A Review of Transportation Issues in Kenya

Gregory E. Dehnert
MSCE Candidate

and

Panos D. Prevedouros, Ph.D.
Associate Professor

Department of Civil Engineering
University of Hawaii at Manoa
2540 Dole Street, 383
Honolulu, HI 96822
Phone (808) 956-9698
Fax (808) 956-5014
e-mail: PDP@HAWAII.EDU

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ABSTRACT

This paper presents a review of past and current problems in Kenya’s surface transportation system, the causes behind them and potential solutions. Since the overwhelming majority of Kenya’s population is rural, any successful efforts must improve conditions of life in rural areas. Kenya has an annual population growth rate of about 3% which adds stress to current problems with land use and development which have been plagued by the conflicting needs of agriculture, tourism, traditional woodsmen and herdsmen, and wildlife preservation. A vital link to all land based activities is the transport system which is largely undeveloped and portions that exist are inefficient. Infrastructure supporting motorized transportation seems to be in stark contrast to people’s needs and culture. Support of non-motorized transport may be the means for successful near-term progress.
1. INTRODUCTION

The objective of this paper is to present a perspective of land transportation issues in Kenya after a review of background driving forces such as cultural, political and socio-economic conditions. This topic rarely appears in transportation literature. An extensive literature search on Kenya’s transportation problems was combined with the first author’s considerable presence in Kenya to generate this paper.

Life-styles and culture, land use conflicts, and the effects of wildlife-based tourism as a growth industry are discussed in detail. They are followed by a presentation on land transportation issues, primarily mobility and efficiency. Emphasis is placed on rural areas where about 80% of Kenyans reside [1].

2. BACKGROUND

2.1. Life Styles

The majority of Kenya’s population maintains lifestyles centered on agriculture, pastoralism, herdsmanship, or charcoal working (woodsmen). These lifestyles are detailed below.

2.1.1. Agriculture

The agricultural sector dominates the economy and accounts for eighty percent of total employment [1]. Farmsteads are widespread over the cultivable country lands. Since agricultural land is scarce and must grow if self-sufficiency (a governmental policy) is to be reached, government officials overlook the intrusion by farmers. Farmers, most non-ranch owners, plant crops wherever and whenever possible. They plant on the sides of roads, deforested areas, on the side of hills often stripping the land of its other resources. The timber industry has also invaded
Mount Kenya indiscriminately [2]. Forested areas are cut down to provide harvestland. Buffer zones between wildlife and civilization are shrunk, and rich soil is often washed away or ruined due to these practices. Higher elevations provide richer and more fertile land due to rainfall and other environmental factors. The farmers often garden in areas which are forbidden, such as near or on game reserves. If the agricultural sector is permitted to expand, the encroachment of the country’s other resources may be impossible to control.

2.1.2. Pastoralism

Pastoralism has been an indissoluble part to certain tribes and cultural traditions. Cattle are an integral part of marriage practices. The prospected groom offers the prospected bride’s family cattle to wed. Livestock provide life and nourishment with their meat, blood and milk. The Masai tribe keeps their livestock fenced in the center of their villages to protect them from wild animals, raiders, and wandering. A man is sometimes measured by how big his herd is. Herdmanship has been in Kenya’s history and culture for years, however it is recently becoming less desirable. Grazing land is scarce and growing population makes the herdsman’s way of life even harder. Since the land cannot sustain a growth in cattle equivalent to human population, the number of cattle per person and, thus, the per capita income from pastoralism has dropped [3]. As this way of life becomes more difficult, people are moving to Kenya’s cities in search for work.

Corruption and the inequitable distribution of land have been the leading problems in the disbursement of land. Current policies work against the less educated pastoralist. Previous efforts to remedy problems such as privatization have failed. In privatization efforts in the past, eight out of ten allotees sold part of their land in the first 10 years, resulting in a loss of over 1/3 of grazing land [4].
2.1.3. Woodsmen

Charcoal making is another occupation which has been in demand and will increase as population grows. Woodsmen can be seen with big charcoal bags along roads all over the country. Charcoal is the fuel for the vast majority of Kenya’s rural population. Woodsmen make the charcoal from trees which are growing fewer in number due to overuse, nature (fires and elephants) and deforestation to make way for agriculture and developments. As long as the demand for charcoal increases, due to the population boom, charcoal will be a part of the economy.

