"INDUSTRIALIZATION OF ATHI RIVER TOWN"

BY

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other university.

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DEDICATION

In Memorium of

Jaduong' James Mireri

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Abstract.

The central theme of this study is to investigate which factors have been responsible for the current rate of industrialization in Athi River town and the socio-economic effects of these industries. Although Athi River town appears to have great potentials for industrial development, it is not known precisely which factors make the town attractive. While appreciating the benefits from industries the adverse effects will also be considered.

This study focuses on Athi River town and finds out that cheap, good industrial land, transport and market explains 77 percent of industrial location decision in the town. Raw materials and government incentives are found to be insignificant location factors.

The rate of industrial growth in Athi River town is 10 percent, which is much higher than the projected national growth rate of 6.4 percent. The employment growth rate in the town is 10.6 percent, which is more than twice the projected 4.4 percent (Sessional Paper No. 1 1986). These show that the town has great potentials for industrial development. The high growth rates of industrial development and employment will

create more job opportunities to Kenyans. Also, E.P.Z. is proposed in the town, which is a reflection of the town's favourable industrial location characteristics. E.P.Z. if implemented will boost the town's growth through infrastructure provision and employment creation.

The study further found out that, as a result of the explosive growth rate of the town inter alia, the town is characterised by haphazard growth. Further, the town lacks an upto-date plan to guide growth. The existing plan was prepared in 1970 although the town is experiencing marked change. The rate of infrastructure provision is lagging behind the town's growth. The disposal of industrial wastes is raising a lot of concern particularly from chloride Metal, Athi River Mining and East African Portland. This is a result of weak pollution control laws and the machinery to enforce them.

To harness the full industrial development potential of Athi River town will require proper planning and co-ordination of development activities.

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LIST OF ABBREVIATION.

1. DDC -District Development Committee.
2. EPZ -Export Processing Zone.
3. KMA -Kenya Association of Manufacturers.
4. KMC -Kenya Meat Commission.
5. MVA -Manufacturing Value Added.
6. NES -National Environment Secretariat.
7. UNEP -United Nations Environment Programme.
8. UNIDO -United Nations Industrial Development Organization.
9. WCE -World Commission on Environment.
10. LDC -Less Developed Countries.
11. GDP -Gross Domestic Product.

CHAPTER ONE.

1.1 INTRODUCTION.

1.2 Introduction.

A country's level of development is rated according to the extent to which it is industrialised (Roger, 1990). The more industrialised it is the more developed it is considered to be. Industrialization is considered as an engine of growth. Industry can strengthen agriculture for example by providing domestically produced inputs or alternatively by generating the foreign exchange to import these (Weiss, 1990). While industrial development brings about socio-economic development of an economy, the industries have adverse effects on the land use and environment. The damage caused to the environment may either be irreparable or too costly to correct. Industrialists being cost minimisers are reluctant to undertake environmental conservation as it is an expensive undertaking (U.N.E.P., 1989).

Kenya is a developing country with a fast growing labour force that is expected to reach 14 million people by the year 2000 (Sessional Paper No. 1 1986). Therefore, it is in dire need of more job opportunities to absorb it's large labour force. Sessional Paper No. 1 (1986) clearly specifies that industrialization must be soundly routed in the economic resources and needs of the country. In Kenya,

industrial sector contributes 27 percent to the G.D.P. and industrial growth rate is projected at 6.4 percent per annum. Employment in the modern sector is projected to grow at a rate of 4.4 percent per annum.

The experience of the developing countries shows that economic activities especially industrial activities, tend to be concentrated in one or a few urban areas with many economic advantages (U.N.I.D.O 1968). External economies and industrial agglomeration are important locational factors which, if unchecked, might well lead to the overwhelming concentration of industry in one or at most a few urban areas. These external economies are thought to stem from two or more sources: the availability of infrastructural facilities and interurban relations. The centres offer infrastructure, larger markets, higher levels of education, ease of contract with governmental bodies and managers of others.

The consequence of the above process is a problem of regional disparities which must be reduced as a legitimate and necessary objective of development. The main concern of development should not be the rate of economic growth but the social and economic price at which a given rate of growth is got (Allessie cited in U.N.E.P., 1989). Efforts to counteract the strong tendency towards industrial concentration should not be sudden but smooth and gradual and based on the

local conditions and availabilities and on national aspirations.

Smith (1971) argues that, with the pull of the market, externalities go a long way towards explaining the continuing concentration of manufacturing in the major metropolitan regions. A carefully developed industrial park in a small town can offer many services that a firm could expect to find in a metropolitan area. There has thus been some movement of industry from the inner city to nearby suburban communities and beyond to some smaller towns. The increasing spatial mobility of some critical inputs such as raw materials appears to widen the choice of location in many industries and expand the mobility of location decisions being made in grounds other than those of economics.

The provision of adequate infrastructural facilities is an important way of attracting industries to certain areas.In the Machakos District Development Plan (1989/93) the D.D.C. intends to place greater emphasis on building infrastructure that helps the private sector to create productive employment in towns. Sessional Paper no.1 (1986) states that supportive incentive structure is crucial to attract new investment. Development Plan (1989/93) also has it that investment allowances for rural based manufacturing projects will be maintained at 60% to

encourage investment in these areas.

Although Athi River town is classified under regions to benefit from the incentives, it enjoys special privileges because of its proximity to Nairobi, which is only 20km away. Athi River town has inherent advantages, which have enabled it to attract many industries: it is favoured by good communication network; abundant flat land and proximity to Nairobi.

Athi River town is traversed by the main Mombasa-Nairobi Road, the Great North Road, Kenya-Uganda Railway plus the existence of Jomo Kenyatta Airport, which is 20km away. These will continue to be catalysts for future industrial development in the town. This is primarily because of the important role that Nairobi will continue to play to its satellite towns like Kiambu, Limuru, Kikuyu, Thika, Ruiru and Athi River. Nairobi will continue to play a significant role as the main market and source of inputs for industries within it and those of satellite towns.

It is expected that with increased congestion in Nairobi's industrial area and high cost of land in Nairobi City, Athi River town will continue to offer an alternative preferred site for industrial development. This calls for proper planning and co-ordination of development to attract more industrial activities and minimize haphazard industrial

development in the town. Further, since E.P.Z. is proposed in Athi River town, proper planning of industries in the town will help in the integration with the zone. It is imperative that the advantages brought by E.P.Z. be enjoyed by the whole town.

1.3 Statement of the Problem.

Industrialization is one way through which socio-economic development of an economy can be realized (Roger, 1990). In Kenya industry ranks second to agriculture in importance with respect to G.D.P. The main concern of development should be the social and economic price at which a given rate of growth could be got.

In Kenya there has been a tendency towards industrial concentration in a few towns notably Nairobi and Mombasa (oral interview with Bithwetti, a Senior Industrial Development Officer). Such trends may in future lead to serious concentration of industrial activities. The Kenya government has been promoting industrial decentralization policy to industrialize other parts of Kenya (oral interview with Bhatia, an Adviser on E.P.Z. in Kenya). Athi River town, which is only 20km from Nairobi is also supposed to enjoy privileges accorded to all industries located outside Nairobi and Mombasa. With the inbuilt locational advantages, Athi River town is

emerging as a major industrial town.

This study seeks to identify which factors have been responsible for attracting industries to Athi River town and their scope for playing such roles in future. The study further examines the rate and nature of industrial growth in order to establish the ability of the town to industrialize and their socio-economic effects to the development of Kenya and Athi River town in particular. The provision of infrastructure should be taken as necessary measure to promote industrial development in high potential areas like Athi River town. Proper industrial development requires sound planning and co-ordination of development activities to minimize adverse industrial effects especially industrial pollution and haphazard industrial development.

1.4 Objectives of the study.

This study has the following as its main objectives:

(1) To examine locational factors, which have attracted industrial activities to Athi River town;

(2) to examine socio- economic effects of industrialization on the town; and

(3) to give suggestions for the orderly growth of the town.

1.5 Key questions that this study seeks to answer.

To achieve the above objectives the following key questions will be asked:

(a) Why is Athi River attractive for industrial development? and

(b) What are the socio-economic effects of industrialization to the town?

1.6 Assumptions of the study.

(a) That Athi River town has great potentials for industrial development.

(b) That through proper planning and development co-ordination, full potentials can be tapped with minimal adverse effects.

1.7 Justification of the study.

Industrialization process in Kenya concentrates in a few towns, predominantly, Nairobi and Mombasa. Nairobi's industrial area is increasingly becoming congested. The industrialists will benefit from locating industries in the neighbouring centres where they will still enjoy the privileges of proximity to Nairobi.

Once a definite knowledge of the potentials of Athi River town to industrialize can be developed, sound policy measures can then be developed to encourage industrialization of the town. It is important to appreciate the benefits which these

industries generate and therefore their future contribution. Although industrialization generates socio-economic development to the society the same has potential adverse effects, which can only be controlled through a proper understanding of the industrialization process. Therefore, it is of great importance to understand the dangers that these industries pose. A clear understanding of the nature and rate of industrialization will form a strong basis for proper planning and future development of the town.

1.8 Scope of the Study.

This study is primarily focused on the area within Athi River town and its environs. The study specifically examines the forces that have attracted the industries to Athi River town. It further examines the socio-economic effects of industrialization. However, it only deals with industries employing over fifteen (15) people. Although the study pays attention to the sources of raw materials, it is primarily concerned with activities in the factory; where they market their products and how/where they dispose of their wastes. Notwithstanding the provision for small and medium scale industries, because of the very nature of large industries, their requirements are normally enormous and their effects.

1.9.0 Research Methodology.

This study used both secondary and primary data. A reconnaissance survey was also conducted on the study area before the primary data collection.

1.9.1 Reconnaissance Survey.

A reconnaissance survey was conducted to familiarise the researcher with the study area. It was intended to establish the number and types of industries in Athi River town. It was also intended to identify authorities which would be important sources of both secondary and primary data. The relevant authorities were briefed on the ongoing research project. Also, appointments were made with the authorities for later primary data collection and consultation.

1.9.2 Secondary Data Collection.

Secondary data relevant to the research topic was collected from libraries, institutions and companies. Both published and unpublished literature proved useful. Collections or publications by University of Nairobi libraries, U.N.I.D.O., Ministry of Industry, Ministry of Lands and U.N.E.P. were very important in building secondary data base. Data collected from Athi River Town Council Office provided an understanding about industries in the town. The town council especially provided the number/types of

industries in the town and when they were established; and employment characteristics in the town. Mangat and Patel Consultants also provided data on employment and population expected from E.P.Z. and infrastructure development plans by E.P.Z. Authority.

1.9.3 Primary Data Collection.

Primary data was collected through questionnaires, interviews, discussions and observation. Photographs of the relevant physiographic features were taken. There are 29 industries out of which 5 were closed down at the time of this survey, therefore only 24 industries were operating then. The study covered 12 industries, which form 50 percent of the population. The 12 industries were arrived at because of the following reasons: given the inherent difficulties in securing permission from the industrialists to carry out a survey, enough time could not be found to study all the industries and 12 (50 percent) industries were considered representative of the population.

A stratified random sampling was used based on the type of industry as shown below. A stratified random sampling was considered suitable because it would ensure that all types of industries were sampled for the study. From each stratum a random sample was used to identify the 12 industries for this study. A

questionnaire was later administered to all the sampled industries.

Table 1 Sampling Frame

Industry type	total number	number sampled
mining	4	2
metal	5	3
textile & plastic	4	2
chemical	3	2
leather	2	1
food and oil	3	1
poultry	2	0
carpentry	1	1
total	24	12

Source: Field Survey 1991.

Physical observation of the production process of each of the sampled industries was carried out to appreciate the inputs and outputs of each factory and the general situation in each factory.

Index numbers were used to weigh the perception of industrialists about industrial location factors. The factors investigated were: industrial land, communication, market, raw materials and government policies. The factors were given indexes, which enabled the researcher to weight the factors as given by the respondents. The most important factor scored 5, followed by 4, 3, 2 and 0 respectively.

Data were obtained for annual production (Ksh) and employment, where possible for the first 3 years

of operation and for the last 10 years from 1980. Data on the major raw materials, their sources and proportion from each source region were collected.

Data on the main markets for the products and percentage share from each market region were collected. Those on the main forms of industrial wastes were collected in quantities of tones/cubic metres. Inputs and output sources/destination were investigated to determine industrial linkages.

Information on institutional policies and programmes on industrialization and environmental conservation to assess their adequacies in sustaining a healthy environment were collected from the relevant authorities.

The following key officers were interviewed:

(1) Bithwetti, a Senior Industrial Development Officer, Ministry of Industry. He provided information on government policies, strategies and programmes on industrialization in Kenya. He also gave an account of problems facing the industrial sector in Kenya.

(2) Bhatia, an Adviser on E.P.Z. in Kenya. He provided information on E.P.Z. more specifically on proposed E.P.Z. project in Athi River town.

(3) Wachira, the Machakos District Physical Planning Officer. She provided information on Athi River

town's planning situation and problems therein.

(4) Mwangi, a Chemist at the National Environment Secretariat. He provided information on the role of the Secretariat on industrial pollution management in Kenya.

(5) Mwake, a Consultant with U.N.I.D.O. He provided information on industrial development in Kenya, industrial pollution problems and industrial development planning.

(6) Kyatha, an accountant of Athi River Town Council. He gave data on the historical development of the town and the problems the town is facing. He also provided information on the council's policies, strategies and programmes on industrialization in the town.

1.10 Data Analysis.

The study makes use of both qualitative and quantitative analytical techniques. Statistical tools used are: statistic, time series analysis, index numbers, geometric projection and models. Mean, mode, median, percentages and tables proved useful in this study. Programmes used in data processing, analysis and presentation were: Lotus 1:2:3; Statistical Package for Social Scientists and Microstat

1.11 Limitations of the study.

It was not possible to quantify some aspects of effects of industrialization, namely, air, noise, heat and water pollution. This was because of lack of finance and technology. Equipments used in measuring air, noise, heat and water pollution are not readily available in Kenya. Similarly, expertise in such fields are equally lacking. In the absence of such equipments physical observation was considered appropriate.

Some industrialists refused to provide data on production. Therefore, analysis on production covered only the industries which provided data.

It was not possible to examine the effects of industrialization at the sources of raw materials. This was because of limited time and resources. Therefore the study covered the effects of industrialization beginning from the factory and beyond.

CHAPTER TWO.

2.1 LITERATURE REVIEW.

There is increasing awareness the world over concerning the questions of urbanisation, industrialization and environmental safety as exemplified by the literature below. High rates of urbanization and industrialization have resulted into haphazard urban development coupled with incongruent land use activities located next to each other.

2.2 Industrial Location Theory and it's Empirical Analysis.

Smith (1971) argues that it will be practically difficult to find (costly to purchase) land in and around big cities where underdeveloped land is scarce and competition from other users is strong. Many existing firms in urban areas have less space than they need and expansion may be economically impossible. Also it may be prevented by land use zoning laws.

Capital can be obtained in any location, if a high return is offered. Most individual buildings are for practical purposes perfectly immobile. Materials are not easily spread over the earth's surface. Their distribution is a major determinant of plant location. The expenditure incurred in acquiring materials involves both the cost of extraction or production

and the cost of transporting them to the factory.

The historical tendency has been for sources of power and labour to play a steadily decreasing role in industrial location. The large concentrated and somewhat affluent body of consumers found around the city with its large industrial market is the reason for somewhat rapid industrial growth in and around the major urban areas. Transportation is often considered to be the most important single determinant of plant location.

Cooper (1975) notes that physical factors such as raw materials or transport facilities are more ubiquitous now than they perhaps were in the past given the massive investment in infrastructures common to most industrialised countries and that government incentives and planning controls may assume a given importance to the decision maker as a result of this.

Hoover (cited in Cooper 1975) showed that transport costs tend to encourage firms to locate either at raw material sources or at the market centres and tend to discourage intermediate locations unless favourable rate structures can be negotiated. Firms will locate where they can tap the largest market potential even though transport costs may be higher than at the least transportation solution.

Eastern Province Regional Development Plan (1970) notes that Athi River town is the only truly

industrial town in Eastern Province. This position is likely to be maintained in future with increasing numbers in the manufacturing sector. As an industrial outpost of Nairobi with excellent road connections, this town offers ideal conditions for small firms, which while wanting to partake of the advantages of the big city, cannot afford the high rent and land costs. The land at Athi River is ideally flat and well serviced except water, which might pose a long term problem.

Athi River is a major industrial town in Kenya. It has well over 10 industries, which include inter alia: East African Portland Co., Kenya Meat Commission, NOVA Chemicals, Chloride Metal and Athi River Mining. Some of these industries are serious polluters of the environment

Stuart (1976) argues that employment represents a useful unit of measurement for requirement for land development. Employment forecasts may be used to provide information crucial to understanding population trends. Adolwa (1985) argues that before the establishment of Pan Paper Mill the tiny market's growth was mainly based on agricultural activities in its immediate hinterland. Economically the growth of Webuye town was slow and did not represent any characteristic that would have made its growth different from that of others.

