Rapid Urban Growth and its Environmental Impacts in Rabak Town.

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Abstract:

This study was conducted during 2007- 2010 in Rabak town, the capital of the White Nile State, in an attempt to know the facts behind the rapid urban growth of the town, and the magnitude of the environmental impacts due to these factors , in order to recommend some mitigation measures to prevent or decrease these impacts.

The historical, the descriptive, and the analytical, are the main approaches adopted in this paper. For collection of data, documentary sources, observation, questionnaire, interviews, laboratory test and measuring of pollutants were adopted. This was done to know the present situation of the components of the environment, and the magnitude of the environmental impacts in addition to the mitigation measures and management plan to be adopted.

The investigation shows that the major factors behind the rapid urban growth of the town include: the physical environment of the area, the location of the town, the connection of the town by different means of transport, the availability of factories, the selection of the town to be the capital of the state in 1994, and the construction of the new bridge in 1980s.

The study reveals that the above factors, in addition to their positive effects have negative impacts represented by air pollution where the process of burning sugar cane in Assalya caused the emission of CO (carbon Monoxide) to be 1.5ppm (part per million) in block 23 which considered high in relation to the normal one 0.03ppm (part per million). Soil pollution due to the dust of the cement factory is found to the south west of the factory, where the gypsum represents 12.9% of the sample tested, which considered high and its used in cement manufacturing, socio-economic problems, planning problems and traffic congestion took place.

The investigation proposed major recommendations expected to improve the environment, include mitigation measures that should be adopted in factories cause pollution, the importance of applying laws and legislations to protect the environment, the integration of the environmental dimension in development schemes in all phases and the adoption of the environmental impact Assessment (EIA) in present and future schemes.

المستخلص:

أجريت هذه الدراسة خلال الأعوام 2007- 2010م بمدينـة ربك عاصمة ولايـة النيل الأبيض في محاولـة لمعرفة العوامل التي أدت إلى النمو المتسارع للمدينة ومعرفة حجم الآثار البيئة الناجمة عن هذه العوامل بغرض وضع إجراءات للتقليل من هذه الآثار أو منعها.

اتبعت هـذه الدراسـة المنهج التـاريخي والوصـفي والتحليلـي لجمـع المعلومـات واعتمـدت الدراسـة علـى مصـادر المعلومـات والملاحظـة الاستبانة والمقـابلات والفحص المعملي وقياس الملوثات وذلك لمعرفة الوضـع الراهن لمكونات البيئة وحجم الآثار البيئية إضافة لإجراءات التقليل والخطة الإدارية لإتباعها.

أظهـرت الدراسـة أن العوامـل الرئيسية وراء النمـو المتسـارع للمدينة تتضـمن العوامل الطبيعية وموقع المدينة وربط المدينة بعدة طرق نقل ووجود المصـانع المختلفة, واختيار المدينة لتكون عاصمة لولاية النيل الابيض عام 1994 وانشاء الكبري الجديد في الثمانينات.

أوضـحت الدراسـة أن العوامـل أعلاه والتي أدت لنمـو المدينـة المتسـارع لهـا أثـار ايجابية وأيضا لها أثار سالبة تتمثل في التلوث الهوائي حيث أن عملية حرق قصب السكر بمصنع عسلاية تسبب انبعاث أول أكسيد الكربون ليصل إلى 1.5 جزء من المليون في مربـع 23, ويعد هـذا عالياً مقارنـة بنسبته العاديـة 0.03 جزء من المليون. أيضا تلوث التربة نتيجة لغبـار مصنع الاسمنت قد وجد جنوب غرب المصنع حيث وجدت نسبة الجبص 12,9% من العينة المختبرة, وتعد نسبة عاليـة وتدخل هذه المـادة في صناعة الاسمنت إضافة لمشكلات اجتماعية واقتصادية ومشكلات تخطيط وزحمة المرور.

دفعت الورقة بمقترحات رئيسية يتوقع منهـا تحسين الوضع البيئي, تتضمن عمل إجراءات التقليل للمصانع التي تسبب التلوث, ضرورة تطبيق القوانين والتشريعات لحمايـة البيئة وضـرورة إدخـال البعد البيئـي في جميـع مشـاريع التنميـة وبجميـع المراحل , وضرورة تقييم المردود البيئي للمشاريع القائمة والمستقبلية.

Introduction:

Urban growth and the environment represents a problem in many parts of the world, especially in Africa, where the pull factors in urban centers lead to mass migration from rural areas to urban ones. This situation has many environmental impacts that need to be assessed in order to know their magnitudes, and consequently plans for the management of these impacts.

The study area for this paper was Rabak town, Fig.(1).The capital of the white Nile state , this town has recently witnessed rapid urban growth as a result of many factors including its physical aspects, location, availability of sugar industries around the town and cement factory inside the town. This situation makes the town more attractive to migrants from different parts of the Sudan.

