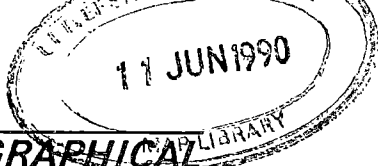




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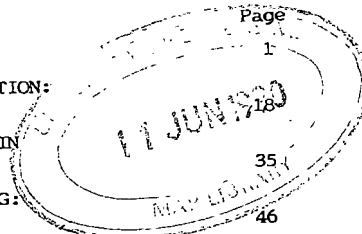
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by

D MAZAMBANI

INTRODUCTION

Deforestation is the removal or destruction of woody plant species, or of forest and woodland vegetation types. This may be in the form of selective felling of trees from woodlands or the entire clearance of wooded areas, (Whitlow, 1979). Deforestation in the peripheral areas of Harare is perpetrated by low-income families resident in the city's townships (low-income residential areas). The principal cause is gathering woodfuel for cooking and heating. Therefore, the process is a direct result of an energy crisis among the low-income families. Similar occurrences have been reported in other Third World urban centres (Morgan, 1978; Le Houeron and Lundholm, 1976; and F.A.O., 1974).

Around Harare, illegal tree-felling has been taking place for many years. Before 1978 tree-felling was confined to the Municipal lands around the townships, and deforestation was selective. From 1978 to 1981 peri-urban deforestation around Harare was characterised by complete clearance of woodlands. Tree-felling was perpetuated by two groups of individuals. These were:

- a) the township residents and war refugees who had no other cheap source of energy for cooking and heating, and
- b) wood traders who were collecting firewood to sell in the townships.

In the winter months of 1978 and 1979, large areas of woodlands were completely denuded (e.g. the hills situated between Kambuzuma and Marimba Park townships; the areas to the south and north of Uzivarasekwa township; the woodlands between the Chitungwiza townships and the Hunyani and Nyatsime rivers; and the Warren Hills areas).

Peri-urban deforestation continues unabated in the remaining woodlands around Harare. Illegal tree-felling is taking place even on privately owned farmlands. The aim of this paper is to describe and discuss the rates and patterns

of deforestation around Harare. The effects of deforestation on the environment are also examined briefly. In the conclusion alternative ways of reducing the rates of deforestation are discussed.

METHODS OF STUDY

The methods adopted in studying deforestation are:

- air-photo interpretation (Kuchler, 1967)
- field monitoring of tree-felling (Gander, 1980), and
- interviews administered to wood collectors.

a) Air-photo interpretation

Aerial photographs for the years 1955, 1965, 1972 and 1978 were used to determine the rates of change of woody vegetation cover in selected sample areas. Trees and bushes were first identified on the photographs using a stereoscope. The photographs were then mounted on a stereofacet plotter to enable counting and mapping of each woody species. On the base map, the woody species were represented by dots which varied in size according to the shapes of the trees and bushes. A grid at half centimetre intervals was then laid over each of the final maps for the four sample areas (Table 1). This facilitated a systematic point sampling exercise. In this exercise each grid intersection was considered to be a sampling point where either one or zero counts of dots were recorded. The total counts of dots for the years 1965, 1972 and 1978 were then expressed as percentages of that for 1955. This was done for each of the four sample areas.

b) Field monitoring of tree-felling

This was aimed at identifying the current patterns and winter rates of deforestation. The minimum quadrat size when studying woody species was reported as 10 x 10 metres (Kellman, 1975). However, the quadrats used in this study measured 50 x 50 metres so that as many species as possible could be sampled. Larger quadrats were not used because of practical constraints set by time and the human resources available. The quadrats were laid in two areas where tree-felling was pronounced. The first three were in the Warren Hills area, north of Kambuzuma township (Fig 1(a)). The woodlands on the hills were dominated by three tree species. These are Brachystegia spiciformis (Msasa),

