CHAPTER VII: IMPACT ON INFRASTRUCTURAL FACILITIES

- **Road Network**
- **Water Supply**

The city has experienced rapid expansion due to rapid increase in population, and the pressure on infrastructure increased substantially. This means that the degree of urbanization in terms of physical expansion has outpaced the infrastructure and basic urban service provision capacity of Addis Ababa city, which as a result, are inadequately provided. In respect of this, it is crucial to assess the status of infrastructural facilities of the city by looking into:

1. The pattern and distribution of road infrastructural facility;
2. The variations in the distribution of foot path and drainage facilities;
3. The pattern and distribution of water supply;
4. The incidence in the deficient area.

To achieve the above goals, the following information was collected from the Finance and Economic Development Bureau of Addis Ababa Urban Government.

1. Length and type of roads and its facilities like drainage and sidewalk way;
2. Extent of water supply of the city;

ROAD NETWORK

Road network can influence economic activities undertaken by the urban people. One of the principal objectives of road construction in a given area is to promote the socioeconomic development in the area. Roads also create a new economic sphere by inviting other activities, which were not in the area through attracting other entrepreneurs because of the developed road in the area (ERA, 2002). Hence, assessing the road network status of the study area is one of the crucial elements in understanding level of development and the extent to which it is influenced by population pressure.

As can be seen from Fig-7.1, the road network of Addis Ababa has a radial form which is shaped by five major roads (AACG, 2010) radiating out of the central Business District (CBD) into the outskirts. The ring road has added an orbital shape which is clearly depicted in the figure. It is evident from Table-7.1 that the total road

Table-7.1 Temporal Variations in the Road Characteristics

Road Type	2000		2010		Percent Change
	Length in km	%	Length in km	%	
Asphalt	700	35.9	1280	45.5	9.6
Gravel	1250	64.1	1534	54.5	-9.6
Total Road Length	1950	100.0	2814	100.0	-
Road length with foot path	220	11.3	387	13.8	2.5
Road length with drainage	423	21.7	1630	57.9	36.2

