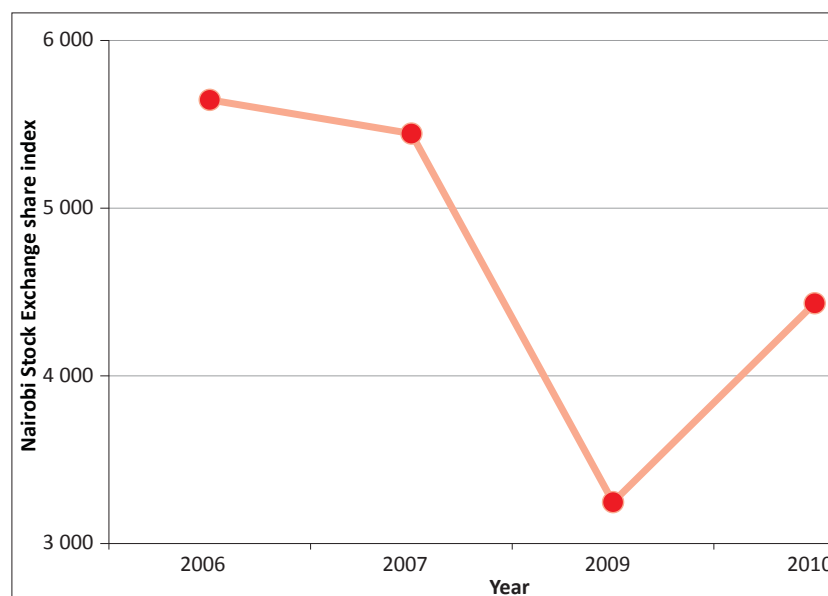
Foreign exchange reserves

The total central government reserves increased only marginally from KSh 1.52 billion in 2009 to KSh 1.56 billion in 2010. However the net foreign assets of the Central Bank rose by 20.3 percent from 220.8 billion in 2009 to 275.5 billion in 2010. To the extent that the level of foreign exchange reserves is an important indicator of government's ability to repay foreign debt, stabilize the volatile exchange rate and tame imported inflation, these levels do not appear to be able to adequately cushion Kenya against the rising fuel prices, for example. As the effects of this macroeconomic indicator are far reaching, this threatens to derail the attainment of the goals of all the three pillars of Vision 2030.

An unstable macroeconomic milieu encourages short-termism rather than long term sustainability. As such, with the comparatively

Figure 1.12: Nairobi Stock Exchange share index, 2006-2010

Source: GoK 2011b



low level of foreign reserves, government commitments on the environment which involve expending money are likely to be postponed. In addition, should public expenditure need to be cut, it is likely that the budgetary allocation to the Ministry of Environment and Mineral Resources, which is already only a tiny fraction that of other ministries such as Education and Defence will be cut more than others. This would obviously have negative outcomes for the delivery of Vision 2030 and beyond because the strides made in the economic sphere would not be sustainable as the departments and agencies with an environment mandate would be inadequately resourced.

Conclusion and recommendations

Vision 2030 recognizes the role of the environment in attaining the targets not just of the social pillar, where it falls, but of the economic and political pillars as well. In a sense therefore, the country's long-term development blueprint is underpinned by the principle of sustainable development and the recommendations set forth below should ensure the actualization of this principle.

- **Mainstream environmental concerns into the economy by:**

- o Formulating a national environment policy which would provide the policy framework for the numerous sectoral environmental policies and laws.
- o Integrating environmental objectives into the plans, policies and programmes of government, government agencies as well as the activities of the private sector (Dalal-Clayton and Bass 2009). To be successful, this would need to be matched

with higher budgetary allocations to NEMA and the Ministry of Environment and Mineral Resources whose funding should compare favourably with the country's well-resourced ministries, such as that of Education.

- **Institute a range of fiscal measures to reward environment-friendly initiatives** such as green technology and green financing and deter activities that are notorious for degrading the environment by meticulously meting out penalties based on the 'polluter pays' principle.
- **Ensure that the national accounting system embraces environmental accounting** because traditional financial accounting methods typically underestimate the country's natural capital and therefore the environmental costs of economic activity (Burnett and Hansen 2008). Environmental accounting would enable Kenyan businesses to better internalize their externalities, incrementally leading to less water and air pollution, deforestation and land degradation.
- **Encourage consumers to make lifestyle choices and purchasing decisions that are eco-responsible.** This will increase public scrutiny on the environmental friendliness of production processes and the ecological impacts of products and will encourage businesses to adopt environmentally sound norms.

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