Ogendo (1969) defines industrial town as that: (i) with 4000 habitants at least, 3000 of whom were adults (1962). (ii) with approximately 100 manufacturing operatives employed in mechanized factories each factory employing 5 or more operatives. At least a total of 100 of the operatives must be employed in establishments processing or fabricating raw materials. (iii) located either on the railway network or in an area of either high or medium road density.

Isard et al. (1969) argues that in such problems where conflicts of interests arise, solutions have generally been considered indeterminate in the sense that certain joint location decisions, which qualify as solutions favour some participants while other decisions favour other participants. We assume that each economic activity requires certain inputs which must be delivered from sources to the activity site. Outputs must also be delivered from there to destinations namely the consumption points. If the market area is fixed, this will decide the extent of the location space.

Weberian location games (cited in Isard et al 1969): talks of the, grouping together of various production processes in the space to realize various "agglomeration economies." The most important of these are: (a) the economies realized when a facility

required to be next to production point can be more fully employed through the common use; (b) scale economies when by common use the capacity can be greater; and (c) other localization and urbanization economies especially when technically related activities are spatially juxtaposed.

U.N.I.D.O. (1968) observes that a decision on where to locate an industrial project could be as crucial to its impact on the development of the country and its regions as the very decision to undertake a project itself. The existence of agglomeration economies and savings in transport costs had made individual projects less costly in the cities. Lack of transportation in the hinterland is the main problem in regional development. The provision of infrastructure was the most important means to attract industries to an area.

There are three main successive stages of location analysis: interregional, sectoral and intra-regional. At the first two stages attention should be paid mainly to natural resources, environmental conditions (source of power, raw materials and the like), transport, the distribution and characteristics of population and the general development of every region. At the third stage such local factors as infrastructure, specific labour skills and the existence of production facilities and of related

activities and services play a crucial role.

In most developing countries the prevailing tendency had been for industry to concentrate in the metropolitan areas leaving the periphery untouched. Social concern is related to the need to move away from this centre-periphery model. Policy measures to slow the trend toward concentration, both by preventing the establishment of more industry in the developed areas and stimulating new investments into lagging areas have been adopted.

Japanese regional policy, is designed to stimulate the development of "city regions. " The elements of the policy include the establishment of new industries and commercial centres near the large metropolitan agglomerations, the creation of economic activity in less developed regions to deter migration towards the centres, the creation of industrial employment opportunities in rural areas to lessen migration from them.

Townroe (1976) argues that the planners are generally guilty of dealing with industry from an inadequate theoretical basis, which means that the outcome of their proposals are often highly unpredictable. Unwarranted assumptions are frequently made concerning the mobility of industry and the extent to which locational choice can be sensibly manipulated in the interests of public policy.

The advantages of moving industries away from the city are: (1) the possibility of lower rent and rates for premises, taking particular consideration of any relevant government incentives. (2) the extra cost of in site expansion compared with expansion on a new site. (3) reduced traffic congestion, which would mean speedier access, faster turn round, use of larger vehicles and provision for staff car parking. and (4) the proximity to existing and potential markets. (5) proximity to key suppliers, (6) benefits of the full range of government incentives available in the new location.

The four factors, which will dominate the choice of regions. (1) the government's regional policy - incentives like tax allowance, financial assistance, infrastructure provision and their duration in operation. (2) Strategic communication is to try to identify the transportation and communication requirement of the new plant. (3) labour relations (4) markets were a dominant reason for moving, it is the outstanding reason for moving.

Locational incentives offered in Denmark are: loans to industrial undertaking at a rate of interest below market level. Payment by instalments may be suspended for upto five years. Industrial buildings for lease or purchase are put up by the government. In special development regions grants of upto 25 percent

of the cost of the investment are also offered. In West Germany, 12 areas and 19 towns in strategic positions along the eastern border areas, an investment subsidy of upto 20 percent is available. In all other main areas, an investment subsidy of upto 15 percent is available.

Hamilton (1979) observes that research on industrial systems should be concerned with both the location of individual units and with specific groups or types of units, the magnitude of their operation, which can be measured considering employment and production. The spatial structure of manufacturing is a complex of potential possibilities for the spatial realization of production technologies and organizational linkages offered by the location and the association of spatial elements and the subsystems- plants, industrial centres, agglomeration and regions.

The study of that structure involves the investigation of: (a) the position of the elements or subsystems along particular co-ordinates, (b) spatial interrelationships, (c) the degree of concentration of elements and subsystems, and (d) the distribution pattern of the elements and subsystems in space. The practical side weakness of Weber's location model is the difficulty of accurately measuring the variables and parameters involved especially those of

agglomeration and industrial linkage. Weber's model fails to capture broader interdependencies such as the impact of industrial location on local employment prospects, levels of living and environmental quality.

Soderman (1975) says that the idea of location will have two meanings: (a) the act or process of localization conducted by individual actors in the company and geographical position. It has been proved that profitability or productivity of a plant is dependent on its geographical location. Since a location decision is made very rarely, the lack of relevant experience greatly affects the type and quality of the decisions made. Location decision is only one array of decisions that it is low programmed ill-structured and difficult to validate.

Weber (cited in Soderman 1975) used a priori model of a single firm in a perfect market, a firm can react optimally to locational factors with the aim of cost minimization. Weber himself did not formulate the problem in the framework of economic theory but instead showed it considering a physical analogy as a problem of the resolutions of various location pulls or forces. The behavioral approach developed as the culmination of some tendencies: empirically assumptions of perfect knowledge are obviously unrealistic when ideas of distance are introduced. It became necessary to consider the possibility of

locational strategies not subject to the automatic determination of a perfectly competitive market.

Healey (1989) notes that the role played by E.P.Z. in promoting industrialization in the L.D.C. has always been a controversial topic. Experience in many countries in particular in East and S.E. Asia has shown that such zones can contribute mostly to the generation and promotion of exports of manufactured goods and provision of productive employment opportunities. They have more often than not been characterised by a concentration on only a few branches, by using simple and fragmented production technology and by a lack of backward linkages with the domestic economy. Many micro-level factors have been crucial including the location of E.P.Z., the available infrastructure and the efficiency of their administration.

The advantages of locating in an industrial estate: all the enterprises located in industrial estates enjoy preferential advantages. Plant sites can be easily purchased or leased at considerably lower prices than in any other area. Further, various support facilities and services are provided, including a full range of infrastructure. The zone function as a bonded warehouse where the implementation of laws and regulations pertinent to foreign investment, which are normally applied

elsewhere are waived or relaxed.

U.N.I.D.O. (1984) says that priority development centres should be identified in each economic region to concentrate than thinly disperse resources for development. Such centres should be developed on a programmed basis with the necessary infrastructure and social amenities. Investment promotion should be strengthened to attract export oriented foreign investment in rural areas and special and adequate financial and fiscal incentives be granted to such investors to compensate them for extra cost incurred in setting up industries in outlying locations. Workers' housing be constructed by municipal authorities or granting of special credits to investors to build such housing to promote investment in rural areas. An indepth and adequate survey be made to identify the potential for forward and backward linkages operation through the subcontracting from the medium and large firms and promote projects in suitable regions.

U.N.I.D.O. (1985) argues that industrialization process is only 200 years old, starting from industrial revolution in Britain in the 1770s. The prime mover has always been technological innovation. In the tropical Africa the rate of growth in the manufacturing value added plummeted from 10.6 percent in 1980 to 1.5 percent in 1981. The big influence of

a few branches changes reflects the very small industrial base in Africa. At any rate the slow growth of only 1.5 percent in 1981 suggested that Africa was not immune to the impact of world recession.

U.N.I.D.O. (1985) notes that the degree of industrialization got by a given country can be measured by the share of M.V.A. in total income in that country. In the developing countries there is a tendency towards chronic underutilization of industrial capacity. In Tanzania for example the rapid build-up of heavy industries reflects decisions to instill capacity of the manufacturing of intermediate products. A major factor in the fall of M.V.A. in Tanzania has been recurring foreign exchange shortages, occasioned in part by the fall in coffee prices. This has led to shortages of imported parts and inputs and in turn very low levels of capacity utilization.

Industry and Development (No.15 1985) says that the manufacturing production can be identified as remaining firmly centred around the Dar es Salaam and Coast Region for such establishments in 1968 and 1974. In recent years the eradication of abject poverty in the L.D.C. has been a prime focus of the concerted efforts at both the national and in the international level. The fundamental solution to urban poverty is through the creation of productive employment. The

crucial contribution of industry to urban employment generation stems not only from its direct employment effect but more importantly from its combined indirect income induced effects through its extensive linkages with the various sectors of the urban economy and particularly the service sector through an increasing demand for urban services as per capita income increase.

It has been contended that employment growth has not only been lagging behind output expansion in the industrial sector but also the rate of labour absorption in the industrial sector fall behind the growth rate of the urban population. It has been further argued that industrial output expansion and employment creation have not been commensurate with the preponderance of resources allocated to industry and the industry has tended to impede the development of other sectors of the economy and therefore their capacity to generate employment by pre-emptying the scarce foreign exchange. The fundamental issue emerging is whether for every worker employed in the manufacturing sector there may be a multiple expansion of employment in commerce, construction, transportation and service through a network of forward and backward linkages between manufacturing and services.

Chapman (1991) notes that pull factors favouring

the suburbs, are in many respects, mirror-images of the push factors affecting the core. Thus the peripheral industrial land use planning policy, offer modern facilities with opportunities for more extensive factory layout on cheaper land, pleasant working environments and better access to intra and inter-urban motorways.

Studies by Weber, Smith, Hoover, Isard, Keeble, Townroe, Cooper and others have been conducted mainly in the developed world especially Europe. These studies focused on location factors especially: land, market, transport, raw materials and others. Athi River town study will show an interplay of industrial location factors in a developing world and provide a base for comparison with experiences of the developed world. Researches conducted by U.N.I.D.O. have been rather comprehensive in scope and cover both the developed and developing world. Because their area of research is quite large, researches carried out by U.N.I.D.O. in Kenya have been limited necessitating further research.

2.3 Industry and Environment.

Kyalo (1985) notes that Athi River has good communication, proximity to a large market, availability of ample space, which is also somewhat cheaply available, cheap labour, industrial linkage

and industrial interdependence all seem to play a major role in influencing the location of most industries in Athi River town. Kenya Meat Commission and East African Portland lack sound and proper environmental protection policies and their operation have continued to negatively affect land, water and air the basic natural resources for human survival.

The future of our resources and therefore our environment is threatened. The future of our resources depend on a careful and a well co-ordinated effort by all parties concerned to come up with proper guidelines as part of national policies on environmental protection. He noted that all efforts must be put on the cement factory to minimise dust to acceptable limits. Lorries and trucks carrying kun kur mineral from Lukenya should be rerouted to the old Mombasa Road. Possibility of use of railways, landscaping and revegetation should be looked into.

Anderson (1964) states that man-made conditions that raise social and economic standards and threaten human existence and foul natural resources. He points out that there has been a lag between the recognition of emergence of environmental problems and adoption of good laws to control and prevent the problem. He further points out that prevailing meteorological conditions may enable disaster to occur and the basic cultural design of the area includes more than the

existing industrial pattern. He explors the proper role of air resource management, which involves its relationship to planning elements such as land, water resources, transportation, waste disposal and other community facilities all of which form important elements of comprehensive metropolitan.

Yahya (1985) argues that industrial activity is a major factor threatening the quality of the environment. He therefore commended the role of environmental impact assessment at the decision making stage where serious environmental damage can be avoided or minimised.

U.N.E.P. (1979) states that there is an ongoing environmental degradation causing deterioration in the quality of life now and in the future. There is now a campaign for changes in lifestyle with the greater use of renewable sources of energy, less waste, recycling, nature conservation, limits on the pollution and population planning.

U.N.E.P. (1989) advocates for waste minimization through the preservation of low and non waste, technologies, which has now received world-wide acceptance. The report brought out reasons why investors do not use environmentally sound technologies including: insufficient awareness of the environmental effects of production process, lack of true understanding of the true costs of waste

management, lack of access to technical advice, insufficient knowledge of new technologies, lack of financial resources and simply lack of management inertia and resistance to change. Allessie (1989) states that the long term objective of Dutch Government policy is sustainable development. This is a process of development, which meets the requirements of present generation without endangering the requirements of the future generation.

U.N.I.D.O. (1990) observes that in recent years world-wide attention has been focused on environmental degradation as an issue of crucial importance to the survival of mankind and a major area for international co-operation. Environmental degradation continues unabated as the global environment is constantly bombarded on all fronts by impure air, contaminated water, oil spills, toxic wastes, and acid rain, global warming, thinning of ozone layer, desertification, deforestation and soil erosion. The pressing global issues of population, natural resources, environment and economic development are closely interlinked. Industrial pollution need to be considered in the context of the interaction among these issues.

The impact of industrial development on natural resources must be considered seriously. The total amount of water is constant, 97 percent is sea water, of the remaining 3 percent slightly over 20 percent is

underground water. Agriculture, industry and domestic users compete for 1 percent of fresh water. The industries use raw materials, which are either renewable or non-renewable, finite or limited.

Bidwell (1989) calls for a flexible system of control, environmental planning as a priority emphasis on waste management among others. Hall (1990) says that neoclassical economics argues implicitly for the destruction of many existing non-market economics, since the services of ecosystems are rarely reflected in the market forces.

Abler (1977) observes that if a factory decides to locate down town than in an industrial suburb, it adds to rush hour traffic, slowing everybody down. If the factory makes a noise or a smell, it may disturb people in scrambled downtown than out in a large suburban tract. Neil (1974) argues that the desirability of economic growth must be weighed against the desirability of other good things that must be given up. Is it necessary for us to sacrifice our environment to get economic growth? Most people see the only solution of this socio-environmental problem connected with growth as slowing economic growth or stopping it altogether. He rejects a situation where environmental quality is elevated to a level which kills growth.

Ndogoni (1990) says that in Limuru it is evident

that the major source of air pollution is Bata Shoe Industry so considering its location and the pattern of wind movement we realize that the residential areas to the east and north-west are exposed to the highest level of pollution and more so those in proximity to the industry. The people residing in those areas associate various respiratory diseases, rusting of roofing iron sheets and drying of trees to pollution from industries.

Competition for space in the town was initially concentrated along the main transportation network. As the industries attracted more activities, buildings were concentrated right next to the industries causing major conflicting land uses.

He proposed guidelines for land use control: (1) current zoning regulations must be enforced on any land use in the urban areas, (2) all industries that emit toxic wastes should be located away from residential areas, (3) land use planning in urban areas should be comprehensive enough to cover necessities such as recreational parks, public toilets and schools.

Omondi (1984) argues that the continued use of Kenya's national parks and game reserves, which provide the last refuge for wildlife is now threatened by the changes in the land use in the adjacent areas. Now virgin lands in the adjacent areas of these nature

reserves all over the country are brought under intensive agricultural activities, urban development, industrial expansion and others. There should be constant evaluation and monitoring of changes in land use and effects on wildlife, vegetation, water resources and other land uses in the short term and long-term basis.

Atkinson (1982) states that the major national economic goals are: full employment; price stability; rapid economic growth; fair and equitable distribution of income; a safe and clean environment and a proper mix of goods and services. Byrns (1981) says that economic growth refers to quantitative changes in the capacity to produce goods and services in a country. Economic development refers to improving the qualitative aspects of economic growth including changes in the quality of life. Economic growth occurs through expanding capital or labour resources or discovering new sources of raw materials or technologies. Walter (975) observes that economic growth is generally thought of as unidimensional and is measured by increases in income. Economic development involves structural and functional changes.

Studies on industrialization have been concerned with only certain aspects of industrialization at each time and location. Therefore a comprehensive

understanding of industrialization either in Kenya as a whole or a particular town/region has been lacking. These researches have been looking at aspects such as location factors, social or economic effects of industrialization and environment.

The only major study on Athi River town was carried out by Kyalo (1985). He did a study on environmental impact of two industries (K.M.C. and East African Portland) on the town. The ongoing study focuses on industrial location factors and socio-economic effects of industrialization. A proper understanding of potentials for industrial development in the town can help in planning and development in the town.

2.4 Industrial Development Policy in Kenya.

Ministry of Industry (1980) states industrial development policy objectives in Kenya as:

(1) industry should provide higher employment opportunities and should therefore aim at creating various levels of jobs for the people of this country, (2) industrial dispersion to all parts of Kenya will be a prominent feature of future policy, (3) maximum efforts will be made to optimize utilization of local resources, which have development factor for the economy, (4) systematic training for Kenyanization and industrialization in general will therefore be pursued

as a matter of urgency.