2.1.4. Population Control

Kenya’s population has risen from approximately six million in 1957 to twenty million in 1987 and at the current annual growth rate the population is expected to double in 15 years [5]. Roughly half of Kenya’s people are fourteen years old or younger.

Concerned with the negative effects of the rapid rate of population growth and development, Kenya’s government invited a population council advisory committee to make recommendations. The council’s immediate recommendation was the provision of contraceptive services. They also established goals for the improvement of social and economic conditions of Kenya’s families [1].

Traditional attitudes, however, are in opposition to population reduction. The preference for large families remain deeply entrenched. Children are still seen as having a vital role in sharing the burden of work and providing security at an old age when the parents are too feeble to make a living. Women who do not bear many children risk being divorced or ignored when the husband takes a second wife and a second family. Having many children is also a source of respect in several parts of Kenya [6]. Kenyans believe that their basic requirements of survival and respect
are culturally defined by having large families which opposes population control and resource stability.

### 2.2. Conflicting Land Use Needs

In Kenya there is a strange relationship between preservation, conservation, farmers, herdsmen, and the tourism industry; these interests have usually been in opposition to each other. Only 7% of Kenya is protected for the preservation of Africa’s most famous wildlife; this is insufficient to ensure the long-term survival of wild animals [7].

The demands of increasing farmers, herdsmen, and woodsmen for more land and resources have been creating problems for the country’s wildlife, which, in turn, is the main part of Kenya’s tourism industry [8]. Kenya must find a solution to its expanding population without letting the environment and tourism industry deteriorate. Finding a solution for the needs of both people and wildlife is a difficult problem.

In the last thirty years, arrangements have been made for the growing population by clearing forest and savanna lands to farm [1]. The surge in desire for good farm land intensifies strife. Herdsmen purposely drive their cattle onto land reserves to graze. These tensions cause dissension between the public and officials. The most notable drawback is public resentment toward wildlife.

At Amboseli Park, one of Kenya’s most popular tourist attractions, the increasing presence of humans is colliding with the area’s wildlife. When Amboseli was created 25 years ago, the Masai Tribes were pushed off the 150 square-mile parcel of land whose streams had supplied most of the water for their cattle. In return, the government promised to build a series of watering holes [9]. The government’s watering hole projects were not maintained and finally broke. The Masai killed wildlife in protest [3]. The increasing competition between animals and land users caused
bitter rivalry. The wild animals are a threat to the livelihood of the Masai through attacks, disease transmission and feeding ground depletion. “Adui” is the Swahili word for enemy. It is commonly associated with elephants, lions, baboons, and other animals that kill, infect or destroy crops [7].

In the past, when the wildebeest migration took place, the Masai would move away with their cattle. Now the Masai movement is confined by surrounding reserves. Living with the wildlife was easier for Masai when the land was less crowded [3]. The swelling population and the demands for cattle contributes to the overcrowding.

Over the years, pressure from powerful Masai grazing interests in the buffer zone caused the protected core to shrink by 20%, and the remaining buffer zone between parks and farmers is under pressure from the surrounding wheat growers who also want more land[5]. The Masai have a history of living peacefully with the wildlife, but this has changed with the population boom. Well over 300,000 Masai now live in Kenya and their population is growing at levels over 3% a year. Since the land cannot sustain such growth rates, the problems are getting worse. In a 1995 hearing about Kenyan Wildlife Policy villagers complained that “wildlife is great for the country, but for us useless” [7].

The conflicts are exacerbated by policies of agricultural self-reliance. With Kenya’s increasing population, this policy worsens the already imbalanced system. Wheat production in Kenya conflicts with the needs for stability of certain areas of wildlife reservations, and the growth of the tourism industry. Wheat production has been growing at a rate of 2.8% [1]. This rate is below the population growth rate, so the government has encouraged the expansion of wheat cultivation by the year 2000 to continue its self-reliance program. By implementing this policy, the salvation of Masai Mara, one of Africa’s better known reserves, and other game reserves becomes difficult. Moreover the massive expansion of farming implied by the policy would make reserves and parks increasingly vulnerable to human pressures.
Seventy-five percent of Kenya’s wildlife roams outside of park boundaries and Kenya can not afford a significant park expansion to support wildlife [7]. On the other hand, the tourism industry and wildlife preservation can not afford park reduction. The policy for more agricultural land makes wildlife preservation and the tourist industry outlook increasingly uncertain.