The pull factors have positive effects on the study area, and at the same time they have negative impacts, so this paper aims to assess all these factors in order to know their magnitudes and making plans for the treatment of pollutants, planning and socio- economic problems.

Research Problem:

Research problem could be stated in the following questions:

1- What are the factors behind the rapid urban growth of Rabak town?
2- What are the environmental impacts caused by these factors?

Fig . (1) Location of Rabak Town
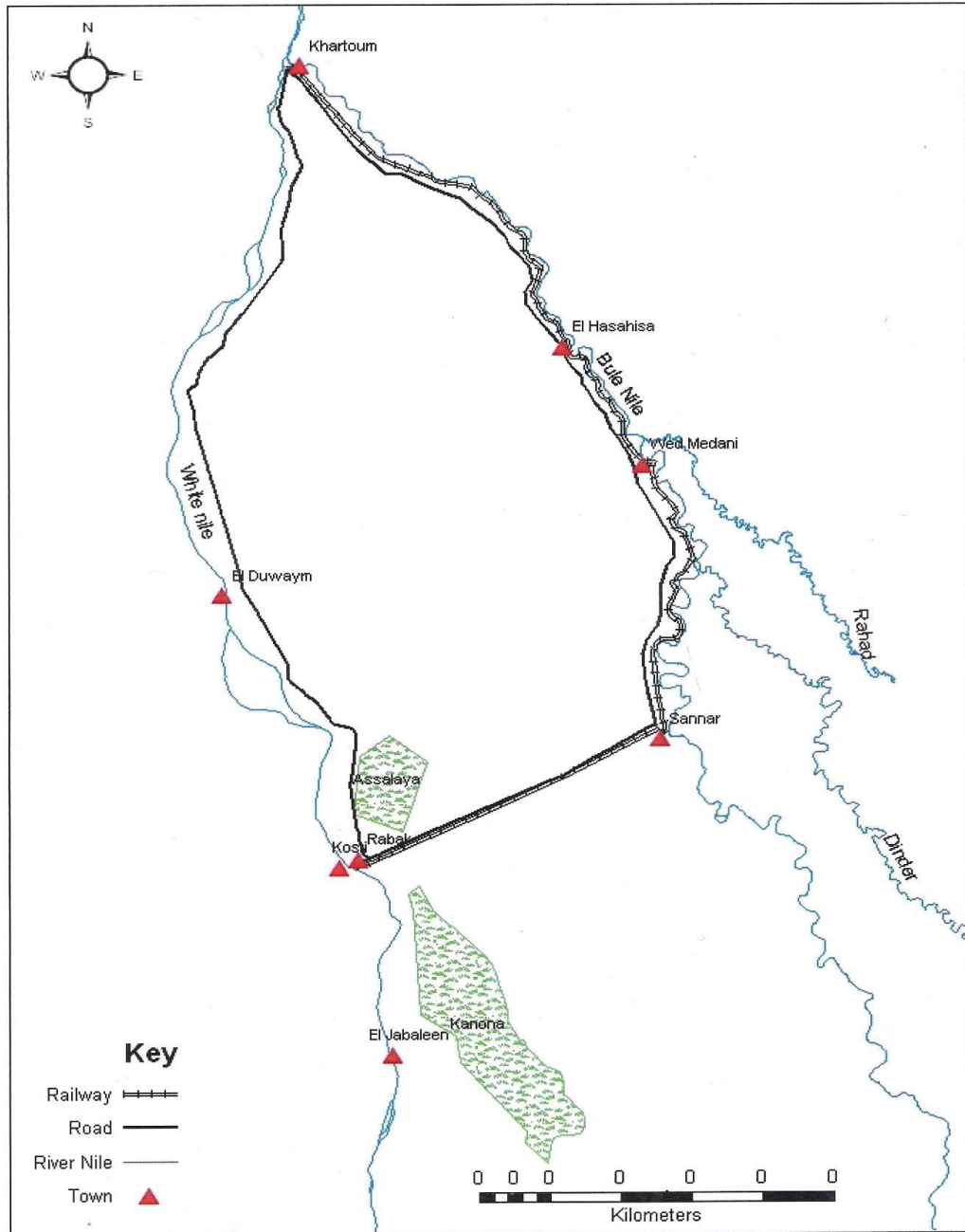
Source: CBS Sudan2010

3- What are the magnitudes of the environmental impacts caused by these factors?

4- Do these impacts have any negative effects on the environment of the area?

The Objectives of the Research:

The objective of the research could be summarized in the following

Points:

1- To know the facts behind the rapid urban growth of the study area.

2- To know the environmental impacts due to the rapid urban growth.

3- To assess the magnitudes of the environmental impacts.