Sessional Paper No.1 of 1986 states that industry must be restructured to become more productive and attain rapid growth, must help expand and diversify Kenya's export base and create jobs at a rate exceeding 4 percent a year. The aim of locating industries in rural areas and the smaller cities of Kenya is an important element in realizing rural urban balance. Ultimately the best incentive for the development of rural based industry is a prosperous agriculture and no tax-based incentive without agricultural growth.

Yet to give an additional boost to rural investment, the 1985/86 Finance Act raised the investment deduction from 20 to 50 percent: for new industries locating outside Nairobi and Mombasa. They receive a total deduction equal to 50 percent of the cost of the plant and equipment thus reducing income taxes in the early years of a project. This allowance when discounted over the life of an investment is equivalent to a subsidy of about 10 percent of the initial cost of an investment under typical circumstances.

Development Plan (1979/83) states that the manufacturing sector ranks second to agriculture in importance to our economy. The sector will become important considering the use of resources,

production, employment and export earning. The rate of growth of the sector between 1972/79 was 10.5 percent a year about twice as high as the rate of growth of the whole economy. In 1977 it employed 118,000 people, which was 13.1 percent of the total wage employment in the economy. It will be looked upon as a major source of employment for the urban and rural population. This implies fuller utilization of the plant capacity, better use of local resources and the application of the most efficient management practices. Development Plan (1989/93) states that the government intends to guide private sector investment to areas of the highest productivity. To meet this objective taxes, prices, wages, interest rates, profits and trade and traffic policies will be restructured and rationalised. Modern sector is expected to grow at 4 percent per annum, employment in the manufacturing sector alone is projected to grow at 4.6 percent per annum rising from 177,000 (1988) to 222,000 by 1993. The government removed price controls on a broad range of commodities to allow market forces to figure out cost-price relationships in the economy. Specifically investment allowances for rural based manufacturing projects will be maintained at 60 percent to encourage investment in these areas.

Export Processing Zone (E.P.Z.) comprises an earmarked area: either near an airport or seaport

provided with various physical communication and service facilities and customs offices. The entire production from the zone remains strictly for export market.

Industrial Review (April, 1989) says that the current plan outlines four broad objectives of industrial development: employment creation, export of manufactured goods, growth of the economy and an actual diversification of the economy's base from agriculture. The Sessional Paper No.1 of 1986 had set out development goals some of which are: creation of productive employment for the ever-expanding labour force, furtherance of rural urban balance, increased productivity in the industrial sector and greater participation of the private sector in development activities.

Industry and Development (No. 17,1986) observes that upon gaining their independence African countries were not sufficiently industrialized to any large degree. The infrastructure and industrial tradition, which play a fundamental role in the industrialization process were generally absent and agriculture and mining were not organized to serve as a stable base for industrial processing. The decision to industrialize after independence was taken on the basic recognition that industry would be the necessary engine for long-term socio-economic growth and would

enable the achievement of increasing economic independence. It has become evident that many investments undertaken in the industrial sector were insufficiently integrated within the national economy and thus with the general development. So linkages between industrial development and the whole economy remained weak.

Industrial Development Series (Feb, 1985) notes that simlarly the Zambian economy the manufacturing sector can play two important roles: it can absorb a large proportion of labour force released from the contracting mining industry, secondly it can help in the diversification of the export portfolio. The manufacturing sector grew rapidly after independence. During 1964/65 it got an annual growth rate of about 15% but stagnated after that. Currently the manufacturing sector accounts for 11 percent of total wage employment over the past years the government has been moving away from direct control.

K.A.M. (1988) states that the basic and the most important requirement for industrial development is an infrastructure, which includes reliable water, electricity, all-weather roads with close connection to the national network, telecommunications and a viable residential area. In addition adequate schools and medical facilities are required before rural industries can develop and prosper. Government

officers have failed to realize that consistent follow-up in the implementation of industrial development policies is also important.

K.A.M. noted that the government should get land for legitimate industrial uses, which are beneficial to the area concerned. The difficulty and near impossibility is to get a suitable land in a suitable location. Kenya's industrial underutilized capacity is 40 percent.

Government policies on industrialization have been rather general, lacking details on various policies proposed and specific areas/regions. The existing data on industrialization in Kenya are outdated, disjointed and general. These make it very difficult for any concrete proposals for industrial development to be made on specific areas. As for Athi River town there are no government documents to provide data on the industrial sector as a whole. Government policies have failed to give serious attention to industrial development. The government has been unable to carry out feasibility studies on areas with potentials for industrial development. That kind of data base would form a strong basis for industrial development planning in those areas. Hence there is great need for further research to facilitate a better understanding of the industrial sector.

2.5 The Theoretical Framework.

The relative importance of different causal factors varies in space and through time as well as between industries and individual firms. At the outset the purpose of location theory is to explain why a particular causal factor is important to an industry and not to another. There is considerable evidence from Western Europe and North America to suggest that the importance of access to raw materials is being reduced (Smith 1971). That has been accompanied by the increasing importance of market.

The major inputs in the production are: land, capital, materials and power, labour, state and local taxes and enterprise. The cost of land varies considerably from place to place and the geographical pattern that it adopts is often quite complex. It is often a major item in the initial expenditure involved in setting up a factory.

Obtaining capital is generally no problem for the large modern industrial corporation whose activities are financed from both internal and external sources. Materials vary enormously in such aspects as bulk, weight and perishability and some need special means of transport as well as handling and storage. Materials are not evenly spread over the earths surface so their distribution is a major determinant of plant location. The historical tendency has been

for power to play a steadily decreasing role in the industrial location, since electricity has replaced the less mobile water and steam power.

Any geographical variation in the rates of taxation will affect a firm's total outlay and may thus exercise some influence on the locational decision. State and local taxes are thus generally a relatively unimportant influence on industrial location. The large, concentrated and relatively affluent body of consumers found in the city together with its large industrial market is certainly one of the major reasons for relatively rapid industrial growth around the major urban areas. Some industries are market oriented.

Transportation is often considered to be the most important single determinant of plant location. Transportation plays a vital role in connecting the factory with the rest of the economic system, making possible the movement of raw materials, energy, labour and finished products. An entrepreneur will only tend to economize on transportation if freight costs comprise a large part of total cost.

Factors which have been identified for study which also feature prominently in the literature above are: land, market, communication, raw materials and government policies. The study will come out with the order of importance of these location factors to see

if the changing relative importance of the location factors in the developed world has any bearing on local situation. Also, to see whether the influence of location factors have been important in industrialization in Athi River.

Development Plan 1979/83 says that the manufacturing sector will become important in terms of use of resources, production, employment, and export earning. Sessional Paper No. 1, 1986 set out development goals as: furtherance of rural urban balance to ensure equitable distribution of the fruits of independence, increased productivity in the industrial sector and creation of productive employment. Specific measures should be taken towards efficient utilization of the existing industrial production capacities. It is of interest to see how far industrialization in Athi River town has gone in meeting the national objectives of employment creation, production and the projected growth rates in the sector.

Although industries promote development, they also threaten the environment on which man continues to depend for survival. World attention has been focused on environmental conservation as highlighted in the above literature review. Industries are major sources of environmental degradation. But developing countries including Kenya have not taken the necessary

measures to conserve the environment.

2.6 Conceptual Framework.

Industrialization of a town is influenced by the favourable location factors therein. Athi River town appears to have great potentials for industrial growth but little has been known about the factors that have been responsible for the current levels of industrialization. This study seeks to establish which factors influences industrialization in Athi River town. The following factors have been identified for study: land, market, communication, raw materials and government policies. This information is important in planning for future industrial development in so far as such factors will help in the future industrialization in the town.

Industrialization has both positive and negative effects. Industries should generate productive employment and rising output. The study examines contribution of industrial sector to: employment, production, effects of industrialization on infrastructure provision and potential impact of E.P.Z. on the town. Industrial growth helps in showing the future rate of industrialization and therefore their effects. Industrialization put strain on the existing infrastructure and therefore the provision of

the same.

Although industries contribute to the development of a society, they too pose potential threat to the environment. Industrialization threaten the environment at three levels: (a) in the factory where workers are exposed to pollutants; (b) in the neighbourhood of the factory where residents are exposed to the pollutants and (c) at any other level where man or the general ecosystem is contaminated by wastes generated from the industries. Therefore industrial pollution will be examined at these levels shown above. In the pursuit to industrialize there is need to consider the potential dangers from various industries in order to keep their effects at low levels. Figure 1 below shows a summary of the conceptual framework.

Industrial Development.

Favourable Location Factors

Attract Industries

Adverse effects
(1) Industrial Pollution
(2) Strain Existing Infrastructure

Benefits
(1) Employment
(2) Production
(3) Physical Growth of the town

Enhance greater

to achieve proper industrial development

Help minimise

(1) Upto date plan
(2) Strong development control & co-ordination
(3) Provision of infrastructure
(4) Proper pollution control

Figure 1

Source: Author 1992

CHAPTER THREE.

3.1 BACKGROUND OF THE STUDY AREA.

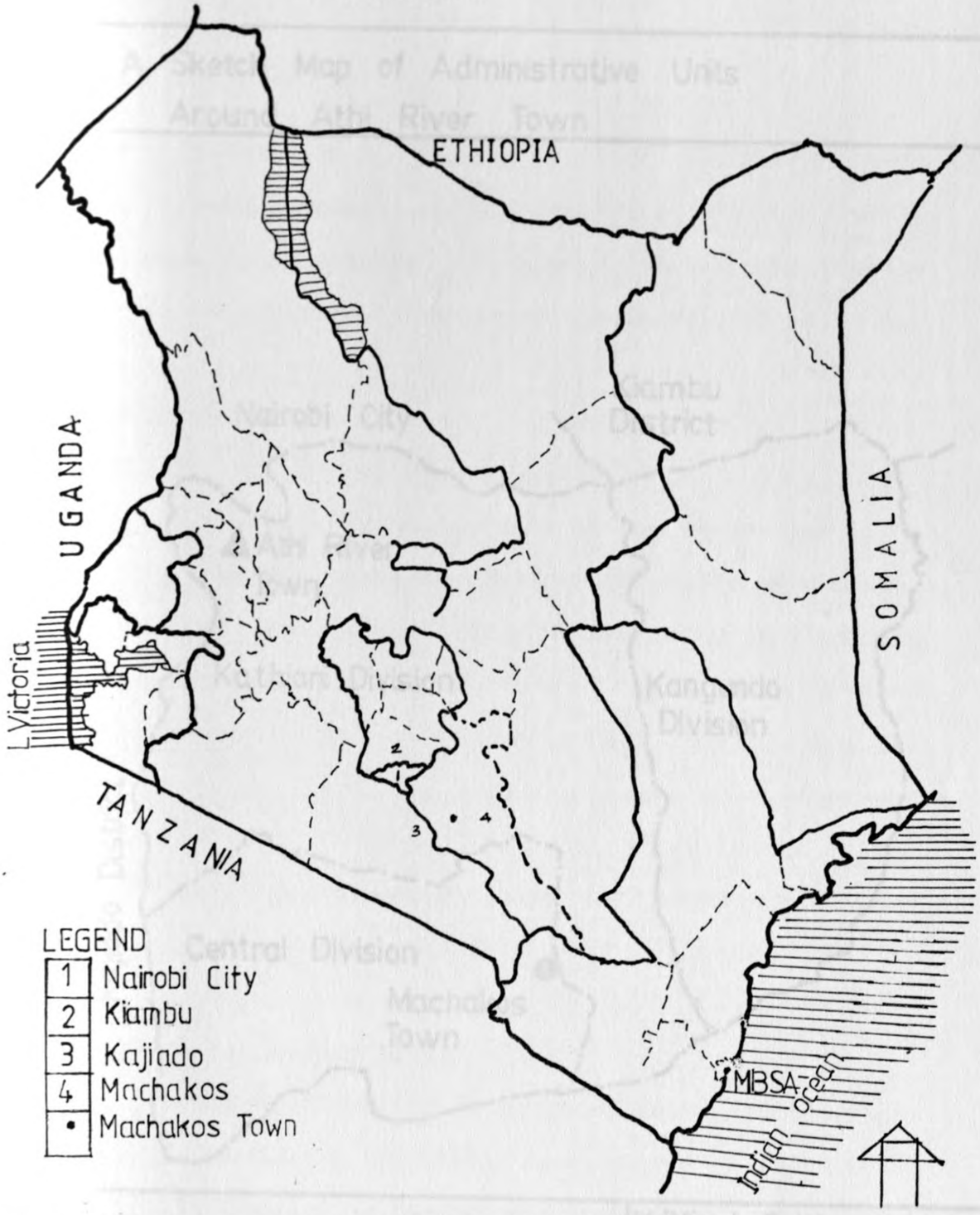
This chapter examines the location, physical background, demographic, resource potential of the study area and the general growth of the town as they relate to industrial development.

3.2 Location of Athi River town.

Athi River town is situated in Kathiani Division of Machakos District. It is located at the North-western most end of Machakos District. The town is bordered by Nairobi City to the North, Nairobi National Park to the North-West and Kajiado District to the West. On the side of Machakos District, the town is bordered by Central Division to the South and Kangundo Division to the East. Athi River town is 330 km^2 large extending to the borders of Nairobi City, Kajiado District and almost engulfing the National Park. The town is located on the Athi Kapiti Plains and the altitude of the township is about 1600m above sea level.

Athi River town is traversed by the Kenya-Uganda Railway and international trunk roads namely the Great North Road and Nairobi-Mombasa Road. Nairobi-Mombasa Road links the town with Nairobi City, Mombasa Port and Machakos town, among others.

THE STUDY AREA NATIONAL CONTEXT



Map 1

Source: Machakos District Development Distric Plan 1989/93

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A Sketch Map of Administrative Units
Around Athi River Town

Map 2

Source: Author 1992

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The Great North Road links the township with Kitengela, Kajiado, and Namanga towns. Namanga town is at the border between Kenya and Tanzania. Map 1 below shows the national context of the study area while map 2 below shows the administrative units around Athi River town.

3.3.0 The Physical Background of the Study Area.

The most striking physiographic unit of Machakos District is a series of hill masses at the centre between the Athi-Kapiti Plains in the North Western and Yatta Plateau in the North East. Notable are the Mua Hills, Iveti and Kangundo massifs of basement complex rock. These hills at the central parts of the district are catchment areas for many springs and streams in the district.

3.3.1 Geology and Soils.

Machakos District is occupied mainly by basement rocks which are generally considered to be of an Archaean age. This system was formed by a stratified succession originally sedimentary rock, which have been metamorphosed and some granitized to a greater extent. The rocks are mainly gneiss, schists, granite and crystalline limestone and are known to contain the high grade index mineral sillimate (Wachira 1977). The end cretaceous and submiocene peneplain stand at a

height of over 1800m and 1500-1800m respectively, were recognised in the area by Schoeman (1948), Batter (1954), and others. In the early miocene times crucial disturbances caused great outpouring of phonolite lava (the Kapiti plains), which now covers the submiocene peneplain in western parts of the area.

Rivers in the eastern part of the area, which do not receive supply of water from basement rocks show intermittent flow. Experience has it that boreholes sited in the volcanic areas are more successful than those sited in basement rock.

Athi River town area predominantly comprises tertiary rocks (Ngong volcanic) overlying precambrian basement rocks, which are exposed in a small area in upper reaches of the Kitengela river. In the north, from Nairobi National Park and eastward are the Nairobi phonolite; in the west are the Mbagathi phonolite trachyte and the east are Athi Tuff.

Rock basement is usually very important in providing strong foundations for buildings. In Athi River town, however the rock basement in most of the town is in the deep parts of the soil so for construction purposes, particularly for industrial and residential buildings, a lot of soil has to be removed to reach a strong basement, which support these structures (Kyalo 1985). This causes high construction costs and a lot of soil, which has to be transported

to a safe place for dumping.

Dark soils characterise most parts of the industrial area in Athi River town. These are classified as dark brown calcareous clays with light textured top soils. When dry the clay fractures to form deep crucks, when wet the clay soil is very sticky plastic and has very poor drainage qualities. The soil type does not form a strong base for foundation for industrial premises. To put up a strong building will require scooping off a lot of top soil.

Yellow-brown soils show up as a thin band between the dark soils north of Athi River Valley opening to large areas along tributaries of Athi River and Kitengela rivers. This is where East African Portland Co. is and it is the area where originally the cement factory used to obtain kun kur mineral. The resource is not exhausted and the quarry can be revitalized in case the other quarries become exhausted (Kyalo 1985).

3.3.2 Climate.

Rainfall amounts and reliability are very important factors in determining the types of activities suited to an area. The higher areas except for Chyulu hills receive well over 750mm of rain. The rainfall amounts received in the district vary from 1250mm in the higher areas of central masses to well below 500mm in the lower areas. About a third of the

area of the district receive rainfall of over 750mm, while about a quarter of the area receive rainfall less than 500mm. This well endowed zone correspond to the high potential zone for forestry, agriculture and intensive grazing. The medium zone, which is about a half the total area embraces the medium potential areas where agriculture is the dominant activity in some parts and livestock in other parts of the zone. The areas receiving less than 500mm are marginal. The effectiveness of rainfall in some zones is limited by the poor shallow soils caused by soil erosion.

