

Environmental Impacts of the Rwandan Refugees on Zaire

The assessment of the environmental impacts of refugees has been a neglected subject. In environmental terms, all the recent emphasis has been on environmental degradation which may have forced some people to become "environmental refugees" and not on the environmental impacts created by the refugees themselves. From a strictly environmental viewpoint, large numbers of refugees are likely to contribute to considerable stress, a fact that has basically been ignored by the environmental profession and agencies. This paper analyses the environmental impacts of the Rwandan refugees in Zaire on the basis of a field assessment. The results indicate that the environmental impacts of the refugees are substantial, and in certain areas, critical, and thus can no longer be ignored.

INTRODUCTION

The sudden arrival of some 1.5 to 2.0 mill. Rwandan refugees to Zaire from 13 July, 1994, has created serious economic and environmental problems for the host country (1, 2). Zaire has been facing a major economic crisis in recent years (3), and the sudden and unexpected arrival of a very large number of the refugees has further aggravated an already existing difficult socio-political and economic situation.

With a total population of over 6 mill., Kivu is already the most densely populated region in Zaire, with an average density of 49 inhabitants per km² (56 for North Kivu and 41 for South Kivu). This is almost four times the national average population density of 13 inhabitants per km² (4). Even before the arrival of the refugees, steadily increasing population pressure and the resulting scarcity of farmland and pastures contributed to ethnic clashes in the region (5). The presence of a very large number of refugees has further contributed to the worsening of what was already a very difficult situation.

Considering the socioeconomic position, it is not surprising that reliable data on the current state of the environment in Zaire are not available. Much of the available information are generally estimates, and accordingly often not consistent. For any reliable environmental assessment, a proper data base is essential. For the current paper, we have depended almost exclusively on expert opinions, both national and expatriate, and limited official UN and national documents that are now available.

It should be noted that Zaire's forest ecosystems contain about half of Africa's remaining tropical rainforest, which covers about half of the national territory and is the second largest tropical forest in the world after Brazil. With the exception of arid zones, coastal reefs and marine islands, Zaire boasts all of Africa biotypes, with flora made up of about 10 000 known plant species of which some 3000 are endemic, representing a unique source of valuable forest products and medicinal plants (5).

ENVIRONMENTAL IMPACTS OF THE RWANDAN REFUGEES

A sudden influx of 1.5 to 2.0 mill. refugees, who are confined to very limited areas, is likely to have direct and indirect impacts on the environment, some significant and others less so,



Overall view of the Kibumba refugee camp also showing deforested area. Photo: A.K. Biswas.

some short-term and other medium- to long-term (6). A field assessment indicates the main environmental impacts of the Rwandan refugees in the North and the South Kivu provinces of Zaire.

Deforestation and Associated Environmental Problems

Unquestionably, the most serious environmental problem created by the Rwandan refugees is deforestation within and around the camps. This is to be expected, unless the camps are properly planned and sited to ensure adequate availability of fuelwood for cooking and forest products for the construction of shelters. The sudden arrival of a large number of refugees made camp siting decisions in Zaire both difficult and complex, and in retrospect, it is obvious that some of the decisions made hastily leave much to be desired, especially in terms of environmental degradation. Extensive deforestation is now obvious in the city

of Goma and neighboring areas in North Kivu, the city of Bukavu and its neighboring areas, and the Ruzizi plain in South Kivu where all the Rwandan refugee camps have been thus far sited.