2.3. Possible Solutions

2.3.1 Tourism

Richard Leakey, renowned paleoanthropologist and former director of Kenya’s Department of Wildlife Services, believed saving the wildlife was not only a choice of morality, but also of good business. Tourism is a major source of employment. Tourists go on safaris in increasing numbers and the money spent goes directly to the local economy. The tourist industry provides incentives to maintain the wildlife areas in their natural state [9].

Les Carlisle, Phinda South Africa’s Regional Development Manager said, “Foreign money paid to see game makes the animals an economic resource, giving the local population a reason to protect animals instead of poaching them.” He also believes that the future of Africa’s wildlife lies in tourism [10]. Leakey considers tourism the only way to save the Amboseli Park and possibly all of Kenya. Wildlife reserves are the key to the tourist industry, an important exchange earner. In this respect, the ecological use of the wildlife conservation areas has an important economic value, and any changes proposed should take account of it.

To encourage tourism, the government of Kenya is trying to give rural people a chance to both derive money from it and to have a say in how it is managed [7]. These types of policies will reiterate the importance of wildlife to the Masai through economic value. The policies will also protect the threatened, endangered, vulnerable, and rare species [11]. The Masai have begun
charging tourists a daily fee of $20 to view wildlife in Masai Mara; collections exceed $1 million annually. With several wildlife parks in Kenya, the revenues generated are substantial.

William Roberts, executive director of Ol Choro Oiroura Wildlife Management and Conservation Association, a regional group that regulates tourism on the Masai Mara Reserve, contends that tourism brings in more foreign exchange than any other industry, and Robert Munro, general secretary of Zimbabwe Trust, a non-governmental organization in Harare, believes that wildlife should be looked at as a competitive land use just like any other land use and it should survive or fall on that basis [7].

Tourism is great for local economies, however, tourism can have negative effects. Mount Kenya is considered one of the twelve international biospheres, but the mountain’s ecosystem is threatened. It is a major tourist attraction, receiving thousands of visitors and is marked with litter [2]. If the tourist industry expands without thoughtful controls, the frequent interruptions to wild animals may affect their eating habits and mating routines. This would be a new threat to the currently threatened animals.

2.3.2. Policies toward a solution

The fate of Kenya’s wildlife and tourist industry depends on the cooperation of the people living near the parks. To remedy this, Leakey planned to make the parks a vital part of the local economy by guaranteeing that the people living nearby receive a greater share of the money generated by the parks [9]. The World Conservation Strategy also recommends to stop the slackness in applying legislation to forbid illegal settlements and illegal cutting down of forests.

New agricultural technology and higher yielding grains should be used in Kenya to stop agricultural land expansion. The planting and use of trees whose branches grow back in a short period of time should be used by woodsmen to prevent deforestation, a major outcome of which is
soil erosion. This is Kenya’s most pressing environmental problem [11]. Most of Kenyan energy needs rely on woodfuels and these household demands have been growing, which puts pressure on forest resources. Modern efficient stoves will remedy inefficient energy use and help heal deforestation. Programs to design and disseminate them would be a worthwhile pursuit for development activity [12]. The exchange, gift, or lending of innovative ideas and non-polluting technology is a step that the western countries should endorse and participate in.

Since the 1972 Stockholm Conference, developing African countries, have seen an upsurge of development and environmental projects. Still it is becoming apparent that development workers and governments have to re-examine the development models they have adopted. The development models Africans have pursued are Western impositions which are not sensitive to local cultures [2]. Land management should be delegated to the local level. This principle will be used in drafting policy recommendations on land management for the Second UN Conference on Housing (HABITAT II) in June 1996 [13].