4- To recommend measures to be adopted to mitigate the negative impacts and to augment the positive consequences.

The Hypotheses of the Research:

1. The following factors are expected to be the reason behind the rapid urban growth of Rabak town:

  a. The location of the town.

  b. The physical environment of the area.

  c. The connection of the town by the 3Rs (Road, Railway and River)

  d. The availability of factories around and inside the town.

  e. The construction of Kosti new bridge in 1980s.

  f. The selection of the town to be the capital of the whit Nile State.

2. The environmental impacts caused by the above factors could expect to cause the following:

  a. Air Pollution.

  b. Soil Pollution.

  c. The availability of squatter settlements on peripheries of the town.

  d. Internal migration.

e. Traffic congestion.

f. Deficit of services in some residential areas.

g. Planning problems.

Research Approaches:

The approaches used in this research are:

a. The historical approach: This approach was used to know the history of the town in order to make comparative study between the past situation and the present one of the town.

b. The descriptive Approach: This approach was used in knowing the physical and human aspects inside the town through observation technique , this include the soil, the drainage system, the morphology of the town, the houses of people, the means of transport, the services and the activities of the people.

c. The Experimental approach: This approach has been adopted for measuring some pollutants in addition to laboratory tests for some components of the environment e.g. air, soil, etc.

d. The Statistical approach: Through this approach statistical analysis took place through tabulation, percentages averages etc. from the obtained data.

Research Methodology:

The sources of data for this research include the following:

1. Documentary sources.

2. Observation.

3. Interviews.

4. Questionnaire.

5. Laboratory tests for soil pollution.

6. Measurement of air pollution.

1- Documentary sources:
   a. Published Sources: Published data is of great importance to any study, the research benefited a lot from similar or relevant topics, seminars, workshops and papers related to the field.
   b. Unpublished Sources: The research make use of different ministries inside the state e.g. ministry of construction and planning, health and agriculture. Unpublished thesis in universities were used.

2- Observation:

It represents one of the field survey techniques; the observation includes the following features:
   - The prevailing environment.
   - The squatter settlements.
   - Traffic congestions.
   - Pollutants inside the town.
   - The natural drainage system inside the town.

3- Interviews:

The researcher asked certain questions about specific topics related to the field of study. Such interviews covered both individuals and groups, the following are the main respondent.
   - Local government officials.
   - Officials in cement and sugar factories.
   - Health officials in protective and curative health.
   - Town planners.
   - Local leaders in the town.
   - Elder men in the society.

4- Questionnaire:

The researcher depends on this technique for collecting data from respondents. The questionnaire was composed of 62

questions covering all topics of the research; the questions have been structured to contain the following points:

- Socio-economic impacts of industries.
- The physical characteristics of the town.
- The internal migration.
- The pollution cause by the cement and sugar factories.
- The impact of urban growth in planning.

The Sampling Procedure:

An area random sampling was adopted in selecting respondents inside the town. It was based on the administrative distribution (Fig 2) where there are 47 populated residential areas with total population 114.489 (Statistical Report of Ministry of health). 10% of the residential areas were selected randomly for household questionnaire and from the whole residential areas 5% of household were selected randomly, then the following formula was conducted to determine the number of the sample in each residential area (table 1.):

$$n = \frac{x\ y}{\varepsilon\ x}$$

Where:

n = the number of the sample in each residential area.

X = the number of families in each residential area.

Y = the number of whole selected sample (5%)

ε X = the whole number of the families in the selected areas.

The results are as follows:

(Table 1.): **The Selection of the Sampled Families in the Study Area**.

Sample Area	Total No. of Families (x)	No. of Sampled Families (n)
1. Block 1 El Amara	1294	65
2. . . . Block 4 New	5252	262

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Rabak		
3. . . . Block 29 North	4661	233
4. . . . Block 45,46,47 Quz Abu Gima	4025	201
5. Block west El khor	2575	129
Total	17807 (εx)	890 (Y)

**Measuring Air Pollution Resulted from Assalaya Sugar Factory**:

For measuring air pollution resulted from the adjacent sugar factory **Assalaya** a gas detector was used to know the presence and concentration of gases resulted from burning sugar cane in this factory.

Laboratory Analysis for Soil Pollution Resulted from the Cement Factory:

For testing the soil pollution caused by the cement factory, a sample of the soil from one area around the cement was subjected to laboratory analysis in November 2009, to know the presence of the dust on the soil.

Data analysis and interpretation:

The data obtained by using the methods above was subjected to statistical computation and analysis by using the statistical package for Social Sciences (SPSS) to test the hypotheses stated earlier.