TABLE 1

Location and sizes of sample areas

Sample No.	Location in relation to nearest township	Size (km ²)
1	North-west of Kambuzuma	3,0
2	North-east of Dzivarasekwa	3,6
3	West of Mabvuku	3,5
4	North of Zengeza	7,8

TABLE 2

Woodlands as percentages of the 1955 tree cover

Year	Area 1	Area 2	Area 3	Area 4
1955	100,0	100,0	100,0	-
1965	89,0	79,0	80,8	100,0*
1972	77,8	63,8	63,7	90,0*
1978	22,0	20,1	18,5	30,3*

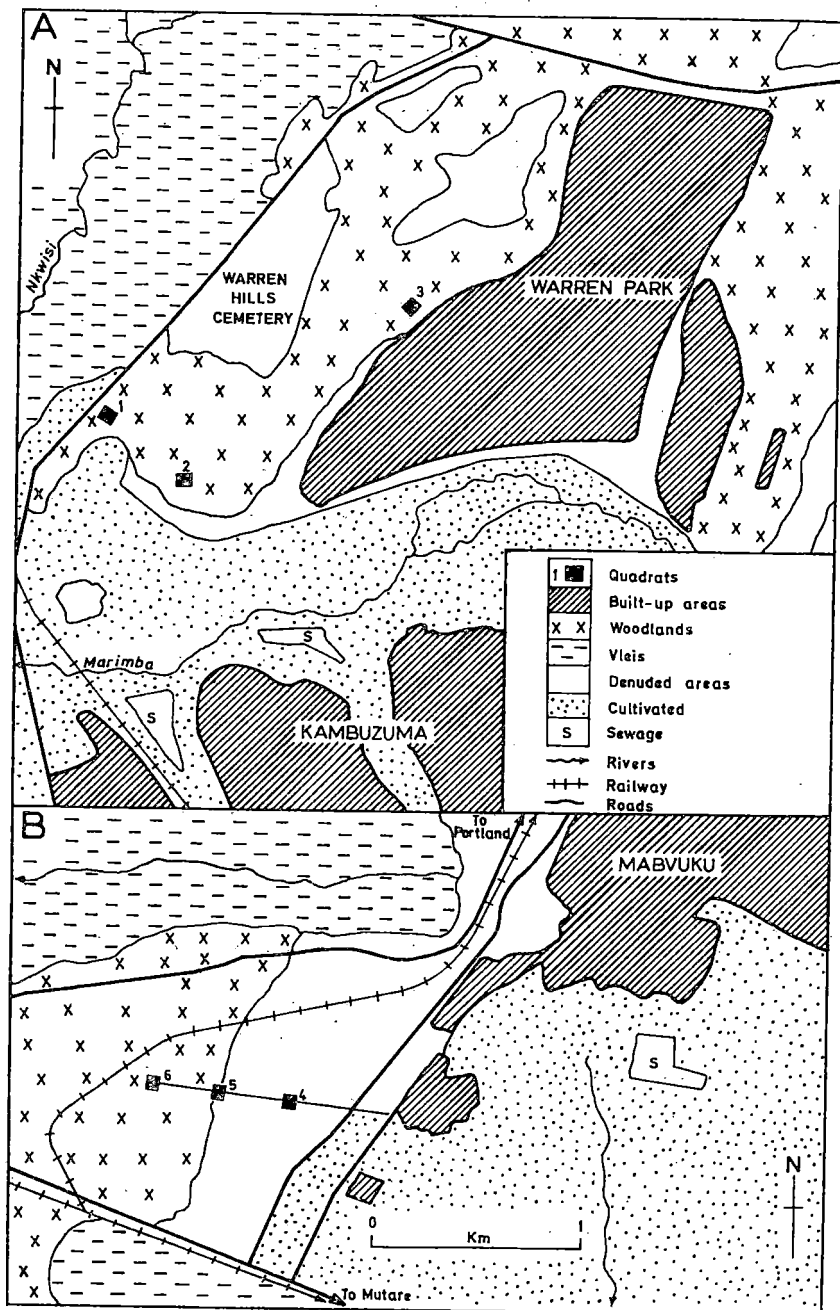
* Expressed as a percentage of 1965 woodland cover.