The Kenya Energy and Environmental Organization (KENGO) is hoping to solve some of these problems. In August 1994, KENGO launched the eco-cultural model for sustainable management of natural resources in Kenya. According to Achoka Awori, KENGO’s executive director, the failure of recent resource management and legislation is the absence of social and cultural considerations in planning [2]. Most of Kenya’s projects have neglected the relationship between culture and sustainability. KENGO points out that there is need to sensitize communities on these linkages between what they view and the environmental constraints to it. Dr. Achola Kapiyo, a KENGO associate director, identified the lack of connections between culture and development projects as a weakness, leading to regrettable policy decisions such as the fencing off of land, damming of rivers to generate electricity and the resettling of humans without due consultation [2]. If such policies were in effect in the past, the Masai relocation would have never happened.
Implementation of policies and innovations are needed to remedy Kenya’s land use and development problems. The past policies need to be reexamined and new governmental approaches should be closely monitored to see which promote sustainability.

3. ANALYSIS OF KENYA’S TRANSPORTATION SYSTEM

3.1. Introduction

The transport system in Kenya is underdeveloped and ineffective. Although Kenya is wealthier than many African countries, it suffers from some of the same problems such as hunger, illiteracy and lack of economic opportunity. The significance a good transportation system can have on a country’s economy is immense. Transportation facilities expand the options for work, education, health, and other amenities, and directly affect economic efficiency [14].

Countries from the western world have donated funds to build up Kenya’s transportation network in order to solve the multitude of pressing transportation problems. The majority of these efforts have ended in failure. Furthermore, even if an effective transportation system was in place, the majority of Kenyans would not be able to use it. It is commonly known that poor and rural people resort to non-motorized transport or NMT [15,16,17]. Eighty percent of Kenyans are in rural areas, and their main mode of transportation is walking, supplemented by bicycles and motorized vehicles; Table 1 shows rural mode choice in Kenya.

<table>
<thead>
<tr>
<th>Mode Choice</th>
<th>Walk</th>
<th>Bicycle</th>
<th>Motorized</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>90%</td>
<td>4%</td>
<td>2.5%</td>
<td>3.5%</td>
</tr>
</tbody>
</table>

Source: [18,19]
Kenya does not have the resources or training to build and maintain an effective transportation system. Solving the transportation problems in Kenya should be a major goal for its government [14,20,21,22]. A major emphasis on NMT as a means to improve accessibility for the masses is warranted by the prevailing economic conditions. Long-term planning for eventual motorization is also required for overcoming long-distance accessibility problems.

3.2. Roads in Kenya

There are factors in Kenya’s roadway system that inhibit efficiency, but could be improved by Kenya’s Ministry of Transportation. Only 32% of paved roads in Kenya are considered in good condition, Table 2.

**TABLE 2: World Bank Kenya Statistics, 1995**

<table>
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<tbody>
<tr>
<td>8</td>
<td>324</td>
<td>32%</td>
<td>105</td>
<td>52%</td>
</tr>
</tbody>
</table>

Excessive wear and tear per mile is experienced on Kenya roadways and rural roads are often unusable in the wet season [23]. With each rainfall, new groves and ditches are formed in dirt roads often making them impassable with standard two-wheel drive automobiles.

Only 9% of Kenyan roadways are paved (Table 3). Many of these roads do not have shoulders, and the ones that do are poorly maintained and rapidly deteriorate. This problem has direct effects on traffic flow. Roads slowly fall apart from the outside to the center, forcing the motorists to drive closer to the centerline which increases accidents and slows the flow. Furthermore, as traffic in one direction increases, demand for passing in that direction also
increases. At the same time, traffic in the opposing direction also increases, thereby decreasing the number of opportunities to pass. This problem worsens by the deterioration of shoulders and the large number of potholes. Due to the limitations to pass, the impact of heavy vehicles on traffic is immense, especially in mountainous regions such as Mount Kenya and the Great Rift Valley. Queues form which cannot be dispersed without the ability to pass at reasonable intervals.