Fig . (2) Rabak Town
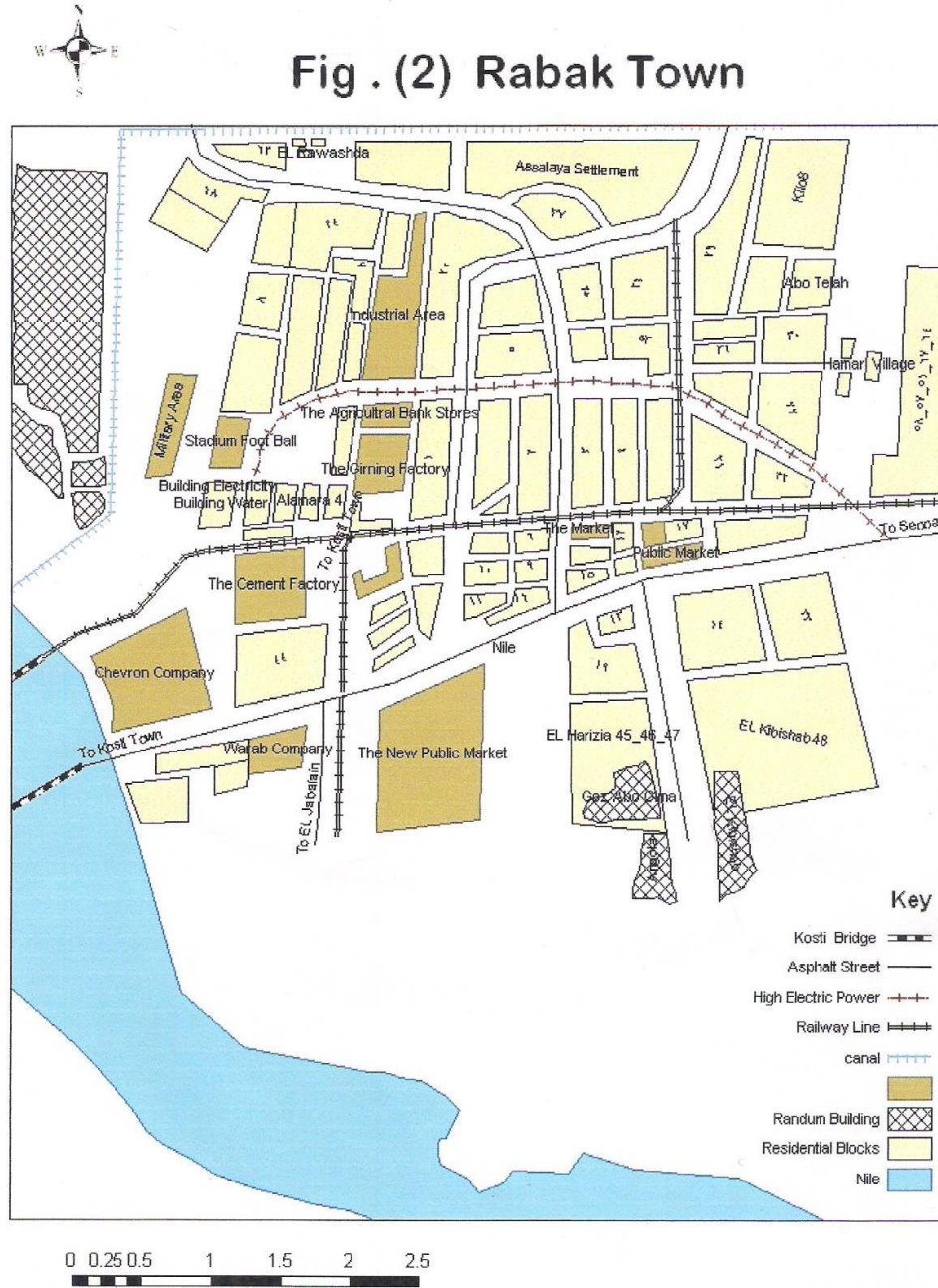
Source: Rabak Survey office 2009.

Literature Review:
Concepts:
Urbanization:

Breese (1966:3) defines urbanization as "being the process of becoming urban, moving to the city, changing from agriculture pursuits common to cities and corresponding change of behavioral patters" For him urban population in newly developing countries consists of recent migrants, who have no influence on their new societies, nor any means of a achieving control over their environment. Moreover, the vast majority of urban population in these developing countries maintains very law levels of living.

On the other hand, western forms of urbanization have been developed to the point where by different means; the ordinary citizen can make some impact on the environment in which he lives.

Urban Growth in Developing Countries:

Hance (1965) cited by El Imam (1999) concerns him with urbanization in developing countries. He reveals a number of contrasts between urbanization in Africa and that in developed Western world. These contrasts are:

- Growth rates of major centers are more rapid in Africa.

- There is a less correlation between rates of urban growth and measures of economic growth.

- Urban growth is often parallel by a comparable development in the rural areas i.e. Push factors are more influential in rural Africa compared with Europe.