The rain falls twice a year in all parts of the district. The first rainy season is between March and May and the second is between October and December. The rest of the six months receive little or no rain. During the long rains the highest recorded rains was in the month of April, which was 150mm of rainfall.

These rains are preceded by two dry spells when the sun is very hot with generally strong, occasional winds. The driest period falls between the months of August to September and have occasional drought in January and February. The variation between maximum and minimum rainfall is marked, for example, Mbooni area has rainfall of 242mm in November but only 10.10mm in June. This shows that a higher amount of rain fall in a very short time causing torrential rainfall and so floods in rivers. The seasonality of

the rainfall in the district means that a high runoff in the rivers will occur during wet season followed by very low flow during the dry season.

The short wet season is not enough for the growing of some crops, which take long to mature. This limits the number of crops that can be grown in such circumstances. On the other hand, the maximus can be useful in roof water harvesting and store for use during the dry spells. This may further call for development of dams along the major rivers to store the runoff during the rainy season for use during the dry season.

Machakos District falls within the zone of arid and semi-arid lands, it is an area characterised by extreme variability of rainfall. Typically good seasons are interspersed with extremely dry periods and variations in the rainy seasons add to the difficulty of ensuring adequate crop production.

Generally higher temperatures are experienced in the lower parts of the district, whilst the hill masses experience somewhat lower temperatures. The mean monthly maximum temperatures range between 23-28^{0}c. The later being the highest recorded and these fall within the months of February/ March and September/October. The mean monthly minimum temperature range between 11 and 15^{0}c. The lowest being the former having been recorded between the months of

June/July.

High temperatures and seasonal rainfall are responsible for intermittent streams, which generally characterises the whole district. Also, excessive temperatures such as those recorded in the southern part of the district create water shortages during the dry period and reduce the moisture available for vegetation. So development in such areas is interfered with.

Wind blow from the Indian ocean in the south-west direction from November to May across the township. A dry wind blow from the north mainly during May to October. But no data exists on detailed understanding of wind flow characteristics.

3.3.3 Drainage Systems.

The general drainage pattern is from west to east. Most of the streams flow during some part of the year and are deeply incised down to the bedrock with many sand deposits along their beds and between rock edges. There are a few permanent rivers and streams in Machakos district. Athi River is the major perennial river and drains most of the district, while Tana and Thika rivers drain the northern most parts of the district. Mua, Kilungu and Mbooni hills also have a few perennial streams whose flow is extremely intermittent at low altitude. Kibwezi Division is

drained by Kambu, Kiboko and Mitito Andei rivers all of which are tributaries of river Athi.

The perennial springs and streams offer potential for piped and gravity fed water schemes for domestic and livestock uses in the low altitude areas. This can be achieved by constructing small water projects for example rock catchment, springs, wells and others. Surface water is scarce but subsurface water resources (found in sand river beds) are an important source of domestic and livestock water in many parts of the district. They offer a high potential for development of non piped water for example construction of subsurface dams for both human and livestock uses.

The development of water storage reservoirs along the river Athi could greatly reduce water problems in the basin as has been identified by Tana and Athi River Development Authority. The damming of Athi River offers a potential source of water for industrial and other urban developments in Athi River town.

3.4 The Physical and Demographic Changes in Athi River.

The existence of the town can be traced back to the siting of Mavoko Railway Station, which culminated into the establishment of central activities around the railway station. The first Athi River Development Plan shows that before 1970 the town was a very small

centre with only two industries, namely, East African Portland and K.M.C. The centre then was dominated by activities related to the two industries: the factories, the staff housing and shopping facilities at Makadara and Mavoko, other estates include Kisumu Dogo and Sophia. Although at that stage the town had potentials for industrial development it had only low level activities.

By 1969 the population of the town stood at 5343 compared with 582 in 1948. The rapid rise in population by over 800 percent between 1948/69 is attributed mainly to the establishment of K.M.C. (1953) and East African Portland (1957). Before the establishment of these two industries the town was serving a function of purely a rural centre with railway station and a few shops. These two industries attracted a large population through increased employment opportunities.

Between 1969/79 the population nearly doubled from 5,343 to 10,012, which can be attributed to the increase in the number of industries. In the 1970s, 8 more industries were set up, these industries created opportunities, which attracted immigrants leave alone population growth because of natural increase.

Between 1979/89 the population of the town nearly doubled rising to about 20,000 (1989) from 10,012 (1979) people. The population doubled in a decade,

which could be attributed mainly to immigrants and partly to natural population growth. The population rise can be connected to the growth of old and new industries offering more job opportunities. In the 1980s 12 more industries were set, which opened up opportunities for employment.

The 1991 population was estimated by Mangat and Patel Consultants to be about 21000 people. Between 1990/91, 7 new industries were set up. At the time of the survey 8 industrial premises were observed to be under construction, which is going to attract a larger population for employment and other related activities.

Table 2 Demographic Trend of Athi River Town.

Year	Population
1948	582
1969	5343
1979	10012
1981	11500
1984	17000
1990	20000
1991	21000

Source: Kyalo 1985; Mangat & Patel Consultants 1991.

Athi River was initially a very small centre.The town boundary was reviewed in 1987 covering upto 225 km^2. The latest boundary review was in 1990, which expanded the boundary from 225 km^2 to 330 km^2. The

latest boundary review (1990) has not been translated into a map.

The town expansion is engulfing the tip of Nairobi National Park, which touches almost the town centre. Industries emit gas, which with the influence of the prevailing wind direction across the park can pose danger to the flora and fauna in the park. Portland factory releases a lot of dust and dust was observed to be covering vegetation around the factory, such problem is likely to extend to the park. If dust and other pollutants can cover pasture for wildlife then their life would be threatened.

Therefore with the rapid expansion of the town, activities neighbouring the park must be restricted to those in harmony with the park. The industries, which release a lot of noise, dust and other pollutants must be set up away from the park. Measures must be taken to guard against dumping solid wastes in the park as that may equally pose danger to the same.

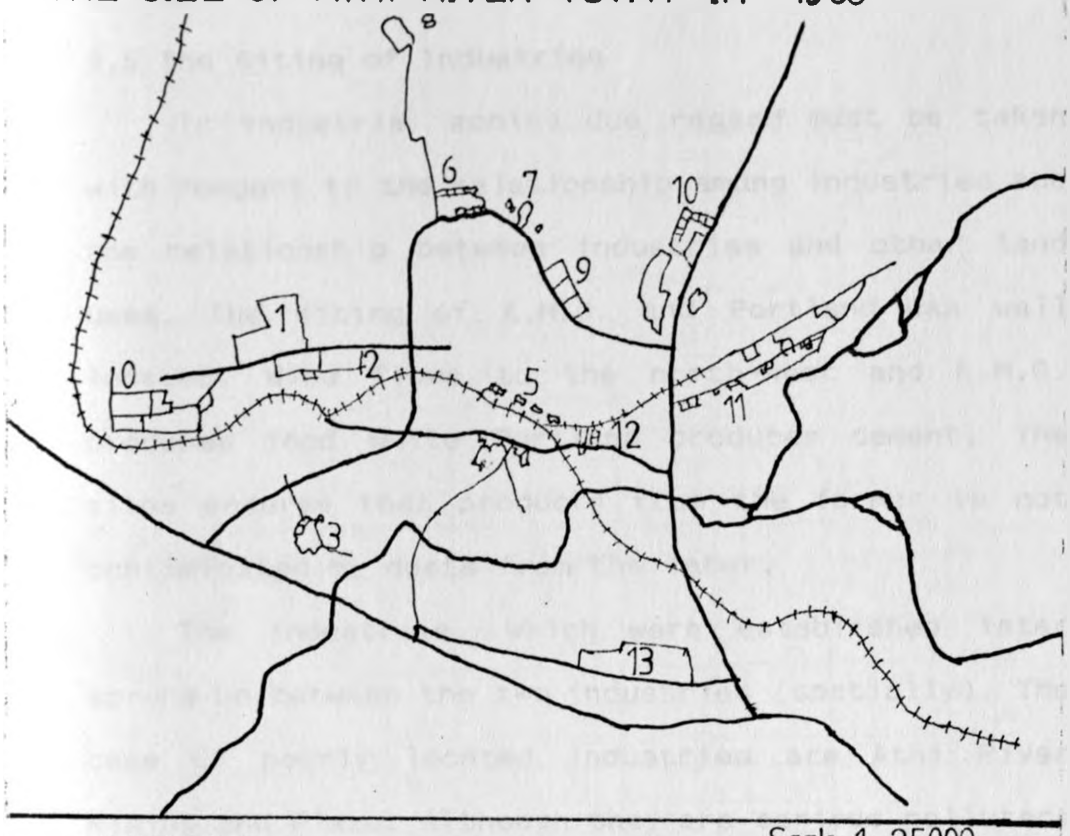
Spatially there is higher concentration of industries around the town centre, mainly areas served with sewerage system. Along Nairobi-Mombasa Road and along the Great North Road within Athi River town about 7 industries are located, which are also directly linked to the major roads. Map 3 below shows the size of Athi River town in 1968 . Map 4 below shows boundary expansion in Athi River.

These industries have sprung up along such roads to benefit from the land, which is well serviced with infrastructure. It is also along the Nairobi-Mombasa Road where 8 industrial premises under construction were observed. The approval of these industries to be directly linked to the main roads violates planning principle, which requires that roads of the calibre of Nairobi-Mombasa Road must have limited access to ensure smooth and fast flow of traffic.

The major cause of development problems is lack of upto date plan and a co-ordinated machinery to administer the plan. The plan, which is still being used was prepared in 1970 and the plan earmarked most of the land as differed. On top of that most of the land is state owned and as such can be planned and allocated to interested parties as deemed fit by the concerned officers. Therefore the differed land has been allocated haphazardly without professional regard. Field surveys show that the town council lacks power to influence industrial development in the town as land is allocated in Nairobi without consulting the Town Council. The problem is further compounded by the confusion of who should be responsible for development control in Athi River town. The Machakos District Physical Planning Officer observed that she no longer deals with Athi River town development as the Nairobi Office has taken over such duties. Kenya's Planning

procedures require that the District Physical Planning Officer should plan and control development in her/his areas of jurisdiction.

THE SIZE OF ATHI RIVER TOWN IN 1968



Scale: 1: 25000

LEGEND

0 KMC FACTORY
1 KMC STAFF HOUSES
2 CHIEF'S OFFICE/POLICE STATION
3 HIDES/SKIN CENTRE
4 MABOKO SHOPPING CENTRE
5 MABOKO RAILWAY STATION
6 SOPHIA ESTATE
7 MAKADARA SHOPPING CENTRE
8 WATER TANK
9 COUNCIL HOUSES
10 EAPC JUNIOR STAFF HOUSES
11 EAP CEMENT FACTORY
12 KISUMU DOGO ESTATE
13 EAPC SENIOR S. HOUSING

Map 3

Source: Kyalo, P. 1985

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3.5 The Siting of Industries

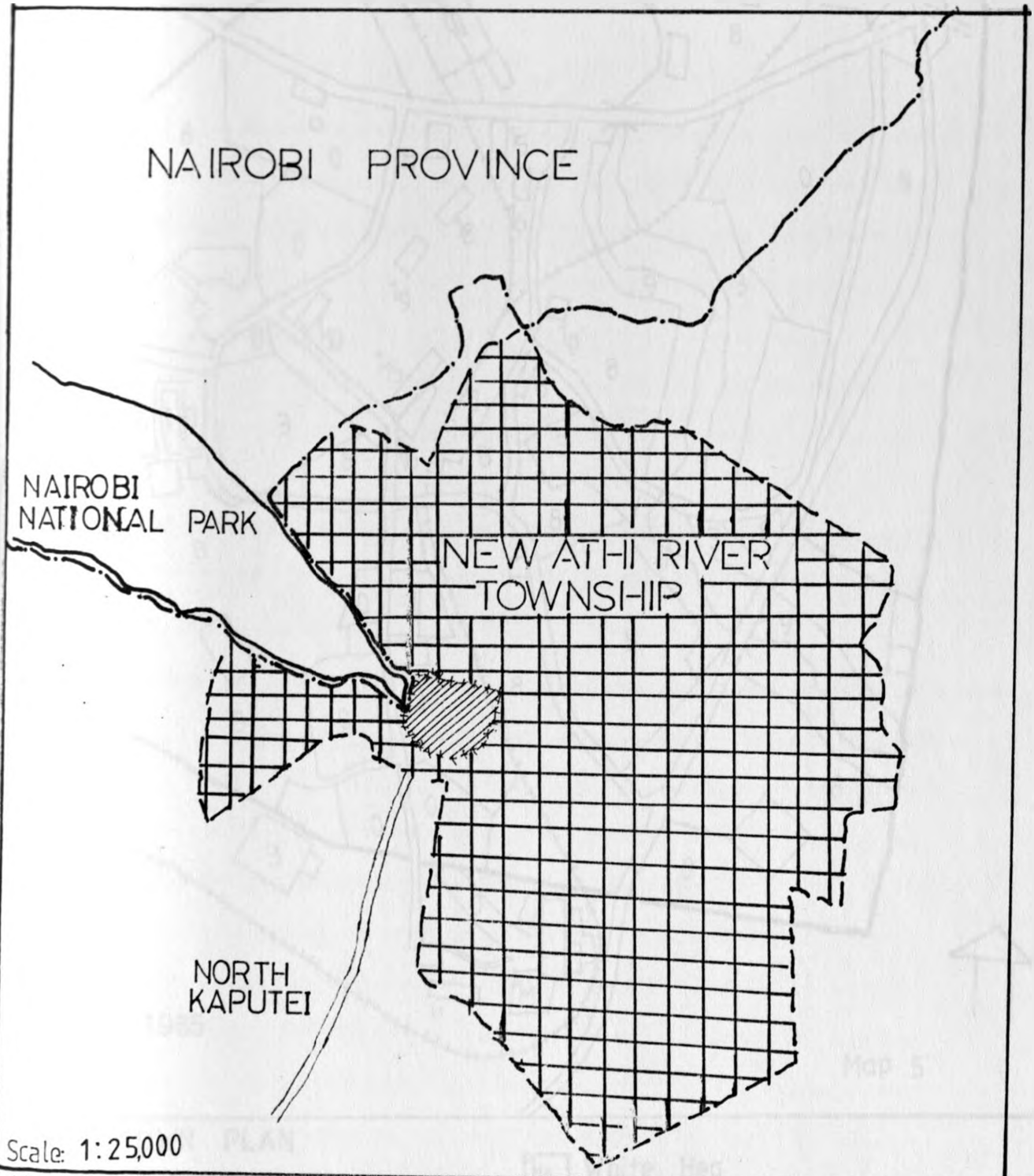
In industrial zoning due regard must be taken with respect to the relationship among industries and the relationship between industries and other land uses. The siting of K.M.C. and Portland was well located. Wind flows to the north-west and K.M.C. produces food while Portland produces cement. The sites ensures that products from the former is not contaminated by dusts from the later.

The industries, which were established later sprung up between the two industries (spatially). The case of poorly located industries are Athi River Mining and Plaza. Although they are serious polluters of the environment they are located close to schools, residential areas and other industries. Map 5 below shows the existing Athi River town plan.

Werrot is located adjacent to Athi River Mining, during the field survey trees within the former were covered with dust from the later. Werrot is subjected to too much dust from Athi River Mining. Portland although close to Nairobi National Park releases a lot of dust into the atmosphere.

Industrial location has not considered the location of residential areas. Some industries are located very far away from the residential areas for example KAPA, Galsheet and M.M. Distillers.