TABLE 3

Percentage annual decrease of woody species 1955-1978

Period	Area 1	Area 2	Area 3	Area 4
1955 - 1965	1,1	2,1	1,9	-
1965 - 1972	1,8	2,7	3,0	1,5
1972 - 1978	12,0	11,4	11,8	11,0

Fig. 1 POSITIONS OF THE QUADRATS



Julbernardia globiflora (Mnondo) and Uapaca Kirkiana (Mzhanje).

The fourth to sixth quadrats were laid west of Mabvuku township (Fig 1(b)). Each quadrat was visited three times; initially at the beginning of the cold season (at the end of April), then at the peak of the cold season (mid-June) and finally at the end of the cold season (end of August). During the visits information concerning deforestation was recorded under the following categories.

- (i) Trees: - the number and species with branches cut off,
 - the number and species which were ring barked,
 - basal circumferences, and
 - the number of species not harmed.
- (ii) Stumps: - heights,
 - basal circumferences of stumps above one metre, and
 - number of stumps peeled.

The methods adopted in this exercise followed those used by Gander (1980) in Kwazulu, South Africa.

c) Interviews

The objectives of the interviews were:

- (i) to find out the income levels to which most wood collectors belonged,
- (ii) to establish an explanation of the varying patterns of deforestation,
- (iii) to determine the distances travelled and the time spent on wood collecting.

Information on the patterns of use of woodfuel in the townships was also gained from the interviews.

RESULTS

Table 2 shows that between 1955 and 1978 the extent of woody vegetation in three of the sample areas studied decreased by more than 75 percent. In the fourth area only 30,3 percent of the 1965 woodland cover remained by 1978. Table 3 and Figure 2 show that deforestation was greatest from 1972 to 1978. After 1978, complete destruction of trees took place in several parts of the sample areas. In the fourth sample area (Fig 2) complete deforestation south

Figure 2 : Distribution of woody vegetation in sample area 4 .



of Prince Edward Dam took place from mid-1978 to 1979. Tree-felling in this area was carried out by squatters and war refugees residing in Chitungwiza. The squatters and refugees were in search of firewood and building poles.

Seasonal patterns of deforestation

Deforestation is greatest during the winter months (May to August) when there is a high demand for firewood for heating in addition to that required for cooking. There are several reasons for the preference for woodfuel for heating purposes compared to other fuels. Firstly, most houses do not have an electricity supply. Approximately 61 percent of the households in the low-income residential areas did not have electricity supplies in December 1979 (Mazambani, 1980). Secondly, electric heaters cannot be used in houses which only have one amp electricity supplies. Thirdly, an electric heater does not have the same heating efficiency as an open fire when used by a large family or when the living room is large. Fourthly, for most low-income families an electric heater is considered to be an expensive item.

Results from field observations in the six quadrats are shown in Tables 4 and 5. The rates of deforestation were highest between mid-June and mid-August because of the high demand for firewood during this period.

Patterns of deforestation

The destruction of woodlands in the peripheral areas of Harare is taking place in four ways. These are:

- (a) complete denudation of woody species (Plate 1),
- (b) selective felling of preferred species (Plate 2),
- (c) removal of tree branches, and
- (d) ring barking.

The nature and degree of tree exploitation is determined both by the distance of a woodland from the nearest residential area and by its species composition. The influence of distance is illustrated by the results of field analysis in the three quadrats located south-west of Mabvuku township (Fig 3). The quadrat nearest to the township had only two trees (Table 5). This quadrat (fourth) had the highest percentage of stumps which were below one metre. Thirty-four percent of these stumps were peeled. Peeling had affected stumps belonging to tree species which were preferred for use as firewood (Parinari curatellifolia). The fifth quadrat had the highest percentage of trees which had most

Plate 2



Plate 1



TABLE 4

Rates of deforestation in six quadrants. April - August 1981.