Source: AACG, 2010

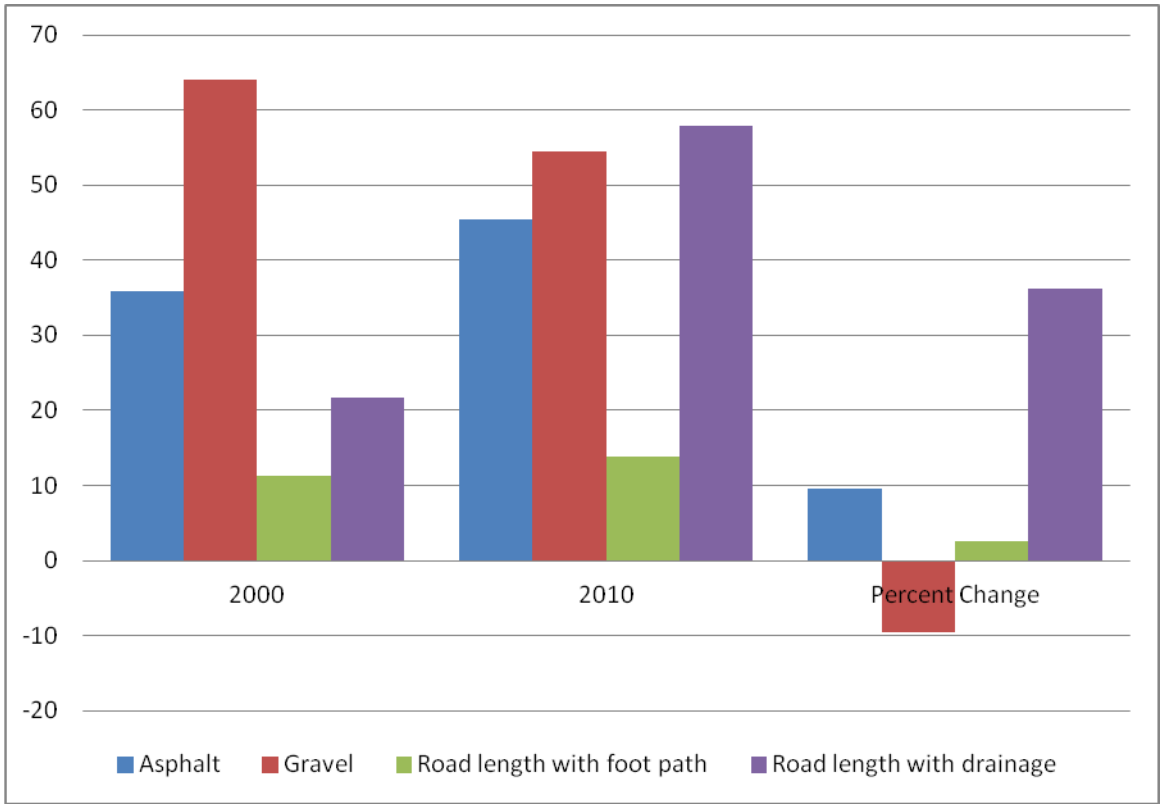


Fig-7.1 Temporal Variations in the Road Network Types

length of the city had been increased from 1950 km in 2000 to 2814 km in 2010. The proportion of gravel road length showed a declining trend from 64.1 percent in 2000 to 54.5 in 2010. This means that it had been converted to asphalt road type. This significant proportion of gravel road length resulted in absence of balanced hierarchy, capacity limitation, and low connectivity (AACG, 2010).

Foot Path

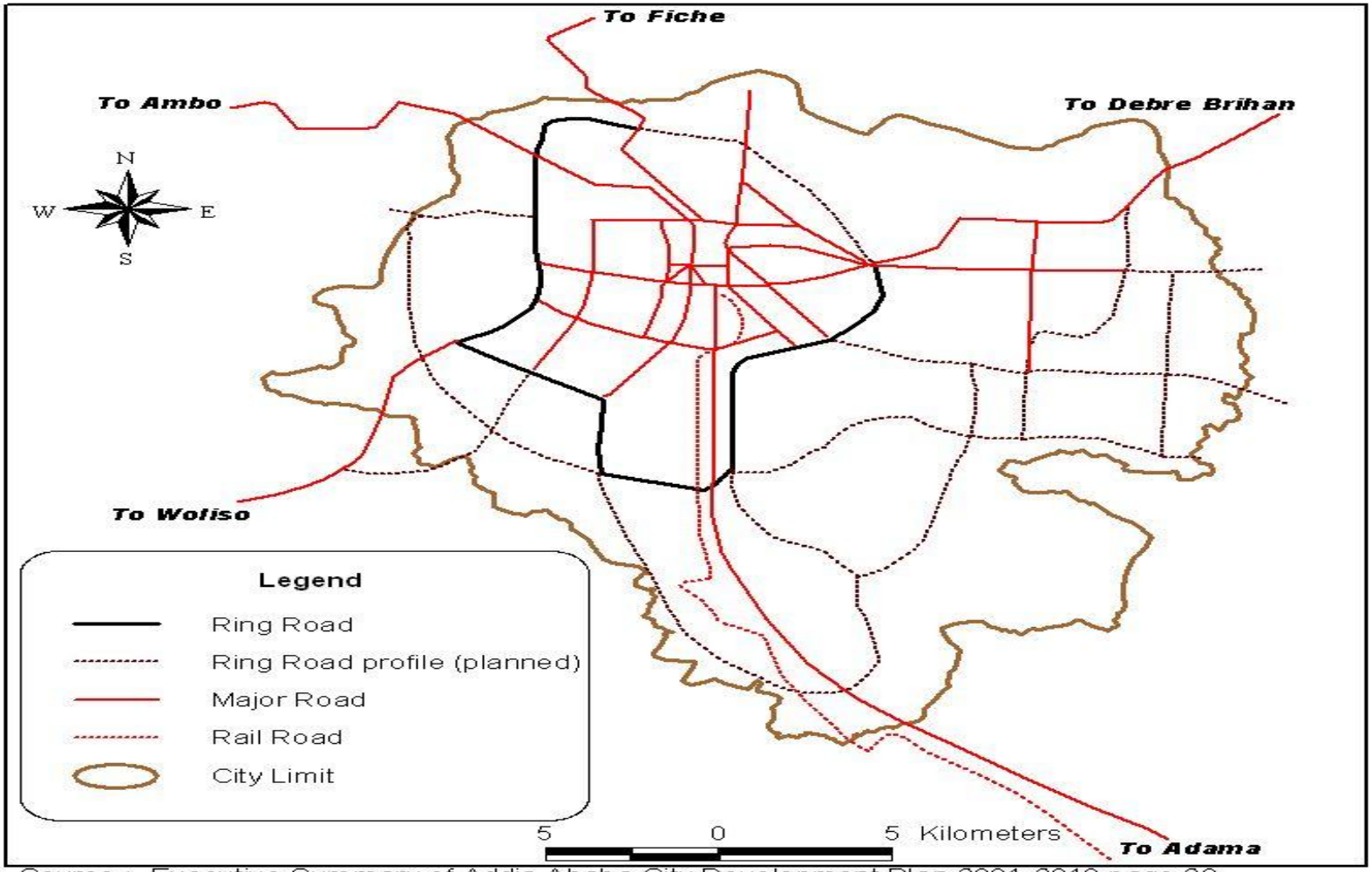
As can be seen from Table-7.1, in 2000, only 11.3percent (220 km) of the total road length had side walkway. In 2010, this figure was increased to 13.8 percent (387 km). The percentage change in the total road length is greater than that of road length with foot path. However, according the study conducted by the Ethiopian Road Authority (2004/2006), the dominant mode of travel in the study area is walking (60.5 percent). With this dominant mode of the city's transport, such limited sidewalk way length may result in discomfort, congestion and traffic accidents.