- Linkages of some cities with their hinter lands are less developed.

- There is relatively less specialization in Africa cities and higher rates of unemployment and under employment.

- Differences in outlook and values which may adjust to the city and reduce the tempo of its economic life e.g. reliance on extended family for support.

According to Abu Sin (1991), the urbanization is either a direct result of dramatic and rapid process, or functional one. It is clear that dramatic urbanization is closely related to the developing countries where the process is a direct consequence of mass- urban migration and natural growth of urban population. These two facts are found in the study area that leads to the rapid urban growth.

Mohammed (1966: 269) mentioned that urbanization in developing countries is characterized by a wide spread of unemployment and poor urban living conditions. Consequently, disparity in terms of life chances and style, in addition to a socio- economic stratification of urban population, are the outstanding features in urban centers. He concludes that this situation has been reflected on spectral structure of the city and on housing situation in particular.

Impact of Urbanization and Industrialization on Environmental Problems:

As happens in all industrialized and developed parts of the world, changes in social structure and rapid economic

development in the developing countries bring with them some new and important problems (UN.1971).

The growth of population, industrialization, levels and diversification of consumption, new technologies, increase in transport and tourism activities, and the need for recreation all have some serious impacts on the daily life of individuals and communities. They also pose important environmental problems, the intensity of which may certainly vary from country to country throughout the world (Ibid)

Industry in Sudan:

Industries in Sudan are existing in a very low density and most of them depend largely on the agricultural products and the other natural resources. Consequently the industrial establishments are found either attracted by source of raw materials or concentrated in large cities. Therefore, the Sudan industries with their discriminating activities could create intensive waste problems of local nature (El Zain: 1982).

All industries in the country are light industries aiming at satisfying the consumers' requirements and there is a real bias towards agro- industries because of the availability of raw material and the high agricultural production potentials of the country (Ministry of Industry, 1971-1973).One of the light industries that aim at satisfying consumers requirement are the sugar industries.

Industrial waste:

Industrial waste represent a problem in developed and developing countries especially the way of treating or recycling these wastes, and usually in developing countries the location of industries is found closed to residential areas, so

the people who live around industries will be affected by the pollutants of these industries, whether these pollutants are gases, solid or liquid or noise. Although the volume of waste produced is much less than in developed countries, the exposure levels are higher and danger to human health are greater. A more productive approach may be to control wastes better to guide new development, and to encourage the recycling of wastes by locating waste consuming industries near waste produce (Tylor et.al:1981).

Urban Growth in Sudan, Nature and Rate:

Although population growth in Sudanese towns, like other towns elsewhere, is attributed to both the natural increase and internal migration, the latter is more effective, especially in large centers, high rates of natural increase are typical of both rural and urban population. As cities gain in population from two sources, their growth is much faster than that of rural villages (EL Bushra, 1972, 9)

The spectacular growth of cities has taken place during the last two decades as natural consequences to the increasing employment opportunities in both secondary tertiary activities (Ibid).

The Sudan is far less urban than several of the African countries. In 19955/56, it was found that 8.3% of the total population was urban, by 1969/70 the percentage of the urban population was approximately 11.5% (Ibid).

The national census (1955/56) shows that 8% of the Sudanese were found to be living in urbanized areas. At present (1971/72) out of the 16 million people who inhabit the Sudan, about 2 million or 12% live in over 100 towns. This means that, the Sudan is one of the least urbanized countries,

having over 85% of its population living in rural areas (El Bushra: 1972.6).

The Factors Behind the rapid Urban Growth of the Town:

The role of Location and the Physical Environment in the Development and Growth of the town:

The location of Rabak town in the center of the country makes the town easy to be connected with the whole country, in addition to the type of the soil which is a mixture of sands and clay, this advantage makes the movement inside the town during the wet season more easier especially on the eastern part of the town. The morphology of the town is good where there is a better drainage system in the town. Most respondents mentioned that the location and the physical environment contributed greatly in the evolution and growth of the town. 35% of the sampled population pointed out that the location of Rabak town is in the center of the country, so it is easy to move elsewhere. 33.9% of respondents mentioned that the town is connected by different means of transports represented by the 3Rs (Road, Railway and River).

12.9% of respondents showed that the climate in general is better compared with other parts of the country, where there is acceptable temperature during summer and winter, and also there is a better rainfall in autumn for practicing rain-fed cultivation and animal husbandry, 10.3% explained that the town has better morphology, and this fact explained why the town has better natural, draining system from the east to the west.