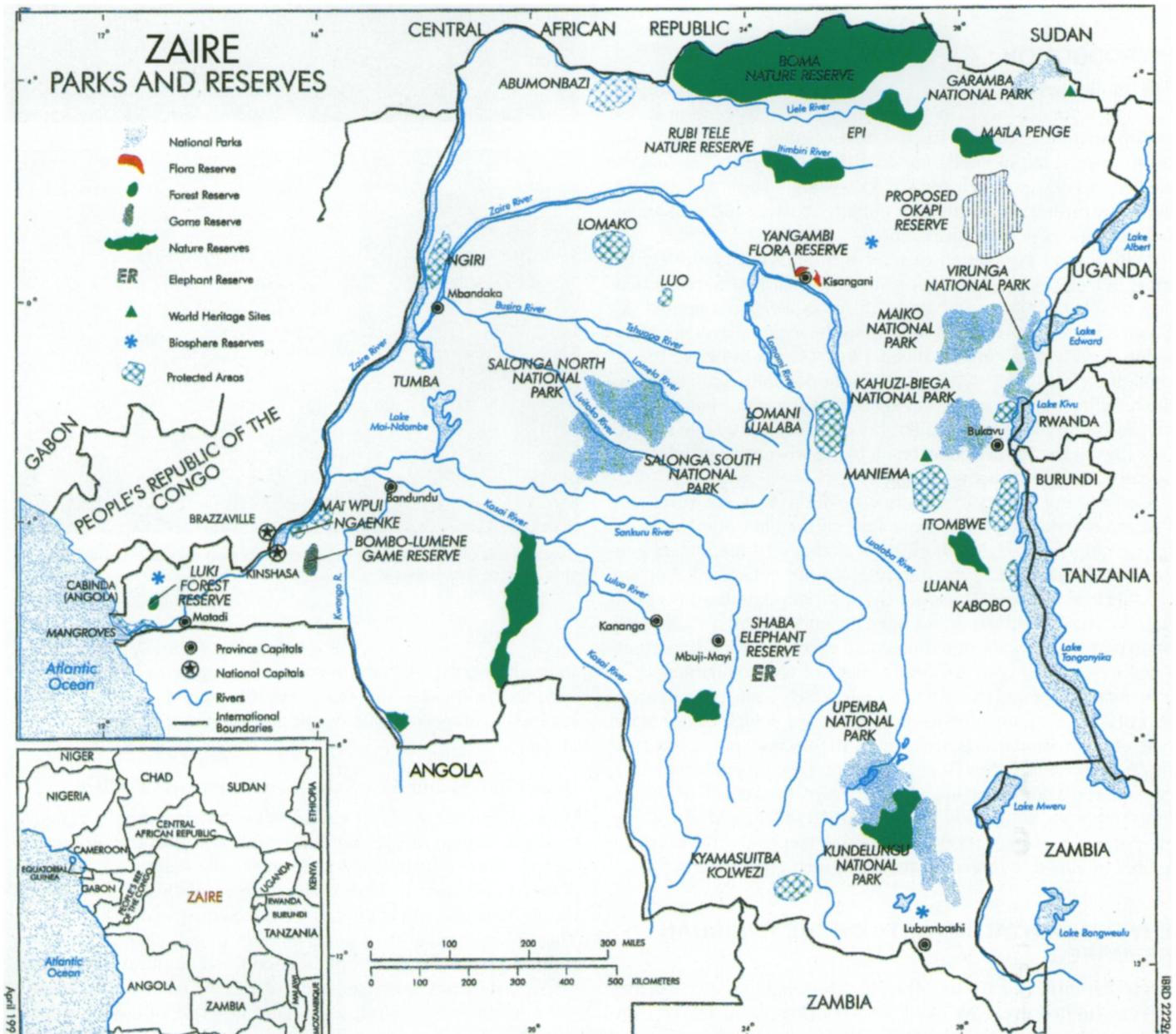
Deforestation in South Kivu: The Zairian Government has estimated that this region lost 3758 ha of forest land within 3 weeks of the arrival of the refugees. In Bukavu, the refugees not only cut the trees around the buildings they occupied (Alfajiri Institute, Ibanda Institute, Bukavu Cathedral, General Hospital and Nyarakavogo-Parizi Clinic), but also used the furniture in many of these buildings as fuelwood. Some 19 ha of land have been deforested in Bukavu. The refugees have been moved out of Bukavu to various camps outside the city itself.

The deforestation around all the refugee camps in South Kivu is already substantial, and the process is continuing unabated. It is even accelerating in some areas. Overall, however, even though the deforestation and the associated environmental costs at South Kivu have been significant, on a long-term basis these do not appear to be as serious as in North Kivu for several reasons.

First, unlike North Kivu, where several major refugee camps are either inside or within the buffer zone of the Virunga National Park, camps at South Kivu are not located near the Kahuzi-Biega National Parks (Fig. 1). Thus, so far, no perceptible deforestation can be observed in the Kahuzi-Biega National Park due to the refugees. However, there is a distinct possibility that if the Rwandan refugees continue to stay in South Kivu for a significant period of time, the Kahuzi-Biega National Park could be affected in the medium to the long-term. As fuelwood and forest products are depleted near the existing camps, the refugees could be forced to exploit the nearest major forest for products both for their own use and also as a commercial activity.