Quadrat Number	Distance from nearest township (metres)	Mid - April to Mid - June (%)	Mid - June to Mid - August (%)	Mid - April to Mid - August (%)	Average per month April - August (%)
1	1000	39,3	46,3	67,4	16,9
2	1500	11,1	20,9	29,6	7,4
3	100	0,0	5,9	5,9	1,97
4	400	0,0	0,0	0,0	0,0
5	700	25,0	33,3	50,0	12,5
6	1000	0,0	26,5	26,5	6,6

TABLE 5

Results of counts of trees and stumps in the six quadrats.

April to August, 1981.

Quadrat Numbers	1			2			3			4			5			6		
Observation Periods	*1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
<u>TREES</u> Total	89	54	29	27	24	19	51	51	48	2	2	2	16	12	8	83	83	61
	39	48	27	33	46	45	41	41	37	0	0	0	62	70	50	40	40	18
<u>STUMPS</u> Total	141	176	201	98	101	106	48	48	51	172	172	172	144	148	152	75	75	97
	28	26	22	20	19	23	19	19	18	1	1	1	28	22	21	40	40	31
	72	74	78	80	81	77	81	81	82	99	99	99	72	78	79	60	60	69

* 1 = Mid - April

2 = Mid - June

3 = Mid - August

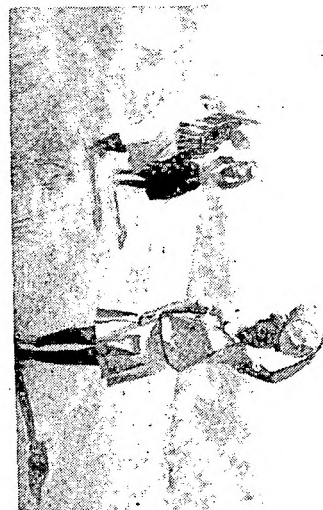
Plate 5



Plate 4



Plate 3



of their branches cut off (Fig 3). In both the fifth and sixth quadrats the species which were affected by felling were Brachystegia spiciformis and Julbernardia globiflora, while the Uapaca kirkiana species had branches removed. Beyond the sixth quadrat there were still indications of exploitation of trees, although to a lesser extent. Whereas the fourth quadrat had lost 98,8 percent of the trees due to wood collecting, the fifth and sixth quadrats lost 90,0 and 48,0 percent respectively.