Employment Opportunities in Rabak Town:

There are many factors that provide the town with employment opportunities, since the selection of the new location of Rabak in 1940, where the construction of the cotton ginning factory in 1952 represents the initial stage of employment opportunities, in addition to its contribution in solving the drinking water problem in its initial stage. The construction of the cement factory in 1964 contributed in solving unemployment problem, and late in 1970s the sugar factories in Kenana and Assalaya contributed greatly in solving this problem, this contribution has not been restricted to job opportunities only, but extended to the growth of the town,809 of respondents mentioned that there are Employment Opportunities in Rabak Town.

In considering the sampled population in this respect 74.2% of the respondents referred the reasons behind the availability of job opportunities to the availability of sugar factories around the town, 11% of them attributed the reasons to the selection of the town to be the capital of the state, 9.4% of the respondents attributed the reasons to the rapid growth of the town, while 5.4% of them referred the reasons to the cement factory (Table 2) and (Fig 3).

Table (2): Reasons behind Employment Opportunities in Rabak.

Reasons	No.	%
1.Availability of Sugar Factories	600	74.2
2. The Selection of the Town to be the Capital of the State.	89	11
3. The Rapid Growth of the Town.	76	9.4
4. The Cement Factory	44	5.4
5. Others.		0
Total	809	100

Source: Field Survey 2009.

(Fig 3). Reasons behind Employment Opportunities in Rabak.
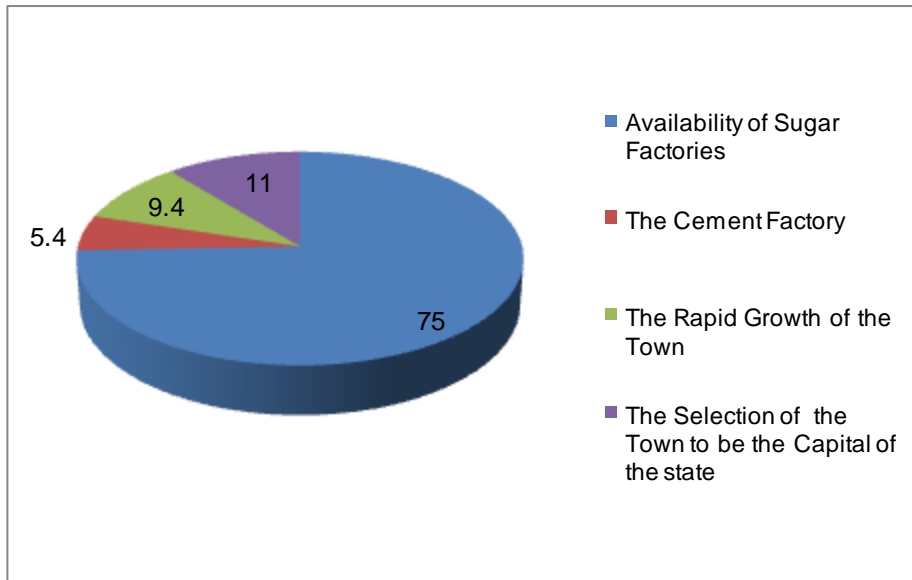
The Impacts of the New Bridge on the Growth of the Town:

The construction of the old bridge in 1910 had many problems, it was narrow and built to serve the railway line mainly, and has one direction for cars, so the contribution of the old bridge was limited, and the construction of the new bridge in 1980s played a great role in connecting Rabak town with the western region, and from that time, the impacts of the new bridge started to take place, that is why 96.5% of respondents explained that the new bridge connects the town with the whole country, 3.5% of them mentioned that the people, cars, and commodities increased in Rabak town as a result of the new bridge table (3).

It's clear that the construction of the new bridge in 1980s contributed a lot in the rapid urban growth of the town, where the town started to receive travelers, commodities, crops, and

even the flow of innovations from the capital Khartoum started to be very quick.

Table (3) The Impacts of the New Bridge on the Growth of the town.

Impacts	No.	%
1. It connects the town With the whole country.	859	96.5
2. Increase of people, cars, and Commodities in the town	31	3.5
3. Others	0	0
Total	890	100

Source field Survey, August 2009.

Fig (4)

The Impacts of the New Bridge on the Growth of the town.
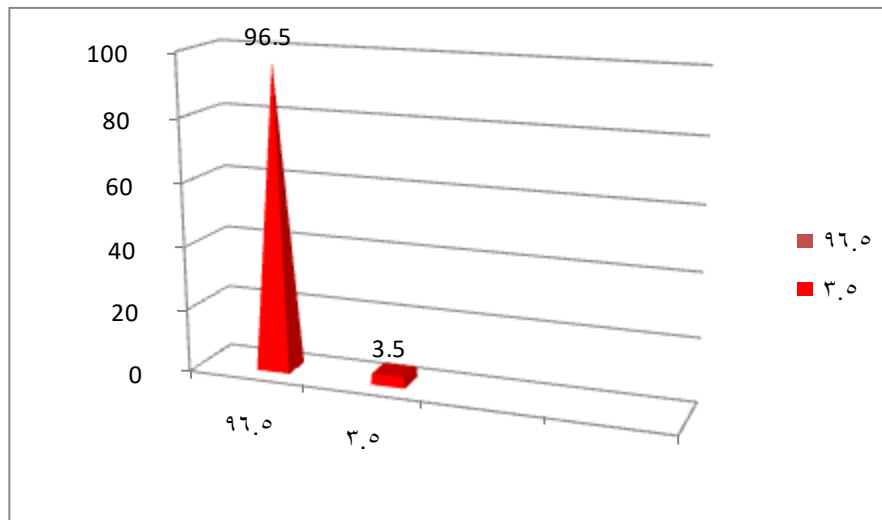
Total: No. 890 (100%)