**TABLE 3: Summary of Kenya’s Primary Infrastructure**

<table>
<thead>
<tr>
<th>Category</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Railroads:</strong></td>
<td>2,040 km, 1-meter gauge</td>
</tr>
</tbody>
</table>
| **Highways:** | total - 64,590 km  
               paved - 7,000 km  
               unpaved gravel - 4,150 km  
               improved earth - 53,440 km |
| **Inland Waterways:** | part of Lake Victoria system is within boundaries of Kenya |
| **Pipelines:** | Petroleum products 483 km |
| **Ports:** | coastal - Mombassa, Lamu  
             inland - Kisumu |
| **Merchant Marine:** | 2 ships (1,000 GRT or over) totaling 4,883 GRT/6,255 DWT  
                           1 Barge carrier  
                           1 Oil tanker ship |
| **Airports:** | total - 248  
                  usable - 213  
                  with permanent-surface runways - 28  
                  with runways over 3,659m - 2  
                  with runways 2,440-3,659m - 3  
                  with runways 1,220-2,439m - 44 |
| **Telecommunications:** | in top group of African systems; consists of radio relay links; over 260,000 telephones; broadcast stations - 16 AM; 4 FM, 6 TV; satellite earth stations - Atlantic Ocean INTELSAT and 1 Indian Ocean INTELSAT. |

Source: [24]

A number of improvements can be applied to two-lane highways. The most effective would be the addition of a passing lane. A continuous lane can be provided with the center lane alternating for exclusive use of one direction at a time. Another necessity is the addition of
climbing lanes to reduce the side effects of heavy vehicles on steep grades. This would greatly improve the capacity of two-lane roads in mountainous areas.

A number of improvements can be made to prolong the service life of roads in Kenya. Good techniques of earth road construction and maintenance along with the integration of culverts will greatly enhance Kenya’s roads. To improve the lifespan of paved and dirt roads, run-off drains and culverts should be built to direct water flow from high to low grades. Obtaining finely crushed gravel in the construction of roads will increase the lifespan of the roads and make infiltration of water less of a problem. The highest priority is improving the drainage of roads, which prevents erosion and saturation. Barwell [19] made several recommendations for upgrading village roads; those most applicable to Kenya are listed below:

1. All roads must have a cambered running surface and side drains
2. Lead-off drains where appropriate
3. Culverts to conduct concentrated water flows across the road
4. Spot improvements on naturally water-logging soils and very steep gradients by provision of crushed rock or gravel surfaces
5. Protection measures in side and lead-off drains
6. Selected clearing of brush and trees from the road to permit the surface to dry out after periods of rain.
7. Selected widening of the road particularly in mountainous areas
8. Selected re-alignment to reduce gradients or the length of route
9. Safe bridges for major streams and rivers.

To achieve these goals, education of villagers and officials will be needed in the aforementioned design and construction elements. A more critical need, however, is education on preventative and ameliorative maintenance of existing facilities, including inspection and determination of the pavement serviceability condition.

Pavement design may also need to adopt to local vehicle loads. In Kenya there exists a legion of public transport mobiles. These cars and vans drive certain routes picking up passengers along the way, charging a price which is negotiated by the driver and passenger. There is no
noticeable passenger limit to automobiles in Kenya. Laws restricting occupancy of cars are not enforced. These vehicles driving on the roads try to maximize the revenue collected on each trip, and profit by pushing the vehicle occupancy to the limit. Most of these vehicles are four-tire vans or pick-up trucks which, when loaded beyond capacity, transfer high loads to the pavements and further accelerate pavement and shoulder deterioration. The frequent passenger and cargo pick-ups/drop-offs at the side of the road may necessitate designs that include a reinforced taper between the pavement and the (natural soil) shoulder.

3.2. Road Projects

Most of Kenya’s road projects are paid for with foreign money. The majority of these projects have ended in failure. Many roads were made with low quality construction techniques and funding often ran short during projects partly due to corruption. A highway strip from Narok to Masai Mara, fully financed by Germany in the 1970’s, ran out of money halfway through its undertaking. The Kenyan government asked for additional funds to finish the work. Germany refused to give additional money to a project which originally had enough funds for completion.

Japan imported its own construction equipment and workers because they realized that this was the only way the road would actually be completed. Japan, with substantial trade links to Kenya (2.6% of all Japanese exports go to Kenya), has a vested interest in improving Kenya’s transportation system, but lack of direct air links to Japan limit the exportation of many of Kenya’s products [25]. Kenya has been trying to attract Japanese investment in the food and tourism industries. Kenya is already the largest destination for Japanese tourists in Africa. In 1993, Kenya was number 1 of 10 recipients of aid in Africa given by Japan [25].