Drainage Facility of the Road Network

As can be seen from Table-7.1, in 2000, only 21.7 percent (423 km) of the total road length had drainage system. The figure of drainage system reached 1630 km in 2010 - it is about 57.9 percent of the total road length of the city. This shows that, the present road constructions in the city are being carried out by taking into account the drainage system of the city, however, it is far from adequate for the total road length of the study area exceeds total length of roads with drainage system.

Plate-7.1 Collector Road without Foot Path

Plate-7.2 Gravel Road Provided with Neither Side Walk nor Drainage System (Peripheral Part of Yeka Sub City)



Source :- Executive Summary of Addis Ababa City Development Plan 2001-2010,page 29

Fig-7.2 Addis Ababa City Road Network

Table-7.2 Temporal Variations and Growth Rates of Registered Vehicles

Types of Vehicles	Year			Growth Rate (%)	
	1990	2000	2010	1990-2000	2000-2010
Motor Bicycle	1832	3115	5230	70.0	67.9
Bus	2813	6530	18956	132.0	190.3
Field Vehicle	5092	11394	17594	123.8	54.4
Dual Pursues Vehicle	5274	9986	10507	89.3	5.2
Dry Cargo	14232	31030	41320	118.0	33.2
Automobile	5419	14439	65674	166.5	354.8
Liquid Cargo	626	1243	3220	98.6	159.1
Trailer	2986	4211	4687	41.0	11.3
Vehicle with Machinery	40	56	120	40.0	114.3
Other	2343	3570	3950	52.4	10.6
Total	40657	85574	173268	110.5	102.5

Source: Addis Ababa Road Transport Authority, 2012

As can be seen from Table-7.2, the growth rates of registered motor vehicles were very high. Between the year 1990 and 2000, the total growth rate of registered motor vehicles was 110.5 %. With very little decline, the growth rate between the year 2000 and 2010 became 102.5 %. Automobiles had the maximum growth rates grown by 166.5 % between 1990 and 2000, and 354.8 % between 2000 and 2010. This rapid growth in the number of motor vehicles of the city and inefficient development of road network has an impact on traffic movement and road safety. As indicated above, the number of vehicle importation in the study area shows significance increase since 1991 where the nation adopts free market economic policy. This rate of growth in motor vehicle results in great impact on the environment. The city's environment can be polluted by emissions from vehicle exhaust, fuel evaporation, and wearing down of tires and metals. These pollutants can easily pollute buildings, water bodies, human health and ecosystems.

Furthermore, due to inadequate road networks, slow road construction and maintenance, rapid traffic growth, shortage of parking space in the narrow streets, as well as ineffective traffic management and enforcement, there is rapid growth of road traffic accidents (Mekete, 1997).