The Environmental Impacts of the Rapid Urban Growth in the Town:

Air Pollution:

Rabak town subjected to many sources of air pollution, where the availability of the cement factory inside the town, in addition to sugar factories mainly Assalaya and Kenana, and the most effective one is Assalaya which located to the north and north east of the town in term of its plantation. For measuring the presence and concentration of gases, a gases detector that gives direct readings was used to determine the presence and concentration of gases due to the burning of sugar cane in Assalaya plantation.Block23, about 3km.from the source of burning to north east of Rabak, was subjected to the test in one hour. The result of monitoring the particulate matters shows a level of $17ug/m^3$ (microgram cubic meter) which is over the standards determined by the WHO by 60-90 microgram cubic meter per year, and 120 microgram cubic meter per 24 hours.

In monitoring carbon monoxide in block 23, it's was found that its 1.5ppm (part per million). According to Landis and HO Yu 1995, CO in the normal condition must be less than 0.03ppm (part per million), while the actual level found in block23 was 1.5ppm. This explains that there is air pollution due to the process of burning sugar cane in Assalaya factory, and Rabak town subjected to this pollution according to the prevailing winds mainly in winter.

Measurement of Soil Pollution Caused by the Cement Factory:

For measuring soil pollution resulting from the cement factory, a sample of 500gm at a depth of 30cm of the soil to the south of the factory, about one kilometer was subjected to laboratory test in November 2009. The results of this laboratory test are as follows:

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SP	Ph	Ec	Ca	Mg	Na
42.0	7.52	0.6	2.0	1.5	3.04

K	$Ca\,Co_3$	$Ca\,So_4$	Clay	Sand	Silt
0.20	4.49	12.9	32.86	58.45	8.69

Non-saline, non-sodic soils.

Gypsum content is high as indicated by $Ca\,So_4$ (12.9%), and this result shows that the area has been affected by the dust of the factory, the percentage of gypsum is high, and it represents one of the three components that used in cement industry.

The presence of the limestone ($Ca\,Co_3$) the calcium carbonates by 4.40% indicates the second component used in cement industry, the presence of the clay represents 32.86, so the laboratory test indicates the presence of all components used in cement industry, but the gypsum was high (12.9%), this shows soil pollution due to the cement factory inside the town.

Squatter Settlement in Rabak Town:

The town has started to attract migrants since the construction of the cotton ginning factory, passing through the cement factory, the sugar factories and the selection of the town to be the capital of the state in 1994 up to the present time. These factors lead to the availability of job opportunities in the town, all respondents 100% explain that the main reason for migration to the town is the availability of job opportunities, and this lead to the squatter settlement on peripheries of the town, mainly to the north east and south east, where Assalaya and Kenana located.

Traffic Congestion:

As a result of the rapid urban growth of Rabak town, all features of the urban centers especially in developing countries occur in Rabak town, among which is the traffic congestion. 70.0% of respondents mentioned that they observed traffic congestion in critical times, in the morning when officials, workers and pupils go to their offices factories and schools

respectively, and the second time is afternoon when they come to their houses.

The traffic congestion in Rabak town caused some problems to the environment, it cause air pollution, noise pollution and in sometimes cause accidents as observed by the researcher.

The Services Situation in the Study Area:

There are many pull factors that attract migrants to Rabak town as mentioned earlier, the attraction of migrants to the town should be faced by new residential plans to absorb the increase of population especially on peripheries of the town, the new extensions cause some problems in services, mainly drinking water, educational and health services. About 53.6% of the sampled population are not satisfied with the services in the town, 41.3% of them explained that there is a problem in drinking water in some blocks e.g. 21, 22, 27, 29, 14, and 51, 24.8% of respondents explained that some blocks on peripheries of the town lack electricity, 13.4% of them showed a shortage of educational services and 19.5% of respondents explained short of health services.