No money is given for the maintenance of Kenya’s roads by foreign countries. Due to the nearly complete absence of road maintenance by the Kenyan government, the roads become nearly
unable over time and, foreign countries donate money to build replacement roads, bringing in foreign money and helping employment. (This is the third-world equivalent of the concept of the “black hole” of highway infrastructure.) Inadequate maintenance is a “universal failure” of infrastructure providers [26]. In sub-Saharan Africa, one third of roads built in the past few years have eroded because of lack of maintenance [22]. The attitude is for new investment rather than maintenance, because donor countries look for contracts to supply capital-goods or consultant services. Another downside of major international lending agencies is that they typically disregard non-motorized infrastructure investment [15,20], which would significantly benefit the poor majority. In the past, World Bank transport projects have usually focused on roads for motorized vehicles, which have failed to improve the transport of many communities [27]. Although they are unlikely to benefit from such investments, the poor will suffer the negative environmental and socio-economic consequences.

The Rural Development Fund (RDF) finances transportation projects in Kenya, which totals only 0.5% of Kenya’s development budget. The RDF projects are distributed according to the percentage of Kenya’s population residing in each district [28]. Since many projects failed in the 1970’s and 1980’s the RDF focuses on unfinished projects and better planning for new ones. Before the stipulation of district allocation for development projects, road projects were often focused in the presidents’ political base. For example, the Rift Valley Province, which has 21% of Kenya’s population, and the president’s home in Kabernett, has been receiving shares often exceeding 40%. With the RDF implementation, the road projects have begun to follow a more rational formula for the benefit of the entire country.

Transportation investment policies need to be restructured to place more emphasis on making roads and trails suitable for low-cost vehicles and non-motorized transportation. Developing countries and major international lending agencies have previously ignored non-motorized modes, particularly low-cost vehicles, in planning and investment strategies [15]. The
past investment policies are slowly changing and funding for non-motorized transportation in third
countries is emerging [20]. A justification for the need to support NMT is provided in the
next section.

3.3. Transportation Data of Rural Kenyan Farmers

The ability of small farm operations in Kenya to transport their products to the market is
limited by the existing transportation system. As a consequence farmers have to sell their product
to traveling traders who often dictate the price of the products [29]. It is not uncommon for
automobile drivers to stop on the side of isolated roads and barter with farmers, and, then,
transport and sell the crop for higher prices in the city. Tourist guide drivers will often pick up
bundles of food on the excursions and sell it in Nairobi. However, many districts have been
benefiting from the government’s attempts to provide improved access, in particular through the
Rural Access Roads program. Barwell [19] specifies that roads constructed specifically to serve
the tea industry allow efficient collection services which require farmers to travel no more than 5
km to collection points.

Barwell also reported on a study that compared the transport needs of small rural villages.
In the survey areas, cattle, goats and sheep invariably move to the market under the guidance of an
escort walking by foot. Pigs and rabbits are moved by animal cart. Milk is 70% transported by foot
and 30% by bicycle. Distances traveled are normally less than 3 km but may be up to 8 km. Sale of
milk is a daily task and usually is done on a dual purpose trip on the way to work or school. Cash
crops are transported by two main means of transport hire, animal cart and matatu which is a
shared taxi, usually a station wagon or pick-up with the rear body adapted to carry passengers and
goods. Cotton transport charges are high; 70% of cotton, maize and beans is moved by animal
carts, which have lower charges and are widely available in villages, 17-19% by matatu, and the
rest by walking. Tomatoes are exclusively transported by matatu due to the perishability. These
highlight the different roles of bicycles and animal carts, which are the most commonly owned
vehicles and are of comparable cost.

Bicycles are used for various purposes such as traveling to and from work, visiting and
shopping. Females rarely use bicycles, probably on the grounds of custom or lifestyle. Fathers,
who usually control household cash, make more trips by public transport than other members.
Males make more trips for leisure than females and females make more work related trips. For
shopping and leisure trips, walking accounts for 60-80% of trips with the remainder being made by
bike or matatu. Over 80% trips for these purposes are less than 7 km, suggesting that they are
usually within the village neighborhoods or among villages.

Loaded walking trips (head or backloading) account for one in three of all trips and 95%
of those loaded trips are carried by females. About 70% of trips involve carrying a load for water,
usually about 25 kg and covering distances up to 8 km. Both water and firewood collection are
female activities. Water collection poses the major daily transport problem to the subsistence
farmer.