PATTERN OF THE DISTRIBUTION OF WATER SUPPLY ACCORDING TO SOURCES

Water is one of the basic necessities of human life, and supply of clean water is absolutely necessary for healthy life. Hence, it is important to assess the pattern and distribution of water supply of the study area. Water for both household and industry consumption is provided by AAWSA (Addis Ababa Water and Sanitation Authority). Details regarding the sources, quantities of supply, catchment area etc., are presented in Table-7.3.

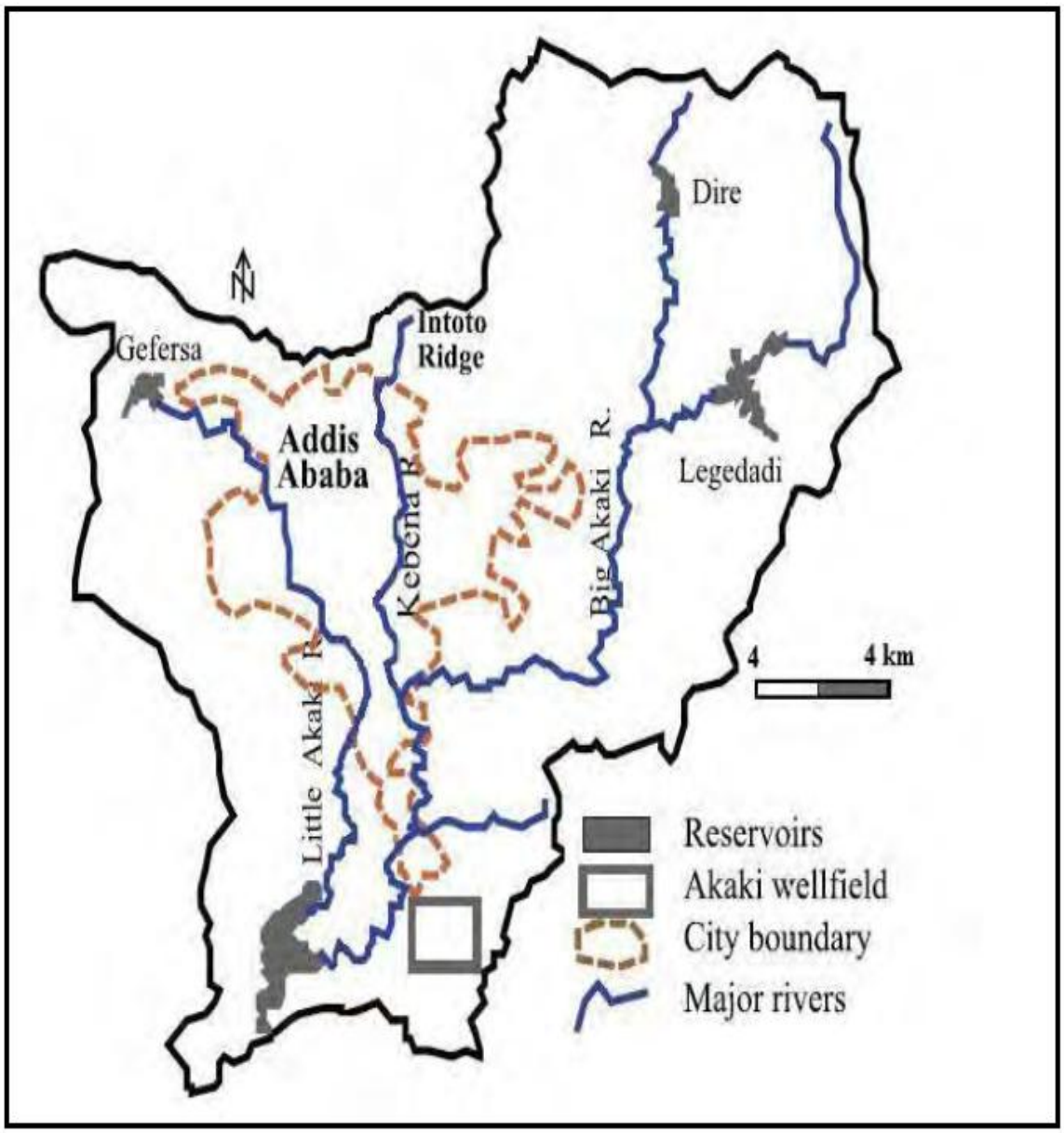
About 65 percent (195,000 cubic meter /day) of water supply in Addis Ababa was provided from Laga Dadi, Dire, Gefersa I and Gefersa III reservoirs. These are located in the surrounding of Addis Ababa, all within the Awash Basin (Fig-7.3). The Gafersa dams I and III are located about 20 kilometers North West of Addis Ababa and the Legadadi and Dire dams are located about 30 kilometers North East of Addis Ababa (AAWSA, 2011). The maximum capacity of water supply is found in Laga Dadi supplying about 127000 m^3/day, followed by dire reservoir supplying 38,000 m^3/day.