Second, refugee camps in South Kivu are not as large as those in the North, though the present thinking seems to be to consolidate them further in the near future. Smaller camps have meant that the intensity and the extent of deforestation near most camps are not as serious as around the big camps. It is likely that it would be comparatively easier, quicker and less expensive to repair the environmental damage caused by the small camps compared to that of the large ones.

Figure 1. Parks and reserves of Zaire (Courtesy: World Bank and United Nations Development Programme).



Finally, the camps of South Kivu appear to have been better planned in terms of site selection and other factors than those of North Kivu.

All these factors imply that if the refugees return to Rwanda in the near future, the deforested areas of South Kivu can be afforested, given national political will and international economic assistance.

Deforestation in North Kivu: The most severely affected areas are in Goma and its surroundings, and in the Virunga National Park. In Goma, the total deforested area have been estimated at 300 ha. This includes the trees along the roads, in school compounds, hospitals, and churches that were occupied by the refugees, and on Mont Goma, which was previously reforested. The most starkly deforested area is Mont Goma, which was deforested in only 3 days to such an extent that not a single tree was left standing.

The refugee camps of Kibumba, Mugunga, Katale and Nyabirehe are now directly responsible for causing extensive deforestation in the Virunga National Park. Three sectors of the park are specifically affected: *i) Rugo-Kibati sector.* The affected area has been estimated at 7200 ha by the Zairian Government. *ii) Mugunga sector.* The deforestation is primarily caused by the Rwandan army personnel. The area currently devastated is estimated at 4675 ha. *iii) Kubare-Kalengera-Katale sector.* No current estimate is available for the area affected by the camps at Kibumba, Katale and Nyabirehe, which are located in and near the buffer zone of the Park, but it is probably significant.

Virunga National Park. While deforestation around any major camps in North or South Kivu is significant, the real critical environmental problem is now undoubtedly in the Virunga National Park. Parts of Kibumba, Mugunga and Katale refugee camps are located within the Park itself or within its buffer zones. The United Nations High Commission for Refugees (UNHCR) estimates for the number of refugees in these camps on 6 October 1994 were; Kibumba 135 000; Mugunga 125 000 and Katale 110 000 (Table 1).

The Mugunga refugee camp has two sectors: one for civilians and the other for military personnel. The military camp, which is now estimated to have some 50 000 people (military personnel and their dependents) is of special concern since this camp is almost exclusively located within the Park itself, and the soldiers are fully armed. Inhabitants of this camp, like many other camps, have already started full-scale economic activities in terms of selling charcoal, fuelwood and other forest products and poached meat. These have currently become large-scale commercial activities. The area affected is approximately 20 km². The Zairian Institute for the Conservation of Nature (IZCN) sent a patrol to check deforestation activities, and this patrol managed to destroy some charcoal kilns. Subsequently, soldiers have threatened to kill any such patrol sent in the future. Conse-

quently, unless the present situation changes, forest destruction in Mugunga can not be prevented. Reliable estimates of the impact of this camp on the Park are not available, primarily because outsiders do not have access for safety reasons.

Much clearer information on deforestation caused by refugees in the Kibumba camp near the Virunga National Park is available. Deforestation at Kibumba, generally takes place in four distinct but different waves. The first wave collects dead wood from the areas of the Park that are nearest to the camp. Since nearly all the dead wood has now been removed from the Park periphery, refugees now walk some 2 hrs within the Park (about 8 km) to collect dead wood. The area affected by this wave is currently estimated at 9 km by 8 km. The second wave cuts dead or live branches but not the main stems. The third cuts the main stems, and the fourth and final wave removes the roots of the trees. After these four waves have been completed, the area is not only devoid of trees, but probably will also suffer accelerated soil erosion, especially during the rainy season. While these four waves were observed in the Kibumba Camp, it is assumed that a similar process is taking place in forests near most other camps.

Initially, refugees collected fuelwood primarily for their own cooking, and poles were cut for the construction of their tents. However, refugees quickly started full-scale commercial activities in terms of selling fuelwood, other forest products and straw to other refugees as well as to the Zairians.