Planning Problems inside the Study Area:

As mentioned earlier, there are many pull factors in Rabak town in addition to the annual natural increase of population 4.9%. These reasons compelled the land department and planners to make new residential areas to absorb such people, such new and rapid spatial extensions will include positive and negative impacts.68.8% of the sampled population mentioned that there are negative impacts resulted from spatial extensions in the town. 52.5% of them mentioned that the new extensions share with the old residential areas their services, mainly drinking water, 18.7% of them explained that some of the new extensions were planned on low lands, that is why some of them subjected to floods during autumn e.g. block 63 south east of the town, 16.9% of them mentioned that some of these

new extensions have shortage of services, and 11.9% of respondents showed that some of them lack services. Table (4) and Fig. (5)

Table (4) The Negative Impacts of the Spatial Extensions According to the Opinions of Respondents.

Impacts	No.	%
1.Some of the blocks were planned in low lands.	114	18.7
2. Some of the blocks lack services.	73	11.9
3. Some of the blocks have shortages of services.	104	16.9
4. The new block share with the all blocks their services.	321	52.5
5. Others.	0	0
Total	612	100

Source: Field Survey, August 2009.

Fig (5) The Negative Impacts of the Spatial Extensions According to the Opinions of Respondents
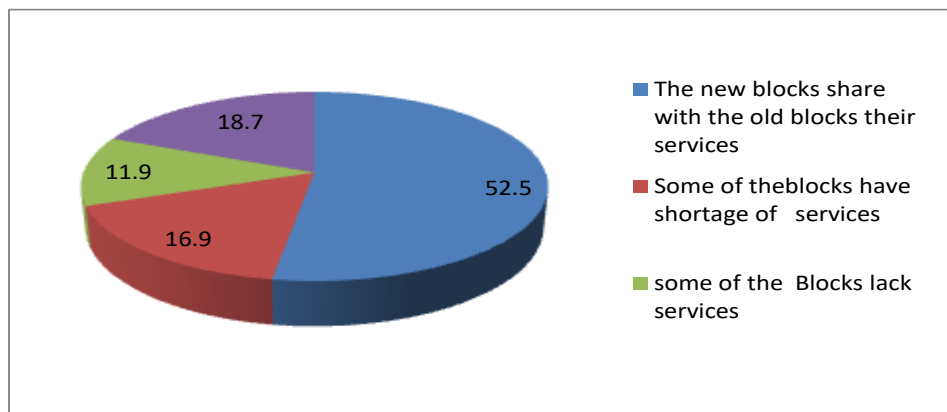
Results and Recommendations:
Results:

The study concluded to the following results:

- The location of the town in the centre of the country contributed in the rapid urban growth of the town.
- The physical environment of the town which includes the climate, the soil and morphology contributed in the rapid urban growth of the study area.
- The connection of the town with whole country by different means of transport (3Rs) railway, road and river lead to the growth and development of the town.
- The availability of factories which include the cotton ginning factory, the cement factory and the sugar factories of Kenana and Assalaya contributed in the rapid urban growth town.
- The construction of the new bridge in 1980s plays a great role in the rapid urban growth of the town.
- The selection of the town to be capital of the whole White Nile State contributed in the growth of the town.
- The study reveals that Assalaya sugar factory causes air pollution to the town through burning of sugar cane process.
- The research explains that soil pollution took place to the south west of the cement factory, due to the dust of the factory.
- The study shows that there are some squatter settlements to the north east and south east of the town due to the rapid urban growth.
- The study reveals that there is internal migration to the town due to the availability of pull factors, which include job opportunities.
- The study explains that there is traffic congestion in critical times mainly in the morning and afternoon.
- The research shows that some blocks of the town suffer from the shortage of services e.g. drinking water, educational and health services and some blocks on peripheries of the town lack these services
- The study shows that there are some problems in planning due to the rapid urban growth include the availability of some

residential areas in low lands which subject them to floods in autumn, some blocks suffer from shortage of drinking water services e.g. block 51 to the east of the town.

Recommendations:

The study suggested many recommendations expected to solve the problems resulted from the rapid urban growth of the town, include the following:

- The sugar factories around the study area, should follow the green harvest instead of burning sugar cane to avoid air pollution to the study area.

- The cement factory inside the town should adopt mitigation measures to reduce emission of dust that cause soil pollution.

The land authority in Rabak town should organize the squatter settlements on the north east and south east of the town by planning these areas.

- Traffic congestion in the morning and afternoon should be cured by traffic-police to avoid noise pollution and accidents.

Services should be introduced to the blocks that located on peripheries of the town, mainly drinking water in block 21,22,27,29, and 14.

- The land authority should solve the cases of blocks that planned in low lands e.g. 63 that subjected to floods in autumn.

- The importance of applying laws and legislation of protecting the environment.

-The integration of the environmental dimension in development schemes in all phases.

-The adoption of the environmental impact assessment (EIA) in present and future schemes.

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