About 14 percent of the water supplied to Addis Ababa is from the Akaki well field, which is located about 10 km South of Addis Ababa, and the remaining 21 percent (63,000 m3/day) of the water is from other scattered wells and the remaining protected springs.

Table-7.3 Basic Water Supply Characteristics of the Study Area

Features	Laga Dadi	Dire	Gefersa I	Gefersa III
Construction Year	1970	1999	1944	1966
Capacity(10^6m^3)	40	13	7	1
Runoff(10^6m^3)	70	40	27	Within Gefersa I's
Surface Area(km^2)	4.0	1.3	1.4	0.4
Dam Size(meter x meter)	22x600	46x665	15x150	18x220
Catchment Area(km^2)	225	72	56	Within Gefersa I's
Supply rate(m^3/day)	127000	38000	30000	Only to Gefersa I

Source: AACG, 2010



Source: *Ayenew et al. (2008) cited in Daniel, 2011*

Fig-7.3 Drainage Basins of the Study Area

It appears from the data in Table-7.4 that there had been an increasing trend in water production capacity from 80,700,000 M^3 in 2005 to 92,200,000 M^3 in 2009. However, as it can be seen from the table, there is also an increasing trend in physical water losses over those years. Consequently, about 20 percent of the annually produced water is lost due to pipe leakages and intermediate reservoir leakages.

Table-7.4 Water Production, Distribution and Consumption

Indicators	Annual Trend				
	2005	2006	2007	2008	2009
Annual water production in million M^3	80.70	82.86	86.28	88.41	92.20
Annual water distribution in million M^3	62.46	65.05	68.16	70.72	73.76
Physical water loss in percent	17.62	17.81	18.12	17.68	18.44
Total population in millions	2.70	2.70	2.73	2.73	2.91
Per capita water supply per year(M^3)	23.10	24.10	25.00	25.90	25.30

AAWSA, 2011

In respect of the adequacy of water supply of the study area, it is crucial to see standards set by scholars. For instance, the WHO and UNICEF in their global assessment of water supply adopted the figure of 20 liter per capita per day or 0.02 meter cube per capita per day for domestic hygiene. This means that, regardless of its quality, the per capita requirements of water volume needed for a year is 7.3 M^3. Hence, it can be concluded that with this measurement, there was no water shortage observed in the study area. However, according to Table-7.5, the maximum daily water demand is about 0.0775 meter cube which means that there has been a water shortage throughout the period under the study.

Table-7.5 Standard Daily Water Demand in the Study Area

Demand	**Unit**
Daily water Demand	0.05 M^3/capita/day
Commercial and institutional water demand	0.005 M^3/capita/day
Industrial Water Demand	0.015 M^3/capita/day
Added flow for daily peak factor	0.0075 M^3/capita/day
Maximum daily demand	0.0775 M^3/capita/day

Adopted from: Ayenew et al, 2008

According to Table-7.5, the maximum per capita daily water demand is about 0.0775 M^3. Therefore, one can easily observe from the Table that no adequate water volume was supplied to the city residents throughout the period under discussion.

This situation is getting worse as needs for water rise along with population growth, urbanization and increase in household and industrial uses. Water scarcity forces people to relay on unsafe sources of drinking water. It also means they cannot bathe or clean their clothes or homes properly. Poor water quality can increase the risk of waterborne diseases as cholera, typhoid fever and dysentery. Water scarcity can lead to disease such as trachoma, and typhus. In addition to all these, water scarcity in the study area causes waste of time due to long waiting time to fetch water (Plate-7.3).

Source: AACG, 2010

Plate-7.3 Long Waiting Time to Fetch Water Due to Water Shortage