A study was carried out by UNHCR and Deutsche Gesellschaft für Technische Zusammenarbeit GmbH (GTZ) on the extent of fuelwood collection between 28 Sept. and 2 Oct. 1994, a period of 5 days. From the Kibumba Camp to the Park 20 main paths were observed every day between the daylight hours of 06.00 and 17.00. The following parameters were observed: number of men, women and children that carried greenwood, green poles, dead wood and straw, back to the Camp and weights of the loads carried. The numbers were randomly double-checked. The observations provide information on the extent of damage inflicted on the Park each day by refugees. An average of 19 090 people used the 20 paths to collect forest products every day (32.6% were women; 33.9% men and 33.5% children); 406 tonnes of wood were carried to the camps each day (the average load carried by each person was 21.2 kg).

The forest loss observed is only via the 20 main paths and from only one camp: Kibumba. The preliminary estimate of total loss of wood from all the camps sited near or within the Virunga National Park is 7000–10 000 m³ day⁻¹, a staggering rate of de-forestation each day.

GTZ is now providing 400 m³ day⁻¹ of fuelwood from plantations to the various orphanages and the Kibumba camp, and is also planning to introduce fuel-efficient stoves in the camps. Even this limited supply of fuelwood stopped in December 1994. These attempts, however laudable, are unlikely to significantly

Table 1. Summary of camp water and sanitation indicators (13).

INDICATORS	KIBUMBA	KATALE	MUGUNGA	KAHINDO	KITUKU
Refugees residing in camp	135 000	110 000	125 000	50 000	170 000
WATER					
Storage capacity-public (m ³)	935	1130	580	450	55
Storage capacity for health structures (m ³)	266	153	120	72	0
Water consumed per day (m ³)	1500	920	1050	429	90
Water consumed per person (litres)	11.11	8.36	8.40	8.58	5.29
Total public tap available	592	422	468	260	33
Persons per water point	228	261	267	192	515
SANITATION					
Number of defecation area	8	0	3	8	0
Size of defecation area (m ²)	6000	0	600	1814	0
Number of provis. latrines drop holes	6486	0	0	0	0
Number of definitive latrines drop holes	0	1240	1826	2200	148
Persons per drop hole	21	89	68	23	115
Number of waste points-rubbish	424	16	306	9	1



Charcoal production near Mugunga Camp, Goma. Photo: A.K. Biswas.



Soil erosion at the Bukavi refugees camp. Photo: A.K. Biswas.

reduce forest destruction. It would take many months to get a significant number of refugees to use the improved stoves, which could make any perceptible difference in total fuelwood use. A quicker and more effective solution would be to change individual cooking system, using 3 stones, to communal kitchens.

The possibility of using communal kitchens was considered, but the concept was rejected by UNHCR because it was felt that Rwandans were individualists and thus communal kitchens would not be acceptable to them. In view of the substantial environmental costs, this decision needs to be reconsidered. If cooking is done the Rwandan way, and by the Rwandan cooks, it is difficult to see why food prepared will not be acceptable to the refugees. Such a step would be of immediate benefit to forest conservation. It would be much easier and more effective to ensure communal kitchens use fuelwood efficiently compared to thousands of individual stoves. This alternative merits consideration in terms of possible implementation.

Environmental impacts of deforestation: The environmental impacts of deforestation are many. It contributes to habitat destruction and consequent loss of biodiversity. In addition, it significantly increases soil erosion, and contributes to land-use changes. Considering Zaire has the largest tropical forest in Africa, extensive forest destruction could have some impact in terms of global and regional climatic change.

In the context of the overall environmental impact of the Rwandan refugees, soil erosion and mudslides and changes in land-use patterns are direct consequences of deforestation.

Soil Erosion and Landslides

Extensive deforestation, including uprooting is resulting in accelerated soil erosion in the camps and their surrounding areas. The problem has been further aggravated by the onset of the rainy season. While erosion can be observed in and around refugee camps in Goma, the problem is serious, and often critical, in the camps around Bukavu, which are often on steep slopes and on alluvial soil. The absence of terracing and proper drainage channels and almost near total destruction of vegetation on these slopes, means serious erosion and the formation of ever deepening gulleys with each heavy rainfall. The soil erosion and mudslide problems are likely to become increasingly serious in the future with each rainy season. Even if all the refugees are moved from the camps on the hill slopes of Bukavu, the erosion problems will remain until and unless the slopes are properly rehabilitated.