ATHI RIVER TOWN DEVELOPMENT PLAN



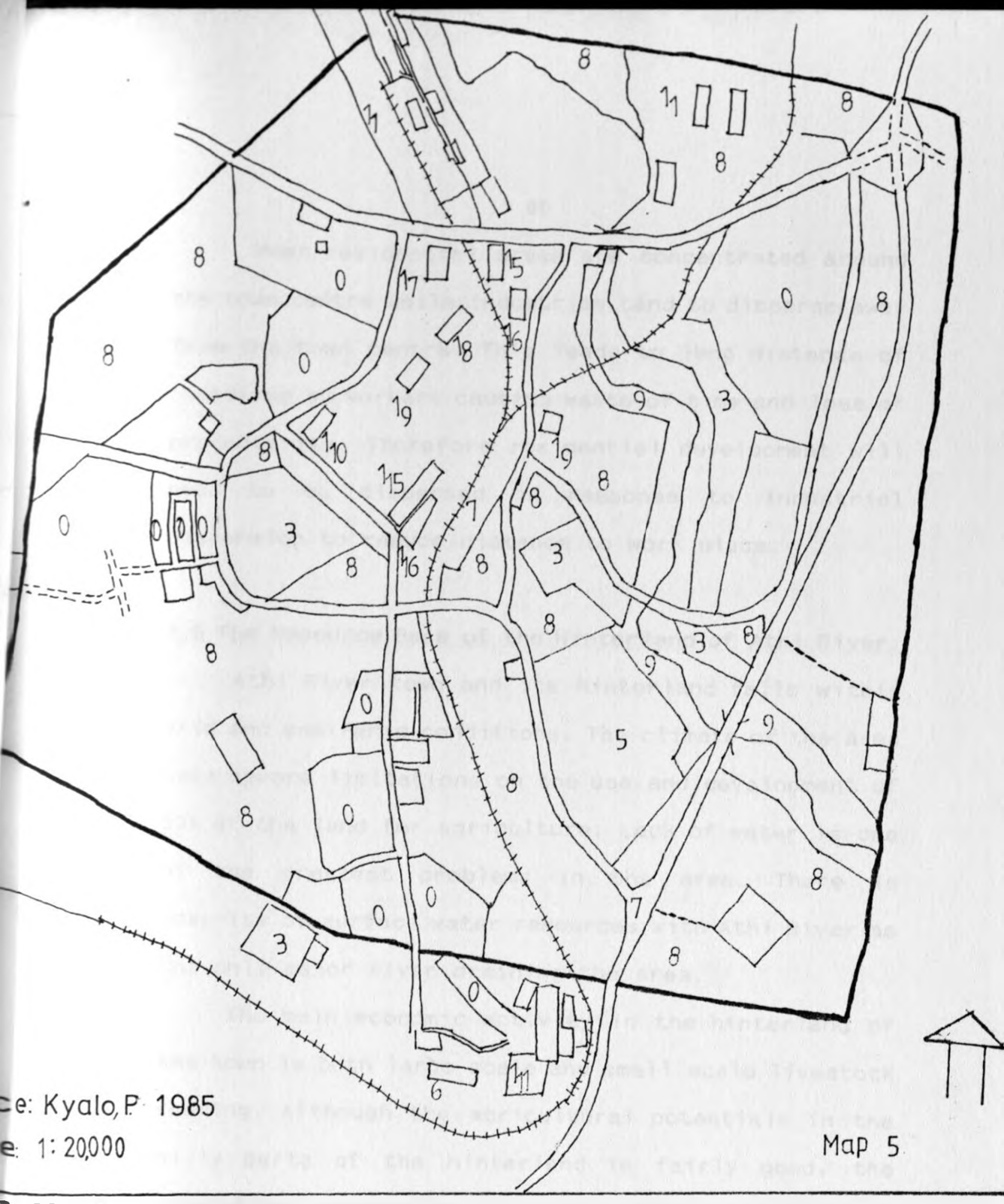
Map 4

Source: Kyalo, P. 1985

LEGEND

- NAIROBI CITY BOUNDARY
- PREVIOUS BOUNDARY
- NEW BOUNDARY
- PARK BOUNDARY

Caleb Mc'Mireri
DURP
University Of Nairobi
M A Planning '92



e: Kyalo, P. 1985

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Map 5

I RIVER TOWN PLAN

ND

- Residential
- Educational
- Recreationanal
- Public Purpose
- Commercial
- Public Utilities
- Transportation
- Deferred
- Agriculture

1	Industries
11	E A Portland Co.
12	Refine Oil Co
13	D D Tannaries
14	S Mining
15	A Leather Works
16	Coral Paints
17	Auto Spring Man.
18	NOVA Chemicals
19	Metal Chloride
110	White Heg
111	K M C
112	Distillary
113	Bottle Man Co
114	Man Outfitters
115	Athi Mining Co
116	Werrot Co

Most residential areas are concentrated around the town centre while industries tend to disperse away from the town centre. This leads to long distance of commuting by workers causing waste of time and loss of productivity. Therefore residential development will need to be dispersed in response to industrial dispersion to reduce distance to work place.

3.6 The Resource Base of the Hinterland of Athi River.

Athi River town and its hinterland falls within arid and semi-arid conditions. The climate of the area sets severe limitations on the use and development of 90% of the land for agriculture. Lack of water is one of the greatest problems in the area. There is scarcity of surface water resources with Athi River as the only major river draining the area.

The main economic activity in the hinterland of the town is both large scale and small scale livestock rearing. Although the agricultural potentials in the hilly parts of the hinterland is fairly good, the population pressure is such that viable small holdings cannot be maintained without substantial outmigration from the land.

The geological survey has revealed few minerals of outstanding value in the township and its hinterland. Most of the existing minerals have been exploited sporadically at various times and currently

mainly kun kur,limestone, marble and chalk are being exploited by some industries in Athi River town. The basic geological structure is such that chances for further mineral based industries being developed in the area is limited.

The hinterland has large quantities of building sand in the seasonal river beds. There are areas where soil suitable for making building bricks is available. Quarry stones are also available at Kathaan in Kangundo. The full potential and benefits from these resources is not yet fully realized.

3.7 Conclusion.

It is quite evident that the hinterland of Athi River town has weak resource base, especially agriculture. This demands that the growth of the town and its hinterland must depend on other types of economic activities. Athi River town can be an important centre for growth for her hinterland. This can be achieved by exploiting its locational advantages in relation to Nairobi City, available land and excellent communication. Industrial development potential in Athi River town can help in creating employment and a base for urban growth.

To support industrial development, efforts must be made to harness the exploitation of the scarce

water resources. Efforts must therefore be made to provide sufficient water supply for industrial development, a facility whose inadequacy is likely to hinder industrial development in Athi River town. Given the very scarcity of water resources, they must be protected against unwarranted pollution from industries to ensure supply of safe water. The flat terrain in Athi River town coupled with closeness to the City of Nairobi among others will continue to attract further industrial development of the town. To encourage industrialization of Athi River town proper planning and co-ordination of development activities is very important.

CHAPTER FOUR.

4.1 INDUSTRIAL LOCATION FACTORS AND POTENTIALS FOR GROWTH

4.2 Introduction

This section evaluates industrial location factors in Athi River town to appreciate the forces that have been behind industrialization of the town. An attempt was made to obtain from every industrialist the four most important factors, which attracted them to Athi River town. This information will enable planners and policy makers establish with certainty, which factors have been attracting industrialists to the town. So, they can plan how to exploit such factors for further industrial development in the town and make adequate provision for future industrial development.

The following factors were identified for the study: market, raw materials, communication, industrial land and favourable government policies. To rank the factors accordingly the most important factor was scored 5, followed by 4, 3, 2 and 0 in a descending order.

The most important factor that attracted the industries is cheap, good industrial land 29 percent, followed by market 25 percent and the third most important factor being excellent communication 23 percent. The least important factors being raw

materials 13 percent and favourable government policies 7 percent. Cheap, good industrial land, market and good communication combined explains 77 percent of the industrial location decision in Athi River.

Table 3 Index Numbers for Industrial Location Factors.

Industr	Mkt	RMat	Commu	Land	Fgp	Others
KMC	5	4	3	2	0	0
EAPC	4	5	2	0	0	3
Werrot	3	0	4	5	2	0
ARMing	4	2	3	5	0	0
Chlorid	4	0	3	5	0	0
Auto	4	0	3	5	0	0
Gals	4	0	3	5	2	0
Sant	2	0	4	3	5	0
KThred	0	4	2	5	0	3
NOVA	4	2	3	5	0	0
Bluet	4	5	3	2	0	0
Pepe	3	0	4	5	2	0
Total	41	22	37	47	11	6
%	25	13	23	29	7	4

Source: Field Survey 1991.

4.3 Industrial Land.

The result as shown in the paragraph above has brought out cheap good industrial land as the single most important location factor. This is further confirmed because all the 12 industrialists interviewed said that industrial plot in Nairobi is

far more expensive than that in Athi River. Some industries like Galsheet and Pepe (some of most recent industries) expressed the sentiment that a part from exorbitant cost of industrial plot in Nairobi it is almost impossible to find the required size of land at the right location. This is a reflection of congestion in Nairobi's industrial area.

Congestion problem in Nairobi's industrial area has forced the rapidly expanding industries like Galsheet to set up a subsidiary factory in Athi River town on a 20 acre consolidated plot, a plot size the company acknowledges is sufficient for future expansion. Besides subsidiary industries with their parent factories in Nairobi's industrial area, there are completely independent (new) industries like the Santowel, which have been attracted to Athi River town because of cheap good industrial land.

The average land owned by the industries surveyed is 7.28 acres excluding K.M.C., which has 211 acres and Portland, which declined to divulge the size owned. Out of the 10 industries, 7 of them have plot size of 5 acres or less with an industry like Athi River Mining having only one acre of land. Industries like Bluetan, Galsheet and Autospring have 18, 20 and 10 acres respectively. On average 2.6 acres are already put into use, which is 35 percent of the average land owned by the individual industries.

Industries having 5 acres or less use on average 55 percent of the land owned. Also, out of the 12 industries visited only 3 industries indicated that their expansion is constrained by lack of land at the site.

Smith (1971) notes that national industrial development can be successful only if some attempt is made to set aside an adequate amount of land for industrial development in places selected for expansion by the planners or likely to be selected by private entrepreneurs. Chapman (1991) also argues that shortage of space has often been identified as an obstacle to industrial growth within the inner city. The trend meant that it is not only difficult for a new business to find a suitable site within the inner city, but, more importantly existing businesses also have problems in re-equipping with the latest technology.

There is need to avoid falling into the problem currently facing some industries in Nairobi, in which industries eager to expand the plant within the surrounding area cannot get land plus the exorbitant prices. Buffer zones should be reserved between industries, which would be allocated to expanding industries in future. This will enable industries to expand around the site other than acquire land at distant places, therefore enjoy the already developed

industrial inertia at the site and economies of scale.

Such a buffer zone once set up should not be totally cleared for expansion but portions of it must be retained to help minimise industrial pollution. The buffer zone should be planted with trees to be effective in environmental conservation. The land in Athi River town is not only cheap but ideally flat for industrial development. The town is on a plainland, which makes it easy for construction of large industrial premises.

4.4 Market and Industrial Linkages.

According to Smith (cited in Keeble 1976) the market emerges as the locational consideration of first importance. Proximity to large or specialized consumer markets...has emerged as the most important decisive factor for manufacturing industry in Britain. But this study identified market as the second most important locational factor.

Market was identified as the second most important factor that attract industries to Athi River. Nairobi City, which is only 20km away from Athi River township is the main market centre for industrial products. This is exemplified because most of the industries studied have marketing departments in Nairobi like Pepe, Werrot, NOVA, Galsheet and Chloride Metal.

Close market for products is important because it helps minimise transport cost and therefore higher prospects for higher profit margin. It also enables ease of direct contact with the salesmen and consumers, which ease information flow about product quality and demand. Still, there are some products, which are directly exported and some are sold all over Kenya like leather (from Bluetan) and cement respectively.

Besides establishing the market factor, an attempt was made to establish industrial linkages. The study revealed that 9 (75 percent) of the industries are related to industries in Nairobi either supplying them with finished products or byproducts as raw materials. For example K.M.C. sells hides and skins to a tannery in Nairobi, NOVA Chemicals supplies to her Nairobi Sales Office finished products, Chloride Metal supplies refined lead to the parent battery industry in Nairobi and Werrot has a sales office in Nairobi.

But there is very little linkage among these industries in Athi River, only Athi River Mining Supplies dust to NOVA Chemicals. This trend should be discouraged because industries in the town benefit the town less than would be expected. If there were greater linkages then more benefits would accrue considering employment and increased profit because of reduced transport cost.

Since most of the products are sold outside Athi River town it is a clear indication that Athi River is primarily an industrial town (area) where products are manufactured and then sold elsewhere. Yet if there are greater industrial linkages and larger market in Athi River then the general socio-economic benefits from industries would be higher to the town. Weberian locational games of grouping together various production processes in space to realize various agglomeration economies does not apply to Athi River itself but in relation to the town and Nairobi. The proximity of Athi River town to Nairobi fosters industrial development in the former because of reduced transport cost to the market (Nairobi).

4.5 Communication System.

The third most important factor is excellent communication, which links the town and other parts of the country and also foreign countries. This is evident by the location of the township at the confluence of Nairobi-Mombasa Road and the Great North Road. The township is also traversed by the Kenya Uganda Railway, which has long been considered to be the triggering force behind location of the town around the Mavoko Railway Station.

The town has the advantage of Jomo Kenyatta International Airport, which is only 20km away from

the township, no wonder that is why E.P.Z. has been proposed in Athi River town. The airport is expected to play an important role in attracting investors to Athi River town with the coming of the E.P.Z.. This is because E.P.Z. is expected to attract mainly foreign investors who critically need air transport. Also, E.P.Z. is expected to be involved in processing /manufacturing of light products, which require air transport for import of inputs and export of finished products (Bhatia an Advisor on E.P.Z. in Kenya).

All the industrialists interviewed use mainly road transport in one way or another. But very few industries 2 (17 percent) use railway transport though railway transport has traditionally been considered as a cheaper mode of transport for haulage of large quantities of commodities. Ironically 6 (50 percent) industries are linked with railway transport out of which only 2 use it only occasionally. This trend can be explained because points of origin of raw materials and the destination of finished products are multiple, which are not necessarily linked with railway line or haulage points. Therefore change of mode may be considered not only cumbersome but also time wasting and expensive. Alternatively it may be argued that railway transport is slow.

Also, the location of Inland Container Depot at Embakasi is convenient for industrialists who import

inputs or export finished products. For example Bluetan exports most her finished products while Santowel import most of the raw materials.

While provision of telephone services has largely been met for most industries yet Santowel Co. complained bitterly because she is loosing business due to lack of proper telephone services. It is necessary that efforts are made to ensure that the rate of services provision cope up with industrialization of the town.

Though the primacy of road transport cannot be overemphasized, a further look at it is necessary. Athi River town already enjoys excellent road network linked by international trunk roads. With further industrialization of the town more traffic will be generated especially the heavy trucks. This is going to pose greater problems of traffic mobility also increased risks of accidents.

For the Nairobi-Mombasa Road to continue playing its role as an international trunk road, road redesign will be of importance. Particularly the dual carriageway currently reaching upto JKA Resort Club should be extended to Athi River township to cater for slow moving and turning trucks and trailers. Besides that, proper maintenance of road network is crucial to improve traffic flow, minimise accidents and reduce depreciation of vehicles.

4.6 Raw Materials.

Raw materials availability ranks fourth (13 percent) as an explanatory variable for industrial location. This is primarily because with increased industrialization coupled with good transport network raw materials can be shipped from anywhere, while the transport cost can be met from the finished products' revenue. East African Portland transports limestone from Brussels in Kajiado and Kun kur from Sultan Hamud. Athi River town area does not supply directly any factory with raw materials. Raw material sources are spatially spread to most provinces of Kenya with five industries importing at least a component directly from foreign countries.

A part from K.M.C. and East African Portland, which were pegged to raw materials availability, other upcoming industries have disobeyed the trend. The trend has changed with raw materials giving way in importance to cheap good industrial land, communication and market in importance. This trend can be attributed to change from processing /manufacturing of heavy and bulky products to light and medium weight products. These are products whose raw materials can be easily transported from far sources to the factory for example Santowel, which manufactures textile, imports most of her inputs from Europe.

Remoteness from markets, lack of labour, poor

transport facilities or other such reasons may offset the pull of raw materials and make utilization at the point of origin uneconomic. Most materials' resources are not available to industry at equal cost irrespective of location and costs of expansion and costs of exploitation and distribution vary widely (Estali 1973).

On the other hand newly upcoming industries are those, which manufacture products of high quality therefore irrespective of their weight and size, finished products can meet transport cost. For example Autospring and Werrot manufacture parts of automobile and assemble machinery respectively. Also (as noted earlier in market) most companies market most of their products in Nairobi, which is only 20km away. Therefore the transport cost for the finished products is low because of the short distance to the market (Nairobi). Besides that, Athi River town has excellent communication, which enables raw materials to be shipped from any source thus it is unnecessary for industries to be pegged to raw material sources.

4.7 Government Incentives.

The government of Kenya has been encouraging industries to locate outside Nairobi and Mombasa as a measure of industrial decentralization and more equatable regional development. Only 7 percent of the

industrial location decisions are attributed to favourable government policies. This is an indication of the weak role of government incentives in industrialization of Athi River town.

The government provides a wide range of incentives including fiscal, financial and infrastructure. The government provides tax incentives like duty free on imported machinery and equipments, 85 percent tax reduction on finished products and lower land rates for industrialists, which locate outside Nairobi and Mombasa. Yet of the 12 industries visited only 2 have benefited from incentives given, the rest were not attracted by or have not benefited from government's incentives.

In fact Autospring noted that those incentives are just on paper and are very difficult to obtain. The General Manager Autospring observed that the company arranged to import machinery believing that she would benefit from the duty free relief on imported machinery, never-the-less that did not happen. This placed the company under unnecessary hardships, she had to make up for what she had not planned for, which is demoralising.