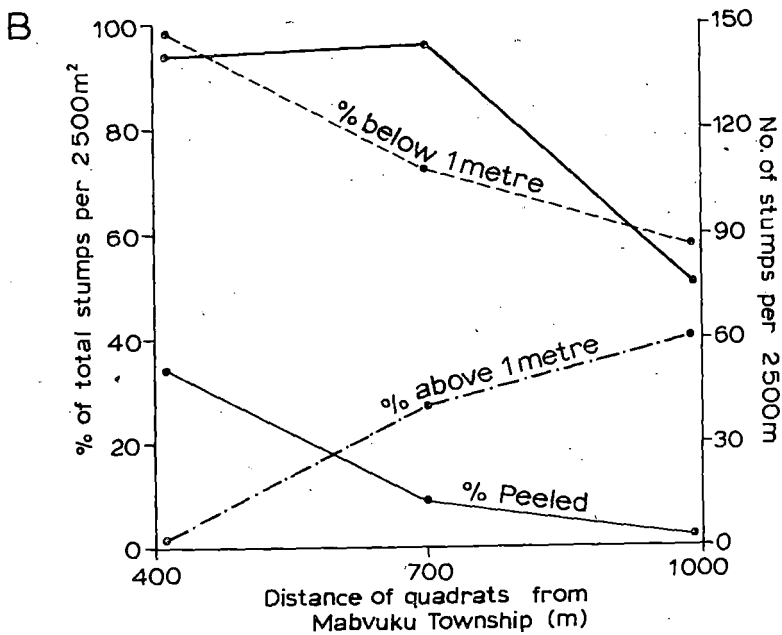
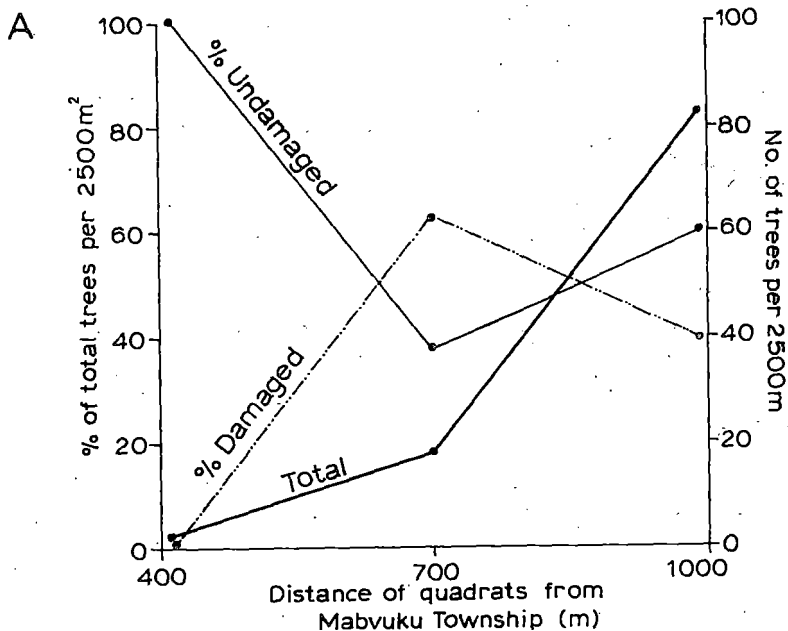
Ringbarking is common where Julbernardia globiflora and Brachystegia boehmii (Mpfuti) are dominant species. The purpose of ringbarking is to kill the trees as well as to obtain the bark which is used for various construction purposes. The dead trees are then chopped down for use as fuel. In the first quadrat 13,0 percent of the trees were ringbarked. Above 64,0 percent of the trees in this quadrat were Brachystegia boehmii species.

Areas currently affected by deforestation

The area most affected comprises the Warren Hills. Unlike privately owned lands, this area is not fenced. Therefore, it is not protected against destructive human practices such as tree-felling. Tree-felling in this area is carried out by wood collectors from Mufakose, Kambuzuma and Rugare townships, (low-income residential areas). Wood is also collected from privately owned farmlands located south of Mufakose township. Another area affected by deforestation is the eastern part of the Cleveland Dam Catchment area. This is situated to the north-west of Mabvuku township. Residents of this township also collect firewood from farmlands located south of the Mutare road. This is one of the areas where there have been conflicts between wood collectors and landowners. According to a police spokesman at Mabvuku Police station, several women were arrested and fined for illegally cutting wood on farms located south of the township during the winter months of 1980. Despite the arrests, residents from the southern part of Mabvuku township still obtain firewood illegally from farmlands south of the Mutare Road. Women from Tafara township sometimes have to walk in excess of three kilometres in search of firewood. They generally obtain the firewood from the commercial farming areas to the east and north-east of the township.

In all the low-income residential areas, collecting wood is a task mainly for the women (Plate 3). However, small boys and even men are also involved in this task (Plates 4 and 5). In winter it is commonplace to see men carrying bundles of wood on bicycles on their way home from work (Plate 5).

Fig. 3 Patterns of Deforestation near Mabvuku Township



Effects of deforestation

In summary, peri-urban deforestation has had the following effects on the physical environment and on human relationships. Firstly, it has resulted in the depletion of woodland cover in the vicinity of the city. This in turn resulted in the development of a stark landscape of bare hills and plains. Secondly, it has caused an increase in the incidence of erosion on hilly terrain and along stream banks. As a result the top soil which is a vital life resource is lost. This soil can never be recovered. Thirdly, deforestation has caused the destruction of wildlife habitats, especially birds. Fourthly, it has resulted in increasing shortages of locally obtained woodfuel. Consequently, a woodfuel trade involving the transportation of firewood from commercial farmlands and communal areas developed (Mazambani, 1980). Lastly, deforestation has caused conflicts to develop between those who perpetuate tree-felling on the one hand and the private land owners and City Council staff on the other hand.