The study of these villages shows that major improvements in efficiency can be made with
the promotion of NMT. The time required for task completion will decrease considerably with
widespread use of wheeled NMTs. Also improved access and transport to and for rural farmers
will increase profits.

3.4. Non-Motorized Transportation
The majority of transportation modes in Kenya are non-motorized; these modes are some of the most efficient [15,17]. This is due to the economic conditions in Kenya, lifestyles and traditions. Walking and other non-motorized transportation is influenced by income, trip length, weather, and the availability and cost of alternative modes [15,17,20,29]. However, non-motorized transportation is often not included in the planning of city transport networks. Therefore, as the city grows, people are more dependent on motorized transport [30]. Pedestrians and other low-cost vehicles should be provided safe, comfortable, direct, and accessible routes covering rural and urban communities [17,20].

When people think of transportation they think of motorized vehicles. In Kenya these modes are also used but are much less important to the majority of the people. Simple low-cost vehicles are used more for local land transport. These vehicles are known to be inexpensive to own, operate, offer a cost of haulage that is competitive to (and at times cheaper than) motorized modes, are able to withstand low standards of road surfaces, and can travel over the narrow paths and unimproved roads which form the largest part of the route network used [17,29]. Given the effort many Kenyans put into carrying loads on their heads, backs, and shoulders, there is extreme potential for introducing non-mechanized vehicles to utilize this effort more efficiently and to reduce the time and the laborious aspects of these methods [19]. There are eight broad categories of low-cost vehicles [29]:

- Bicycle and Motor Cycle Trailers
- Carrying Aids
- Wheelbarrows and Handcarts
- Animal Transport
- Pedal-driven Vehicles
- Motorcycles and Conversions
- Basic Motor Vehicle
- Agricultural Vehicle

The characteristics of the three predominant NMT modes are shown in Table 4.
TABLE 4: Characteristics of Three Predominant NMT Modes

<table>
<thead>
<tr>
<th></th>
<th>Pedestrian</th>
<th>Pushcart</th>
<th>Bicycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Speed</td>
<td>5 km/hr</td>
<td>5 km/hr</td>
<td>15 km/hr</td>
</tr>
<tr>
<td>Avg. Speed</td>
<td>3.5 km/hr</td>
<td>NA</td>
<td>6.0 km/hr</td>
</tr>
<tr>
<td>Ideal Trip Length</td>
<td>400 m</td>
<td>400 m</td>
<td>3.3 km</td>
</tr>
<tr>
<td>Avg. Trip Length</td>
<td>1.1 km</td>
<td>NA</td>
<td>2.8 km</td>
</tr>
<tr>
<td>highest mode usage</td>
<td>designed for narrow footpaths</td>
<td>most efficient &amp; economical</td>
<td></td>
</tr>
</tbody>
</table>

Source: [30]

The bicycle may be better than motorized transportation under certain trip length, terrain, and climatic conditions [15]. Widespread use of bicycles reduces air and noise pollution, while at the same time increases mobility. Bicycles can serve the transport needs of many Kenyans. Bicycles can be modified to transport goods and passengers. Bicycles are about four times more efficient than walking which enables people to travel faster and/or carry a greater load [29]. Modifications to bicycles enable rural people to transport small loads of goods easier than carrying aids, headstraps, and shoulder straps. For example, the ‘Oxtri’ is a tricycle which is specifically designed for carrying loads.

Other low-cost wheeled vehicles include wheelbarrows and handcarts. Such wheeled vehicles enable loads to be moved more efficiently than is possible with carrying aids such as headstraps, tumplines, etc. The advantages of wheeled vehicles are that they are simple, robust, light weight, easy to load and unload, fairly stable and easy to maneuver. The disadvantage of wheeled vehicles is that they are difficult to push on rough terrain. Handcarts are seen throughout the city streets of Nairobi and Mombassa; they are an integral part of the non-motorized spectrum of vehicles lobbying on roads and the streets in Kenya. Handcarts are relatively cheap to make and the cost of movement of goods by this mode is often cheaper than mechanized transportation [17]. Handcarts are able to withstand the low quality of road surfaces present in Kenya. They are also able to access narrow alleys and lanes in densely populated areas of the inner city. Even though they have a low speed they serve a useful function in the distribution of goods. Moreover, wheeled
NMT modes (and pedestrians) lend themselves to urban planning principles and the construction of infrastructure for their efficient accommodation as opposed to animal transport such as oxen and camels which are often seen in Kenya. They are slow but are able to manage heavier loads than human powered methods. Animals are able to handle any terrain, including places where it is not possible to walk. Their use on roadways and in cities, however, should be discouraged on the basis of safety, health and sanitation, and traffic flow control.