This is a clear proof that government policies have in large part been ineffective in attracting industries to Athi River town and probably other parts of Kenya. Therefore if the fiscal policy and

financial incentives have proved ineffective in attracting industries then it may be necessary for the government to instead venture into the infrastructure provision as a good industrial promotion strategy in Athi River town. This is primarily because of the important role that infrastructure has played in industrial development in Athi River town.

4.8 Industrialization of Athi River town.

Athi River town has experienced rapid industrialization process, which has been rising steadily over the decades since 1950s. Industrialization process remained dormant before 1970 with only two industries established in the 1950s namely K.M.C. and East African Portland. This can largely be explained because 1960s was the period during which Kenya attained independence and the total industrialization of Kenya and Nairobi for that matter was low. Therefore the current congestion and exorbitant cost of industrial plot in Nairobi's industrial area then was unheard of, thus most industries could easily locate in Nairobi. But K.M.C. and Portland did not locate in Nairobi partly because they are raw material based and had high potential for pollution.

From 1970s through to 1980s and into 1990s have witnessed marked increase in the rate of

industrialization of the town. The period of 1970s recorded 8, 1980s 12 and 1990s 7 new industries established respectively. Therefore between 1970s/80s recorded an increase of 60 percent, 1980s/90s recorded an increase of 32 percent. Also 1990s cover only 2 years. So assuming an average of 10 percent growth rate it is hoped that about 30 industries will be put up in the 1990s. By the year 2000 Athi River will accommodate over 50 industries excluding those expected to come up in the E.P.Z.. This expectation is further confirmed because during field survey 8 industrial premises were observed to be under construction. E.P.Z. is expected to boost industrial development of Athi River being the first of its kind to be developed by the government in Kenya. Industrial Growth rate between 1980/91 is calculated below:

$(1+r)^n P_0=P_n$,

P_0 (1980)=10 industries,

P_n (1991)=29 industries.

r= (11 2.9)-1 = $2.9^{.09}$= 10 percent.

The industrial growth rate in Athi River town is 10 percent compared to the projected growth rate of 6.4 percent, which can be attributed to favourable location factors therein. Athi River is a rapidly industrializing young town. Substantive measures should therefore be taken in advance to properly plan for these industries and follow the plan in

development control. These industries should be thoroughly screened before they are allocated plots in various sites to ensure that there is harmonious industrial development.

CHAPTER FIVE.

5.1 EFFECTS OF INDUSTRIALIZATION.

This chapter analyses socio-economic effects of industrialization to appreciate the benefits and costs of industrialization. This chapter first examines growth of industrial production, employment creation, plant capacity utilization and the potential impact of E.P.Z. This chapter further examines the effects of industrialization on infrastructure provision and industrial pollution.

5.2 Growth of Industrial Production.

In the proceeding section an attempt was made to evaluate the growth of industries under study. The yardstick used in this context is the production trend from 1980 to 1990. The greatest constraint was the reluctance by the industrialists to show the production figures saying such information is classified. Four industries did not show the production figures while the three others their production do not stretch back to 1980. Thus only 5 industries gave full production figures upon which this analysis is based.

As at 1980 total output was ksh.225.5 million, which rose to ksh.306 million in 1986 and almost doubled in 1990 when output stood at ksh. 436 million. Thus between 1980/90 the total output rose by 93

percent. The general trend shows that total output has been increasing steadily except for 1983 when output fell by 13.6 percent from the previous year. The fall of output by 13.6 percent can be attributed mainly to the abortive coup of 1982. The coup had the potential of disrupting the normal healthy business environment, for example Autospring had a drop in output of 82 percent.

The general trend in output is rising over the years almost doubling in a decade which is a clear indication of rapid industrial growth. The consistent industrial growth can be attributed largely to favourable business environment. More specifically assured market (demand) for the finished products and the ability to secure adequate raw materials because of excellent communication among others, explain the industrial growth. The steady growth of industries show that Athi River is a suitable site for industrial location, which is why there is steady inflow of industries to Athi River town. This is exemplified by the high rate of siting industries in the town in the 1980s and 1990s.

An industry like Kenya Thread operates at very low capacity because she cannot receive enough raw materials from Cotton Lint and Seed Marketing Board. The Board is alleged to be inefficient in the supply of cotton and is responsible for the current low

production of cotton. This is primarily because while there is great demand for cotton and consumers are willing to pay high prices, the Board delays payment to farmers. Bluetan although receives enough hides and skin but are of very low quality, producing leather with no grade 1 and very little grade 2 resulting in products, which are less competitive in the world market. The low quality hides and skins is due to poor livestock management in Kenya.

There are internal problems, which have been responsible for the fluctuations of production especially poor management. K.M.C. which has been faced with periodic closure has one of the best technology. The factory uses almost every part of the livestock, producing products ranging from tinned meat to animal feed. Ironically K.M.C., which was economically viable during the colonial era and early part of independent Kenya has turned out to be expensive where tax payers money is pumped although it continues to make losses. The problem is attributed largely to mismanagement, corruption and poor management personnel.

Table 4 Annual Production in Ksh (million) 1980/1990

Ind	80	81	82	83	84	85	86	87	88	89	90
EMC											
RAP											
Pep											
ARM	100	92	96	100	107	120	122	135	170	163	170
Chl	45	53	58	64	68	70	73	80	75	78	81
Aut	33	64	60	11	33	33	32	58	87	93	100
Gal											
San											1.5
KTh	38	40	43	48	53	63	65	57	60	68	62
Wer	9.5	10	8	6	9	10	14	15	19	20	23
Nov						4	7	6	9	4	3
Blu											
Tot	226	259	265	229	270	296	306	346	411	422	436

Source: Field Survey 1991.

NB: The total is for only the 5 industries whose production figures stretch back to 1980.

5.3 The Role of Industry in Employment Creation.

The ecological base of the hinterland of the township is arid and semi-arid therefore the contribution of agriculture in employment is very limited. Industry is the main source of employment in the town contributing over 80 percent of total employment (Kyatha, an Accountant of Athi River Town Council).

An attempt was made to examine employment by the 12 industries from 1980 to 1991. Generally there is rising trend in total employment from 1027 in 1980 to

2019 in 1986 and to 3127 people in 1991. Therefore between 1980/86 employment rose by 96 percent and between 1980/91 it rose by 204 percent, a threefold increase in employment. This steadily rising trend in employment was slumped by the closure of K.M.C. between 1986/87/88, K.M.C. is a major employer in the town.

Employment growth rate between 1980 and 1991 is calculated below: $(1+r)^n P_0 = P_0$, where $P_0(1980)=1027$, $P_n(1991)=3127$ employees,

$r = (11\ \ 3.04)-1 = 3.04^{.09} = 10.6$ percent

The employment growth rate in Athi River is 10.6 percent compared to the projected growth rate of 4.4 percent. This is more than twice the projected employment growth showing that employment growth potential in the town is bright. The steadily rising trend in employment for the industries under study can be attributed to the incoming industries and expansion of individual industries over the years. For example Bluetan increased employment from 120 in 1982 to 315 people in 1991, a 162 percent increase; Autospring increased employment from 257 in 1980 to 500 in 1989 and down to 350 people in 1991; and Portland increased employment from 500 in 1980 to 633 people in 1991. Generally most industries have shown rising tend in employment creation.

But there are industries, which have shown

stagnating/ falling trend in employment. This has mainly been because of lack of raw materials and stiff competition. Kenya Thread has been cutting down on employment because of acute shortage of raw materials, which has forced some sections of the plant to be closed down. Autospring has been cutting down on employment because of falling demand because of mass importation of new and second hand cars into Kenya. Chloride Metal is occasionally closed down because of lack of raw materials. The factory uses used car batteries which some dealers occasionally hoard.

Table 5 Annual Employment From 1980-1991 (X100) for the 12 Industries

80	81	82	83	84	85	86	87	88	89	90	91
10	12	22	24	26	24	20	21	23	30	31	31

Source: Field Survey 1991.

Of the 12 industries visited, 7 of them employ between 17 and 162 people with an average of 64 employees while the other 5 industries employ between 315 and 750 people with an average of 536 employees. The 5 biggest industries account for 86 percent of the total employment in the 12 industries.

The 5 large industries have complex production and large management systems while the smaller one's have simpler management and production systems. For example Werrot is a family industry with only family

members in the management, while NOVA is owned by an individual supported by a small management team. Therefore with expanded management capabilities such companies can create more jobs with the resultant increase in output. The giant industries like K.M.C. also need to improve their management to make them more productive and efficient.

An attempt was also made to find out (if there is any) relationship between employment and production levels between 1980/90. This analysis was done on only 5 industries whose production data for employment and production were given for the period 1980/90. This was done to examine whether increased production create more job opportunities.

Between 1980/86 production and employment rose by 36 and 98 percent respectively while between 1980/90 production and employment rose by 93 and 170 percent respectively. The rate of increase of employment nearly doubles the rate of increase of production in the two cases observed above. For every one million shillings rise in output only two more people are employed, showing that capital intensive technology is employed in the production processes.

Table 6 Index numbers of output and employment for 5 industries.

Year	output ksh million	Index	Employment	Index
1980	225.5	100	528	100
1981	259	114.9	621	117.6
1982	265	117.5	695	131.6
1983	229	101.6	769	145.6
1984	270	119.7	904	171.2
1985	296	131.3	872	165.2
1986	306	135.7	1048	198.5
1987	345	153	1090	206
1988	410.5	182	1228	232.5
1989	422	187.1	1572	297.7
1990	436	193.3	1430	270.8

Source: Field Survey 1991.

If the underutilized capacity of 40 percent is fully used then 80 percent more jobs will be created, which means 2503 jobs will be generated by the 12 industries. Therefore increased industrialization of Athi River accompanied by optimum capacity utilization will definitely benefit Kenyans through increased employment.

An effort was also made to establish the origin of workers for the industries under study to establish how far the industries benefit the hinterland in employment. Two industries refused to divulge the data considering that information to be sensitive. Walker (1975) notes that the positive relationship between urban industrial development and rural periphery is

now widely accepted. This is evident from the increased employment, income and market. Industrialization in the rural peripheries is still seen as playing a major role in providing the job diversification.

On average 57.5 percent of the workers from the 10 industries come from Machakos District within which Athi River town is, while the rest come from Nairobi and other parts of the country. Nairobi is the point of convergence for job seekers where upon failing to get jobs there shop for jobs in neighbouring industrial towns like Athi River, Ruiru and Thika plus workers who change jobs from Nairobi to these neighbouring towns.

Since nearly 60 percent of the employees come from Machakos District so the district benefits from industrialization of the town. This becomes crucial because the district is predominantly arid and semi-arid lands, so employment from other sectors other than agriculture is desirable. This trend will only hold if the government retains the policy of district focus in employment. This policy can be counterproductive as demanding jobs are given to less deserving candidates. Otherwise if this policy is discarded then the district's share will diminish as Kenya's labour is now highly versatile and mobile.

Therefore the rise in employment gives an

impressive picture nearly tripling in a decade. This shows that the future contribution of industries in employment is bright. Optimum capacity utilization in the industrial sector will be necessary to create more employment opportunities. To realize this the whole economy need to do equally well to supply enough raw materials and expand.

5.4 Plant Capacity Utilization.

The level of capacity utilization in industry is a direct measure of the extent to which assets are productively employed. The chronic underutilization of manufacturing capacity is common in developing countries (Weiss 1990). Only 2 (16 percent) of the industries use full capacity of the existing plant. On average capacity utilization is 60 percent with 7 (58 percent) industries using 70 percent and above of their capacity. Some industries like Galsheet, Pepe and Kenya Thread uses 15, 20 and 20 percent respectively. This very low capacity utilization can be explained by shortage of raw materials for Kenya Thread while the other two are new and are in the process of adjusting the capacity utilization.

In general capacities are underutilized by 10 (83 percent) industries. This depicts Kenya's picture in which industries use 60 percent of their capacity. This shows that there is great untapped industrial

potential. We can increase output by simply using the dormant capacity without necessarily expanding the existing capacity. The underutilized capacity can be tapped by improving managerial capabilities, increasing working capital and improved supply of raw materials. These suggestions are borne out of contention that some industries are new, some are crippled with raw materials shortages, some have management problems while others have not built managerial capabilities and staff to utilize fully their plant capacities.

5.5 The Potential Impact of E.P.Z. on Industrialization in Athi River.

E.P.Z. has been sited in Athi River because: (a) Nairobi site would be very expensive; (b) such large land required would not be available in Nairobi; (c) it would put a lot of pressure on the already congested infrastructure in Nairobi's industrial area and (d) E.P.Z. is used as a seed for twin industrial growth strategy of Nairobi and Athi River town, among others.

E.P.Z. is expected to lead to: rise in land values in and around the zone; high rents will be paid in foreign currency and therefore more revenue will be generated. Investors are expected to employ labour intensive technology with an internal rate of return

of 20 percent. E.P.Z's. Phase IA once completed will generate about 20000 jobs (whose funds are already available). E.P.Z. foreign investors would subcontract parts of their production to local firms therefore creating demand for local firms.

E.P.Z. plans to develop sewerage and sewage treatment works as part of environmental protection facilities necessary to mitigate the effects of urbanization that E.P.Z. will generate. The facilities will cater for the development of the whole township. E.P.Z. also has a programme of tapping water from Nairobi for industrial development in the town. A section of Great North Road is going to be enlarged to fit traffic generated by the E.P.Z.. Some of these facilities have been a major bottleneck to further industrialization of the town particularly water supply sewerage and sewage treatment works.

E.P.Z. project also incorporates industrial shades, workers' housing, site and service scheme. A total of 12 industrial shades will be developed, 6 type A and 6 type B. Design work of some components of E.P.Z. is ready, like sewerage and sewage treatment works and project implementation of some components will begin in 1992 (Bhatia, an Adviser on E.P.Z. in Kenya).

The siting of E.P.Z. in Athi River shows that the town has potentials for industrial development. It is

anticipated that once the E.P.Z. is fully developed it will carry the town's industrial development even further. This will demand proper planning and integration of development in the town to cope up with the growth of the town.

5.6.0 Effects of Industrialization on Infrastructure.

Availability of infrastructure is essential for industrial development. It is responsible for attracting industries to an area and influence direction of growth within the town itself. Infrastructure layout is also important in shaping the development of other land uses. This section is going to examine the provision and use of: water, roads, electricity, sewerage and security. The study further examines briefly housing and health facilities provision.

5.6.1 Water Supply.

An attempt was made to examine the availability and adequacy of both industrial and drinking water. Out of the 12 industries visited, 6 of them have private boreholes, which mainly meet their industrial water requirements, the rest are served with town council's water scheme. Of the 12 industries visited, 11 (92 percent) indicated that they have adequate industrial water supply, yet drinking water is scarce

and that water supplied by the town council is not only inadequate but also of low quality. This sentiment was expressed by 8 (67 percent) of the industries visited. Notably the giant industries: K.M.C. and East African Portland still transport drinking water from Nairobi for their employees residing in Athi River. This is a very expensive undertaking as it takes away scarce resources. The town council's water scheme has not been fully integrated with the individual industries' water supply systems although the new Nol Turesh Water Project has already reached Athi River township.

Ironically it was expected that with the extension of the Nol Turesh Water Project to Athi River, water problem in the town would end, but the problem persists. One way of minimising water problem in the town is to integrate fully all the water supplies in the town. The situation is made worse for industries nearer to the Athi River-Nairobi border, which is far from the Athi River town and Nairobi City water schemes. It will call for huge financial investment to supply water to such areas. Water problem in the town will most likely be solved once the E.P.Z. water Project is developed. The E.P.Z. Authority intends to tap water from Nairobi traversing most parts of the town under active development.

Borehole water has high mineral content, which

makes it unsafe for both industrial and domestic use unless properly treated as exemplified by the Bluetan Company. Also individual industries cannot afford the otherwise expensive water treatment works. In this context an integrated water treatment works would be more desirable. With increased industrialization, excessive exploitation of underground water may deplete aquifers and increase salinity of the underground water resources. This makes the importation of water from other sources/ areas a better option.

The water problem in Athi River town has been responsible for the trend in industrial development in the town where industries so far in existence are those, which do not require high quality water. Industries like Autospring, East African Portland and Athi River Mining manufacture parts of automobile, cement and chalk/marble respectively. These are industries, which do not require high quality water in the production process. Water problem was evident in Bluetan, which is forced to mix borehole water with the town council's water to dilute the high mineral content in borehole water, which can destroy leather. Especially food and other related industries, which use high quality water are literally absent in Athi River town. To attract industries of that kind to the town provision of abundant supply of high quality

water is inevitable.

5.6.2 Sewerage and Sewage Treatment works.

Sewerage is important in upholding the aesthetics and environmental health of the town by properly disposing of liquid wastes from industries and households. Of the 12 industries visited 4 showed that sewerage system is inadequate. This is with respect to inefficiency of service and maintenance and limited coverage in which certain areas have to rely on their own sewage treatment works or septic tanks.