Recommendations

Peri-urban deforestation around Harare is a serious problem because it concerns the uncontrolled utilization of a vital resource. The official policy of Harare's City Council on deforestation is: "No-one is permitted to remove trees on Municipal lands without the authority of the Amenities Division of the City Council" (Director of the Amenities Division of the City Council, personal communication). The Council's policy would appear to be doomed to fail because it has overlooked the fact that for a long time the majority of families housed in the townships have not been provided with electricity. Most of these families have been forced by their socio-economic circumstances to collect woodfuel from the neighbouring woodlands. Thus, while the Council has been regarding tree-felling as illegal, low-income families have accepted this activity as a necessary practice. Therefore, for a long time there has been a need to face up to the illegal but widespread practice of tree-felling.

Deforestation is directly related to the inadequate energy supplies in the townships. Therefore, it can only be reduced by providing alternative sources of energy to the low-income families. Electrification of houses has many advantages. Use of electricity is cheaper than woodfuel in the long run (Mazambani, 1980) although the initial cost of installation which the Municipality has to meet is high. Electricity has less deleterious

environmental effects than the use of woodfuel or coal. A further advantage is that electricity can provide for the basic energy requirements, that is, cooking, heating and lighting. A second alternative source of energy is coal. This is favoured by a number of factors. Firstly, Zimbabwe has large coal reserves at Hwange. Secondly, Zimbabwean coal has a calorific value of 6,9 kilo calories per gram compared to the calorific value of 3,5 kilo calories per gram for air dry wood (Whitsun Foundation, 1981). Thirdly, coal would be a more convenient source of energy than indigenous wood because supplies can be delivered regularly. Use of coal may be hindered by high transport costs. Up to a distance of 100 kilometres from the source coal is more expensive than wood. The cost of one tonne of coal amounts to \$14,98 while air dry wood costs \$11,50. At 200 kilometres from the source coal cost \$20,06 in 1980 while wood cost \$21,50 (Whitsun Foundation, 1981). Current prices of coal would probably be higher than those of wood since Hwange coal has increased in price by 27,1 percent (The Herald, 24th December, 1981, p 5). At present coal is not widely used in the townships because it is messy to handle. It is considered a dangerous fuel by township residents since it produces carbon-monoxide. Another reason is the poor quality of the coal stoves which take a long time before heating up. There is a need for increasing investment and scientific research aimed at reducing the amount of gases produced by the coal used for domestic purposes. The heating efficiency of coal stoves also needs to be increased. Current investment on coal by government and the private sector amounts to only one-eleventh and one-sixth of those on hydro-electricity and liquid fuels respectively (Johnston, 1980).

Charcoal is the third possible source of energy. This fuel is not used to any great extent in Zimbabwe (Fuller, 1980). Nevertheless, there is scope for considering the manufacture of charcoal using timber from exotic soft wood tree species. Charcoal has double the calorific value of air dried wood. It is almost smokeless, and does not taint foodstuffs (Fuller, 1980).

The last possible source of energy are wood plantations or woodlots. These can be established near the townships and in other peripheral areas of the city which are not suitable for formal urban landuse types. The woodfuel harvested from the fast-growing tree species would then be sold to township residents. Besides being a source of energy woodlots would be an environmental asset. They would replace woodlands which have been completely denuded.

CONCLUSION

Peri-urban deforestation has been taking place for many years around Harare albeit illegally. It has been caused by an inadequate supply of energy for cooking and heating for low-income families. Improvements in economic conditions and the energy supply situation would reduce peri-urban deforestation. There are several alternatives for a long term energy strategy for the low-income housing areas. These alternatives need to be considered seriously by the authorities responsible for the low-income residential areas.

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