The benefits that widespread use of NMT can have in Kenya are substantial. They help make rural transport more efficient by reducing the number of trips needed for carrying a given load by people. They can be made by local manufacturers, using mainly local resources and materials. The promotion of Non-Motorized Vehicles (NMV) will stimulate employment growth especially in low-income countries such as Kenya [20]. NMV can minimize requirements for foreign exchange for initial purchase, fuel, and spare parts. NMV provide useful employment in their manufacturing and maintenance, and in their use to provide transport services at low-investment cost [29].

Oil imports account for a substantial part of Kenya’s debt. Petroleum and petroleum products accounted for 15% of Kenya’s imports in 1992 [24]. Kenyan export of petroleum products was only 11% in 1990. This contributes to Kenya’s $0.6 billion annual trade deficit. Also, machinery and transportation equipment account for 29% of its trade deficit. Thus the expanded use of NMT should help reduce Kenya’s trade deficit. Shifting from motor to NMT modes will have significant impacts on regional economies and foreign exchange [20]. The transfer of efficient low-cost transport technologies from other countries should be pursued. Kenya should follow Asian developing countries and promote NMT. Regulations and policies should mirror the stipulations of encouraging NMT [20]:

- Taxes on gas and/or on motorized vehicles should be implemented to promote NMT usage;
- Duties on imported NMT equipment, such as bicycles should be eliminated;
- Protectionism policies for domestic NMV manufacturers should be eliminated;
NMV licensing should be eliminated;
Public education, advertising campaigns and incentives should be used to promote NMT;
Barriers to NMV and NMT manufacturing and ownership should be identified and dealt with; and,
Government opposition to NMV and NMT should be eliminated.

4. SUMMARY

The economic impact that a good transportation system can have in Kenya is immense. A good transport system will expand employment opportunities for the poor, enrich culture, and expand its economy. Policies should be adapted to improve the lifetime and efficiency of roads. Kenya’s roads will offer efficient, dependable, durable and safe service if better design and maintenance procedures are adopted and followed by the government.

It is important to recognize, however, that the majority of trips made by Kenyans are made on foot over short distances. Cultural and life-style data presented in this paper make a case for a graduate development of motorization through a (possibly long) cycle which emphasizes NMT. With the usage of NMT such as bicycles, more efficient transportation will be achieved. NMT modes can carry heavier loads than can be achieved by carrying aids, reduce the number of trips, and they reduce dramatically the travel time needed for transport. Common sense thinking suggests that Kenya should promote non-motorized vehicles similar to many Asian countries. A non-motorized system in Kenya will be better for its people and the country’s fragile environment which is already being threatened by expanding population.

Realistically, the majority of Kenyans cannot afford any form of motorized transport, thus, emphasis should be placed on promoting non-motorized transport. NMT-based projects will directly help both the urban and rural populace. According to Herbert [31], projects that promote non-motorized transport will:

1- provide jobs and accessibility to jobs;  
2- distribute essential commodities and keep the distribution cost low;  
3- facilitate access to essential urban services;
4- facilitate social interaction;
5- increase the supply of land suitable for settlement;
6- allocate land use so that the average trip length short and can be accomplished by NMT.

The International Institute for Energy Conservation (IIEC) submitted a document entitled ‘Consensus for Change’ to the World Bank (27). The document contains recommendations for development of the transport sector policies and asserts that NMT should not be put into a secondary status; NMT should be fully integrated into any modern transport system for rich and poor countries alike. Developed countries should come to realize that NMT vehicles are economically and environmentally the most efficient means for short hauls which comprise the majority of trips. The transfer of efficient NMT technology and road construction equipment should be used as a means of reducing both the poverty and the access and transportation problems.
REFERENCES