The sewerage is characterised by frequent blockage, bursts and inefficient management of treatment works. Public Health Office in Athi River has records of complaints by certain industries, which opted to take the council to court for failure to repair sewerage bursts, which was a health hazard. It took so long to be repaired. This is a reflection of the inability of the council to maintain the system. The sewage treatment works releases discomforting smell to the neighbourhood for example Pepe Ltd complained that the working spirit of workers is occasionally hampered by the horrible smell emanating from the treatment works. This sentiment was later confirmed by a field survey visit to the treatment works.

These problems are attributed largely to the

mismanagement and rise in wastes beyond the capacity. Excessive wastes can cause breakage and blockage of the pipes. This can be attributed to the increasing industrialization and housing development, which put too much pressure on the existing capacity, which cannot meet the currently increasing demand for the service. The problem of mismanagement is evident by improper treatment of waste and maintenance of treatment works, which is being eaten away by invading plants. Also, the inability to repair breakage or blockage in time is a clear testimony of poor management.

On the other hand, the town council has been unable to cope up with increasing demand for the sewerage line supply. The area outside the old township is not served with sewerage line like where the Galsheet, Santowel and others are situated lack the same. Such industries are forced to rely on septic tanks, which have limited ability to handle huge volumes of wastes. Therefore industries releasing a lot of liquid wastes are discouraged from locating in areas not served with sewerage line. But sewerage system requires huge financial investment, which the otherwise humble Mavoko Town Council cannot afford without external assistance. The council hopes to benefit from E.P.Z's. elaborate programme on sewerage and sewage treatment works' project in the town.

5.6.3 Access Roads to the Industrial Premises.

This section is concerned primarily with the condition of access road connecting the factory to the main road. Of the 12 industries visited, 5 (42 percent) are connected to the main road with the earth road while the rest are linked with the bitumen surface road. Industries generate heavy commercial vehicles' traffic whose weight earth road cannot effectively support. This implies that traffic flow to such industries like Nova and Bluetan is likely to be hampered during the rainy season when the roads become muddy.

Besides that, some industries have direct entry to the highway like SAI and East African Portland, have direct entry to the Nairobi-Mombasa Road and Great North Road respectively. These roads are expected to attract large and fast moving traffic and must therefore be characterised by least entry/diverging points. This trend must be averted if the two roads are expected to maintain their status as international roads.

This problem is a manifestation of inadequate provision of road network and lack of foresight on the likely consequences of many direct entry/divergence into the major roads. The scenario is typified by industries like KAPA, Galsheet and Santowel, which

have benefited from the old Mombasa Road. These industries are first linked to the old Mombasa Road and subsequently linked to the highway through a restricted entry.

The town council need to properly redesign and upgrade access roads to industrial and residential areas. This will be important in improving accessibility and shaping development towards a desired direction. The existing roads are also very poorly maintained. All industrialists interviewed maintained that potholes on roads tend to deteriorate.

Plate 1 An example of access road to industrial premises, most of which are earth surfaced roads.

Plate 2 One of the upcoming industrial premises which have direct entry to the Nairobi-Mombasa Road.

5.6.4 Electricity Supply.

Electricity is an infrastructure, which is adequately supplied to the town. All industries visited have adequate electricity supply, with the exception occasional power blackout. Kenya Power and Lighting Company should steer a head industrialization in all towns in Kenya, Athi River included with particular reference to speedy installation of power on request.

5.6.5 Security.

Individual industries employ their security personnel with the general support from Athi River Police Station. All the industrialists showed that there is enough security for their life and property in Athi River town. Yet, with increased industrialization robbers may identify Athi River as an area of interest, which require strengthening of the existing security system if the existing security is to stay.

5.6.6 Housing.

There are 1327 residential units within the council, out of which 289 (22 percent), 430 (32 percent) and 610 (46 percent) units are provided by the town council, corporations and private individuals respectively. The private sector is apparently taking a leading role in the housing development a position it is likely to retain with a further move to the market economy. Housing provided by the corporations are provided by the first two industries to be set up in Athi River town, leave alone Railway Housing. The Athi River Town Centre was then too small to provide housing demanded.

Only the two corporations provide housing to their employees while the rest of the industries visited pay employees house allowance. While the 12 industries visited employ 3127 people, the housing stock of only 1329 units show a deficit of 1798 (57 percent). Although 12 more industries are not covered by the study also other sectors, which employ equally a sizable number. This shows that there is acute shortage of housing in the town, a problem which is likely to be exercabated by further industrialization of the town.

The housing crisis was further evident because for the 12 industries under study on average 15 percent of their employees reside in Nairobi. This is

not only costly to workers but also time and energy consuming because of increased transport cost. To enhance productivity and general welfare of workers they need to reside within Athi River town.

The housing crisis was further evident by the mushrooming of slums/squatters' settlement within the town. Housing shortage is usually vividly manifested in the upcoming of slums/squatters' settlement, which are put up to exploit on the shortage of housing. This trend should be discouraged because they destroy the aesthetic fabric of the town and are very difficult to eradicate once established.

Housing problem can be minimised through the promotion of private housing development. This could be easily gotten by availing land to investors at favourable rates and development of infrastructure, which is usually a handicap. Since almost all land within the town council is state owned the government can easily encourage private housing development by providing cheap land for residential housing. From now on the government should encourage land subdivision and change of user. Companies also should be encouraged to develop housing for their staff by availing them land at cheap rates, a trend that had been set by K.M.C. and East African Portland.

5.6.7 Health Services.

Adequate provision of health facilities is essential to serve the fast growing urban population also to provide services in industrial accidents. Currently most of the existing industries rely on Kajiado and Machakos District Hospitals, which are far away and thus unsuitable for emergencies, which may arise. Athi River Health Centre is small and offer only elementary services with little and deteriorating facilities and small staff. During the field survey overcrowding was observed at the clinic. All the industrialists interviewed noted that the existing health centre cannot cater for major industrial accidents.

Plans should be made to develop at least one fully pledged hospital to meet the increasing demand. This can be realized through either private or public sector investment. This will provide adequate medical services to the workers, residents and provide a better understanding of the impact of industrialization on human health. E.P.Z. does not plan to develop a modern hospital.

5.7.0 Industrial Pollution.

5.7.1 Introduction.

Industries are major sources of environmental pollution. It has frequently been alleged that by exerting little or no control over some industries with unpleasant and hazardous manufacturing operations, third world pollution havens have promoted industrial flight by attracting investment by multi-national corporations, seeking to avoid stricter regulations in the developed countries (Chapman 1991). It is at the community level that industrial development problems express themselves most forcibly with respect to the individual citizen regarding desecration of the environment (Smith 1971).

During the field survey, wastes generated from industrial process was investigated, how they are disposed and the safety of the disposal facilities. Industrial pollution is manifested at three levels: (1) in the factory where workers are exposed to pollution; (2) in the neighbourhood of industries where residents are exposed to pollutants or (3) at any other level where man or general ecosystem is exposed to pollutants. The common forms of wastes identified are: Solid, liquid, and gaseous. In cases where measurement was not possible physical observation was used like in gas pollution.

In the manufacturing process wastes of some form

are generated. Wastes pose danger to the industrial labourer, the life near the factory and the life that get in touch with wastes at any other level. Wastes can temper with life and aesthetics of the environment. These make proper industrial wastes management important for sound industrial development.

5.7.2 Liquid Wastes.

About 24.6 million l/month of liquid wastes is discharged by six of the industries visited. The main sources of liquid wastes are: K.M.C., Bluetan and Athi River Mining, which uses a lot of water. Paint waste, which is released by Galsheet although in insignificant quantities but are toxic and hard to dispose of. About 400 l/month of used oil is also released by Werrot.

Waste water from Bluetan is particularly very unsafe. But the company with the help of U.N.I.D.O. has developed a modern waste treatment works, which is expected to treat waste upto the international standards before disposed of to the ecosystem. Leather industry uses chrome and traces of it may find its way into the ecosystem. Chrome is a highly toxic chemical and is dangerous both to the aquatic and terrestrial life.

Due to limited coverage of sewerage, some industries are forced to develop septic tanks for example Galsheet. Septic tanks have limited capacity and cumbersome to dispose wastes from.

K.M.C. and Athi River Mining, which also release a lot of waste water rely on the town council's sewage treatment works for disposal of wastes. Since the treatment works is very close to river Athi, water released from the same, must be safe to control pollution of the river. The town council does not have a consistent programme for treating wastes at the treatment works.

Several strategies have been adopted to reduce wastes. Werrot sells used oil for recycling and Galsheet Ltd also recycle waste water for reuse by the plant. The problem is, once the waste cannot be recycled further, how and where will the waste water be disposed of because Galsheet company has no waste water treatment works.

5.7.3 Solid Wastes.

All the 12 industries visited releases at least one form of solid wastes. Except for East African Portland, which is also a major source of solid wastes (declined to give data on wastes released) about 2.3 million kg of wastes are released a month. Some of the wastes released are: scrap metal, fleshing sludge,

kun kur, limestone, plastic, marble and lead wastes. Some of these wastes are reused or recycled for reuse by other industries for example scrap metal, plastic, cotton and packaging materials. This is a better way of resource utilization as actual waste is greatly minimised.

But lead waste, car battery containers, limestone and marble are dumped at various sites. Lead waste is dumped at Dandora; while limestone, kun kur and marble are dumped within and around the factories' premises. Fleshing sludge is either burnt or dumped around the Bluetan factory. Other solid wastes are dumped at the town council dumping ground.

Wastes that has not been properly used is the cow dung from K.M.C.. Some cow dung enters into the sewerage system while the rest are dumped in the corporation's farm. Cow dung should be used to generate biogas, which can be used for lighting and save on electricity. Fleshing sludge once cleaned of chrome can be used as manure instead of burning.

Limestone and kun kur from Portland form hills around the factory thus destroying the aesthetics of the environment. Athi River Mining uses limestone to fill potholes along the road while the rest is dumped along the roadside. This has caused dusty roads, also destroys the aesthetic fabric of the town and the environment for that matter.

The council's dumping ground, which is very close to the Great North Road is now being engulfed with other land uses like RefineOil and Bluetan. This makes this site unsuitable for continued use as a dumping site. It is necessary that a more suitable site for dumping solid wastes be identified.

Some of these wastes may be dangerous for example car batteries containers may contain traces of lead and lead waste also may contain dangerous concentration of lead. Containers of car batteries should be thoroughly cleaned before discharged while in the manufacture of lead, wastes should be regularly tested to maintain safe waste for disposal. Lead is a highly toxic metal and traces of it is very dangerous to any life. Wastes should be dumped only at the designated places to avoid a long term effect of a dirty environment.

Debris and soil at industrial construction sites also pose a major problem. They should be dumped only at designated sites preferably in the abandoned quarries since they cause ugly hills around the factories. Before approval of development plans, contractors must make a commitment to safely dispose of the soils and debris generated from industrial premises' construction sites.

5.7.4 Gaseous Wastes.

(1) Dust. It was observed as a major problem in 4 factories: East African Portland, Athi River Mining, Kenya Thread and Pepe Ltd. Dust is mainly released into the atmosphere. Dust problem was clearly manifested in the colouring of the vegetation within and around these factories, implying that the neighbourhood of these factories is directly affected by the dust. Thus the people residing nearby and pedestrians a like breath in impure air. The major sources of dust, which are a threat to the neighbourhood are Athi River Mining and East African Portland.

Some companies have adopted technologies, which are aimed at controlling the flow of dust and therefore their effect on the environment. Pepe Ltd taps all the dust and then safely disposed. Preventive appliances like dust musks and other clothwear are supplied to workers by various companies. Measures should be taken to explore into possibilities of adopting technologies, which taps dust, settled and then safely disposed of.

(2) Smoke. It is emitted by 5 of the industries visited. Chloride Metal and Portland uses heavy oil, which releases thick smoke. Smoke becomes a problem especially if the neighbourhood is settled by the people, for example Athi River Mining although

releases a lot of thick smoke is very close to schools and residential areas. This scenario poses danger to the human life and environment in general.

Excessive smoke threatens clean air, which supports life. Efforts must therefore be made to adopt technologies, which at most releases least smoke. Industries such as Chloride Metal and K.M.C. and Portland have put up tall smokestack, which emits smoke into the atmosphere. Smoke filtering instruments similar to the one adopted by Chloride Metal would be preferable. A clean technology such as electric generated power can be encouraged for environmental safety.

(3) Heat. Workers exposed to too much heat at their working place have higher chances of lowering their performance because of deteriorating health. Only 3 out of the 12 industries were observed to be generating excessive heat specifically Portland, Chloride Metal and Autospring. The threat from heat was observed to be a problem within the factory.

(4) Noise. Excessive noise impair hearing and psychology of people exposed to such noise. Five of the 12 industries generate dangerous noise namely: Werrot, Portland, K.M.C., Athi River Mining and Autospring. Noise pollution is predominantly felt within the factory and only rarely does the effect spill over to the neighbourhood like in Athi River

Mining and Portland.

Workers should be provided with instruments which minimise the impact of noise. Technological development towards noise free technology should be pursued. This will depend much on the type of production/products involved for example Autospring cuts and shapes metal, while Santowel produces textile, the later being almost a pollution free industry.

(5) Toxic Smell.

Accidents involving toxic chemicals and radio-active materials can occur in plants in any region. Industrial accidents and their consequences are to a large extent unpredictable. Particular care is required in dealing with toxic chemicals and hazardous wastes and in contingency planning for accidents (W.C.E. 1987).

Out of the 12 industries 3 were identified to be producing toxic smell: Bluetan, Chloride Metal, and Galsheet. The greatest impact was observed at Chloride Metal, which manufactures lead metal. About 15 workers out of the 60 workforce were established to be out of active duty because they have been adversely affected by the toxic smell from the plant. Bluetan uses chrome and the toxic smell is believed to be having traces of the chemical and Galsheet also generates toxic paint smell, which is a problem mainly to workers within the

factory. Although a company like Chloride Metal is taking dietary and clinical measures to safeguard workers' health, never-the-less these measures have proved less successful. The management should provide workers with effective gas musks or automate the production process.

A critical view need to be taken on the value of human life as compared to the benefits, which accrue from these products. Man's quest for wealth must not be pursued even at the detriment of human life. It is unethical to promote production at the detriment of human life. The most serious case is that of Chloride Metal where most people who are exposed to the chemical become literally unproductive and no longer live a healthy life. This makes us to question the philosophy behind production and economic growth.

CHAPTER SIX

6.1 PLANNING AND POLICY FORMULATION FOR INDUSTRIAL DEVELOPMENT.

6.2 Summary of Findings.

Athi River town is going to attract greater industrial activities in future because of the inherent locational advantages and opportunities therein. The study has found that the most important locational factors, which have been responsible for attracting industries to Athi River town are: cheap good industrial land, market for industrial products mainly Nairobi City, and excellent communication system.These locational factors are expected to be in place in future, therefore they will continue to attract more industrial activities to the town.

The findings of this study concurs with previous studies of Smith (1971), Cooper (1975), Isard (1956), Isard et al (1969) and Townroe (1986). These researchers found out that market, communication and suitable industrial land are very important industrial location factors.

Athi River town has been undergoing rapid industrialization having recorded 8 industries in 1970s, 12 in 1980s and 7 in 1990s respectively. Although 1990s cover only two years 7 new industries have been put up while 8 industrial premises were observed to be under construction during the field

survey. Industrial growth rate during 1980/91 is calculated to be 10 percent compared to the projected growth rate of 6.4 percent, so over 30 industries will be expected to be put up in the 1990s. By the year 2000 the town will host over 50 industries notwithstanding those expected from the E.P.Z..

Industrial sector contributes over 80 percent of the total employment in the town. The employment has been rising rapidly recording a threefold increase in a decade from 1028 in 1980 to 3128 people in 1991 for the 12 industries under study. The rising trend in employment is attributed mainly to emergence of new industries and expansion by the existing industries.

The rate of increase of employment nearly doubles the rate of increase in production. During 1980/90 production and employment rose by 93 and 170 percent respectively for the 5 industries with both production and employment data for the period. For every 1 million shillings rise in output only 2 more people are employed. The average capacity utilization for the 12 industries is 60 percent, which corresponds to the national situation. If the idle capacity of the 12 industries can be used employment in these industries can rise by 2503 people.

The employment growth rate during 1980/91 stood at 10.6 percent compared to the projected growth rate of 4.4 percent. By the year 2000, it is anticipated

that total employment from the industrial sector will be about 10000 people, excluding the underutilized industrial capacity and employment expected to be generated from E.P.Z.. Therefore the rising trend in the employment gives an impressive picture nearly tripling in a decade. This shows that the future contribution of industries in employment creation is bright.

On average 57.5 percent of the workers from the 12 industries come from Machakos District with the rest coming from other parts of Kenya. Therefore industrialization of Athi River town benefits the hinterland through employment creation. Such benefits will only continue to accrue when the district focus in employment remains in force.

Infrastructure provision is very instrumental in shaping and accelerating industrialization. Electricity and security of life and property are adequately met. Railway transport although available, is very rarely used. Lack of abundant good quality industrial water has been responsible for discouraging industries, which use high quality water. Borehole water, which is used by many industries has high mineral content and therefore unsuitable for all industrial needs. Water resources in the town are poorly integrated, which exacerbates the water problem. Water from Nol Turesh Water Project has also

not been integrated with other water schemes in the town making it less useful. Also excessive exploitation of underground water may deplete ground water aquifers and increase salinity of the underground water resources. The existing sewerage and sewage facilities are being superseded by the growth of the town serving only limited areas and poorly maintained. To cope up with the increased demand for sewerage and sewage treatment works, redesign and development will be important.

The town has poorly designed and developed road network. Of the 12 industries visited 5 are connected with earth roads. Over 5 industries have direct entry to the main roads, Nairobi-Mombasa Road and the Great North Road and other upcoming industrial premises also have direct entry into the main roads. These two roads must be protected to preserve their international status. There is great need to plan properly, redesign and upgrade the road network within the town. Once planned, roads should be developed progressively in response to increasing need especially for industries currently linked with earth roads.

There is housing shortage in the town. There are 1329 housing units while the 12 industries visited employ 3127 people, already showing a deficit of 1798 housing units, excluding employees from other industries and other sectors. There is also

mushrooming of slums/squatter settlements because of housing shortage. There is also lack of health facilities in the town to cater for emergencies like industrial accidents and increasing demand. This will require that the town council and the central government work on modalities of how to build hospital(s) in the town.

The rate of infrastructure provision has not coped up with the rate of growth. This is clearly manifested in the problems of sewerage and sewage system, earth roads linking the industrial premises, shortage of water and others explained above.

The town's development is still governed by a 1970 development plan, which is outdated and cannot be useful in guiding the rapid development in the town. There is also confusion of who should plan and control development in the town, which is responsible for the haphazard development in the town currently.

Industrial pollution in the town poses a real threat to a descent and a healthy life. Pollution needs a consistent evaluation and monitoring network to establish the trend therein' which will provide a framework of control. Pollution if left unchecked poses great danger to human life and the general ecosystem which man continues to depend on for a healthy living.

Some industries can be considered as generally

safe and therefore desirable for example Pepe Ltd, Santowel and Kenya Thread. These industries generate least wastes most of which are reused or recycled. With dust musks and other working equipments they do not pose any threat to human life.

The other category of industries is like Autospring, Werrot, NOVA and K.M.C. do not pose serious threat to human life. With most of their solid wastes recycled or reused in other production processes, measures can be taken to minimise pollution from these industries. The noise pollution is only marked within the Autospring factory.

Industries which are considered to be having serious potential for pollution of the environment are: Chloride Metal, East African Portland, Athi River Mining and Bluetan. East African Portland and Athi River Mining are dangerous in noise, solid wastes dumping and dust. Noise pollution is mainly felt by the workers while solid wastes are dumped haphazardly within and outside the factory premises. These problems should be of great concern to policy makers. Bluetan and other leather industries, without proper and consistent treatment works can be extremely dangerous to aquatic and terrestrial life, which get in touch with it especially river Athi. Wastes from Chloride Metal, Bluetan, and similar industries must be consistently monitored to make sure that they are

safe. At the time of the survey about 15 of the 60 employees of Chloride Metal were already adversely affected by lead chemical and can no longer work.

Industrialists must strive towards adopting low and non-waste technology in various respects. Clean technologies need to be considered where applicable and feasible. The current solid waste disposal ground must be transferred to a more suitable site. The current sewage treatment works need to be modernised to cope up with increasing needs. Effluent discharged by the treatment works must be constantly monitored to ensure that the discharged waste water is safe.

Kenya has weak institutions and laws relating to industrial development, pollution and environmental protection. Kenya lacks industrial pollution control standards and expertise to scrutinise thoroughly the papers of prospective industrial investors before they set up industries. There is no central authority with the necessary expertise and power to co-ordinate all industrial development. There is no consistent and elaborate criteria for approval of industries. Therefore any dangerous industry can set up without noticing, which has happened in several cases in Kenya.

The country needs to build institutional capabilities to enforce environmental protection laws as a concrete measure towards environmental

protection. Also lack of pollution laws makes it even more difficult to enforce what is not there.

In Kenya there is no central authority with the necessary expertise and power to co-ordinate all industrial development. There is a clear indication that the government is merely paying lip service to environmental conservation and has instead chosen to encourage industrialization without due precaution.

Bithwetti (a Senior Industrial Development officer) observes that the ministry's primary aim is to promote industrial development, little attention is taken concerning pollution consequences after that. The potential investors may be reluctant to put up pollution control devices, which is normally very expensive. Kenya has not developed industrial pollution control standards, which makes it impossible for any realistic pollution control to be carried out. Kenya lacks the necessary expertise to scrutinise thoroughly industrial investments before the premises are put up.

Mwake (a Consultant with U.N.I.D.O.) notes that some industries allowed to operate in Kenya have been unable to meet pollution control standards in their home countries. They therefore pose a great threat to environmental safety in Kenya. He gave an example of leather industry, which uses chrome, which is highly toxic. He further noted that it is unnecessary to make

laws which cannot be enforced.

Mwangi (a Chemist at the National Environment Secretariat (N.E.S.)), says that N.E.S. is concerned with the establishment of industries for promotion of peoples' welfare. The Inter-ministerial Committee has been formed by N.E.S. to provide inter-displinary component when addressing issues. This committee in pursuit of her work looks at: (a) industrial siting criteria; (b) monitoring of existing industries; (c) establishment of environmental guidelines and standards of proposed industries; and (d) monitoring of the laid down guidelines and standards. Conduct inspection of waste management and then make recommendations.

He further observed that industrial pollution control is carried out on phase by phase basis in order not to put burden on industries. N.E.S. expects industrialists to comply with pollution control requirements. Industries create employment and other social benefits and so should be encouraged to grow.

N.E.S. should work with Ministry of Industry to scrutinise the papers of prospective investors, never-the-less this rarely happens. Only in cases where foreign funding is involved is when N.E.S. is invited to contribute. While some industries are approved by the D.D.C. and are never referred to the Ministry's head office other industries are approved by the

Ministry of Industry without consulting other interested parties.

In Kenya there is no consistent and elaborate criteria for approval of industries. Any dangerous industry can easily locate without notice. Such industries have turned out to be devastating like in Kel (in Thika). This clearly shows that Kenya does not have tight control over industrial pollution through development approval.

He notes that N.E.S. lacks the personnel to undertake full industrial inspection and therefore concentrate on only problem areas. N.E.S. relies on individual ministries for inspection of cases of specialised pollution. Therefore the role of N.E.S. in pollution management is highly constrained. N.E.S. notes that industrialists have been unco-operative and have failed to appreciate the role of N.E.S..

He further states that the Ministry of Environment and Natural Resources is working on a sessional paper which will create a legal framework upon which environmental conservation/preservation will be administered. With respect to industrial pollution, to complement the Sessional Paper on environment there is need for competent and pollution monitoring network, which can provide a viable and comprehensive information for planning and management.

6.3 Recommendations.

In order to stimulate economic growth of Athi River town in an environmentally sustainable manner the following suggestions are made:

(1) Athi River town Development Plan should be revised to effectively manage the rapid growth in the town. The responsibility to plan, co-ordinate and control development of the town must remain the sole responsibility of the Machakos District Physical Planning Officer, for an orderly development control.

(2) The Ministry of Lands, the Ministry of Industry and the Athi River Town Council should set aside ample land for future industrial development, such land should be well planned and if possible provided with infrastructure and made available to investors at favourable rates.

(3) The Town Council, Central government and other interested agencies need to develop adequate infrastructural facilities specifically:

(a) (i) Integrate all the water resources in the town.

(ii) Mobilize funds to finance connection of water pipes nearer to consumers once the E.P.Z. plan to tap water from Nairobi to Athi River is developed (funds are already available).

(iii) The Ministry of Water Development need to

monitor the rate of exploitation of underground water resources within the town council. Over-exploitation of the resource may deplete the aquifers and increase salinity after that.

(b) Since E.P.Z. is planning to develop a modern sewage treatment works and trunk sewerage lines, the town council and the central government should work out ways of generating resources to serve sewerage lines nearer to the needy consumers.

(c) The Town Council and the Ministry of Health should work out ways of developing a modern hospital in the town.

(4) Department of Physical Planning, Ministry of Public Works and Athi River Town Council should work out the possibilities of planning, redesigning and developing road network within the town. This should be done with the intension to:

(i) preserve the international trunk roads (Nairobi-Mombasa Road and the Great North Road);

(ii) improving access roads within the town especially to industries and residential areas;

(iii) to examine the possibilities of extending the dual carriageway from the JKA Resort Club to Athi River Town Centre.

(5) There is need to promote industrial development and optimum capacity utilization and fully integrate the industrial sector with the total economy. Problems of shortage of raw materials, small management and poor management were responsible for the production below capacity. These problems can be minimised through: sound economic policies and individual industries encouraged and supported to improve their management capabilities.

(6) The government of Kenya must develop a competent and efficient institutional and legal framework to deal with industrial development and industrial pollution.

(a) The Ministry of industry with other interested parties must work on procedures of how industrial development can be co-ordinated with respect to approval of new industries. They must develop the much needed expertise to authenticate the level of pollution from every prospective industrialist.

(b) The Ministry of Industry with other related institutions should work out industrial pollution standards, which is still lacking in Kenya.

(c) An elaborate and enforceable industrial pollution laws should be worked out by the

Attorney General, Ministry of Industry and other related institutions.

(d) An Industrial Pollution Monitoring and Evaluation Network should be developed by the Ministry of Industry. For the institution to be effective it must be equipped with experts, equipments and capital backed by strong legal system.

(7) Every industry should be encouraged and supported to adopt low and non waste technology, clean technologies such as those involving recycling or reuse of wastes where feasible:

(a) K.M.C. should work out the possibilities of developing biogas to use cow dung for lighting, which will help conserve electricity and use cow dung productively.

(b) The town council dumping ground must be relocated to a more suitable site.

(c) Pollution control personnel should consistently monitor the effluent from Chloride Metal, Bluetan and other similar industries.

(d) The town council with other interested parties must control dumping of limestone, kun kur and soils/ debris from construction sites. The town council should liaise with Portland Co. and Athi River Mining to remove the solid wastes they have haphazardly dumped in the town. The two

companies should meet the cost of removing the wastes. The affected industries should be asked to remove the soils and debris generated when industrial premises were being built.The solid wastes should be dumped in the abandoned quarries.

(e) measures should be taken to explore into the possibilities of adopting technology, which traps the dust, settled and then safely disposed like has been adopted by Pepe Ltd.

(f) measures should be taken to explore the possibilities of lowering the effects of heat from industries.

(g) Workers should be provided with instruments, which protect their ears from dangers of noise (where applicable).

(h) Industries, which release smoke should adopt smoke control filters as has been adopted by Chloride Metal.

(i) Automate production process where production involves toxic wastes like Chloride Metal or provide workers with gas musks.

(j) industries involved in similar effluent should develop an integrated waste treatment works like for all leather industries.

Figure 2 below shows a summary of the recommendations.

A Guide to Industrial Development.

To achieve industrial development in Athi River town

Athi River town Council should:
(1) Revise the town plan
(2) Set aside ample industrial land
(3) Develop industrial industrial infrastructure to cope with demand
(4) Control dumping of all solid wastes
(5) Relocate existing dumping ground.

The central govt should (1) co-ordinate all industrial development (2)improve national economic performance (3) Plan, redesign and develop all the needed infrastructure in the town(4) Develop industrial pollution standards and laws (5) Develop industrial pollution control monitoring and evaluation network.

Figure 2

Source: Author 1992.

6.4 Conclusion.

The research topic of this study was: **Industrialization of Athi River town.** The objectives of the study were to: examine the locational factors which have attracted industrial activities to Athi River town, the socio-economic effects of industrialization on the town and to suggest policy measures to aid in the orderly growth of the town.

The industrial growth rate and employment growth rate in Athi River town is much higher than the national projected growth rate. This shows that the town has great potential for industrial development. The great potential is attributed to proximity to the major market (Nairobi), cheap good industrial land and good communication.

The rate of infrastructure provision do not cope up with the rate of industrialization in Athi River. Athi River town's growth is characterised by haphazard development because of lack of upto date town plan and weak administration system to administer the development. Town development is still guided by the 1970 Development Plan.

To achieve meaningful industrial development in the town, there is great need to co-ordinate all industrial development activities through planning, infrastructure provision and development control.

Also, industrial development policies need to be revised both at the national and local levels to make them more effective in meeting the needs of the society.

6.5 Research Needs.

Industrial promotion strategy should be done selectively. This is because resources are scarce and must therefore be invested in areas where they can produce the best results. Before any investment is carried out in an area, research should be carried out to establish potentials therein. This is particularly in relation to infrastructure development. There have been cases where the government provides infrastructure in areas with no potential for growth causing wastage of scarce resources. Feasibility studies should be carried out before any investment is made and such studies must include; expected requirements, benefits and costs.

There is a very clear evidence that industries unable to meet environmental standards in the developed countries are moving to the developing countries such as kenya. In the case of Kenya there is great need to establish the actual level and rate of pollution. Further research should be conducted on the suitable pollution standards. Research should also be focused on industrial pollution legislation and it's

administrative system to make them more effective in pollution management. Research should be directed particularly on how to integrate all agencies involved in pollution management in order to avoid any loophole in pollution control administration.

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THE QUESTIONNAIRE FOR THE INDUSTRIALISTS IN ATHI RIVER (Please note that the information given here will be treated as confidential)

1) a) Name of respondent..... b) age.....
Nationality..... d) highest level of education..... e) professional training.....

f) position in the company.....

2) When/where did this company start other than in Athi River.....

3) When was this company established in Athi River....

4) When was the final decision taken to build it in Athi River.....

5) What were the basic causes for considering this location (a) market..... (b) raw materials..... (c) cheap good land..... (d) favourable government policies..... (e) others, specify.....

6) Which of the four above are the most important (1).....5 (2).....4 (3)...3 (4)....2

7) What is the size of land owned by the company at the site..... what is the size actually in use.....

8) In case of future expansion do you think this land is adequate.....

9) How much more land would you need for future expansion.....

10) What is the cost of land in Athi River town in Ksh...../acre.

11) Do you think this price is better compared to say Nairobi.....

12) Are you aware that the government is encouraging industrialists to start industries outside Nairobi and Mombasa.....

13) Can you name some of the incentives offered by the government in relation to Q12 above
a).....
b).....
c).....
d).....

14) In your opinion are these incentives adequate.....

15) Please can you explain further Q14
.....
.....

16) Particularly can you identify two incentives which attracted you here 1).....2).....

17) Is your factory served with : a) water.....
b) electricity..... c) electricity.....
d) sewerage..... e) tarmac road.....
f) railway..... g) security.....

18) In your opinion are they all adequate.....

19) Which ones are in short supply:
a)..... b).....
c)..... e).....

20) How does the inadequacies affect your operation
a).....
b).....
c).....
d).....

21) How can these problems be solved
a).....
b).....
c).....

22) Which institutions should work towards alleviating some of these problems in Q19
a).....b).....
c).....c).....

23 Please fill in the table below: Employees.

yr	noempl	magmt	tech	others	casual	pmnt
yr1						
yr2						
yr3						
1980						
1981						
1982						
1983						
1984						
1985						
1986						
1987						
1988						
1989						
1990						
1991						

24 Please indicate in the table below, three major inputs used

Name.....%.....source of inputs (places).
1)..... .....1)..... ...% (2)..... ....%
2)..... .....1)..... ...% (2)..... ....%
3)..... .....1)..... ....% (2).... ....%

25 Fill in the table below output (Ksh)

80	81	82	83	84	85	86	87	88	89	90	91

26) Is the firm optimumly utilized.....
what capacity is currently utilized.....

27) Why do you use such capacity.....

28) What are the three major forms or type of wastes from your factory (type & quantity respectively)
a).....b).....
c).....

29) where do you dispose or discharge your wastes
a)..... b)..... c).....

30) Do you consider these disposal facilities adequate
.....explain.....
.....

31) How safe are these disposal facilities, explain.....
.....

32) In your opinion what can be done to improve these disposal facilities .....
.....
.....

33) What are some of the environmental conservation measures that have been carried out by the company
.....
.....

34) What are some of your future environmental conservation plans .....
.....

35) Where do you draw your employees from (specify region a)..... ....%
b)..... ....% c)..... ....%

36) Is there adequate residential housing in the town
.....

37) Do you provide housing to your employees.....
if yes where.....

38) Where does the rest reside.....

39) Do you pay service charge.....how much.....

40) Have you benefited from service charge.....

41) Is there any interrelationship between this company and any other company a) within Athi River.....
b) other place like in Nairobi.....
What is the relationship.....