Disposal of Human, Medical and Solid Wastes

Environmentally-safe disposal of human, medical and solid wastes are serious problems in all the refugee camps in North and South Kivu. Disposal of human waste is becoming a critical issue since generally no waste treatment is being done at any camp and nor is there any sign that it can be started at any time in the foreseeable future. The problem is particularly difficult for the Kibumba camp which is located on volcanic rock, which means that excavating pit latrines is problematical. Natural depressions are being further excavated and converted into latrines. Even then the problem arises in terms of finding a cost-effective and feasible solution when such pit latrines are filled up with excreta. One approach has been to line these latrines with plastic, and then pump out the excreta when they are filled up. However, efficient operation and management of the pumps has not been an easy task. Because of the difficulties, it was decided to concentrate defecation in specially designated areas which could be more effectively managed. For example, Kibumba now has a defecation area covering some 6000 m². Each defecation area is designated for a specific sex. The various sanitary indicators of the refugee camps in and around Goma are shown in Table 1.

Even with such approaches, some fundamental problems remain. First and foremost is how to dispose of the excreta from the defecation areas and the pit latrines regularly and properly. Currently, only lime is spread on the defecation areas, and then the wastes are transported and dumped in some areas, including

the Virunga National Park. In Kibumba alone, it is estimated that 150 tonnes of excreta have to be transported each month and dumped in other areas without additional treatment.

Another environmental problem is how to manage the defecation areas during the rainy seasons. Heavy rainfall and the consequent storm runoff is contaminating the surrounding areas. This undoubtedly has serious health implications for humans and animals, and may cause contamination of surface and groundwater in specific areas. It is evident that the present practices of human-waste disposal are simply not sustainable on a long term basis.

Disposal of solid waste is also a problem, but in terms of environmental health, it is not as serious as human-waste disposal. Currently, a number of waste points have been established in each camp (Table 1). From these waste points, the rubbish is collected and disposed of at other locations. In some camps, e.g. Bukavu, solid waste is dumped on the periphery of the camp and then burnt. In the past, some solid waste from the Kibumba camp, including disposable diapers, were simply dumped in the Virunga National Park.

Safe disposal of medical waste and corpses present further problems. In Goma, *Médecins Sans Frontiers* (MSF), France, collects incinerated medical waste. This incineration process is working reasonably well. However, some 70 to 80 international organizations are working in the refugee camps of North and South Kivu. Neither UNHCR nor the Zairian Government can control their activities. Medical waste has been dumped in Virunga National Park by some NGOs, which is scattered over areas inhabited by monkeys, baboons and other animals. Clearly, such disposal practices may have significant negative implications in the future.

Disposal of corpses from the camps is another problem. Mortality rates are high. The average rate has been estimated at 2 per 10 000 refugees per day. Some 60 corpses have to be disposed of every week from the hospitals of Kahindo alone. Trucks carry the corpses for burial in mass graves; some were buried at shallow depths earlier and thus exposed after heavy rainfalls. Because of the volcanic rocks around Kibumba, grave digging is often not a feasible option.

Loss of Germoplasms

The main objective of the National Institute of Agromomic Studies and Research (INERA) at the Mulungu Centre near Bukavu is to conserve and improve genetic resources. According to the Centre's Director, initially only 4 ha of INERA land was requested to settle 4000 refugees, but some 60 000 people now occupy more than 60 ha of the Centre's experimental area. The Director is concerned that up to 100 ha of INERA land may be used for refugees in the near future. The refugees have totally destroyed the 60 ha they currently occupy. This includes loss of genetic resources in terms of chinchona and coffee, agricultural experimental fields, and part of an arboretum. Most serious is the loss of 47 clones of chinchona and 40 ha of coffee clones. The chinchona clones had been developed over a period of 15 to 20 years of experimentation, to suit Zairian conditions. Since there are no storage facilities at Mulungu, no germplasms were stored. Accordingly, chinchona and coffee clones are likely to have been irretrievably lost. Loss of the agricultural experimental fields also means that soil fertility experiments that were carried out over the last five years have been lost, and no new work can be carried out until the refugees move out of INERA experimental land.

Poaching from National Parks

Even before the arrival of the refugees, poaching was a serious problem (7). Poaching is more difficult to estimate and control than habitat destruction. On the basis of anecdotal evidence, it appears that the Rwandan soldiers in the Mugunga Camp are

doing extensive poaching, and the meat is both sold commercially and consumed in the Camp.

In other areas, however, short-term impacts of the Rwandan refugees appear to have resulted in a reduction in poaching. This is because the refugees came with cattle, which were later sold. This step appears to have reduced poaching pressure. However, as the supply of cattle decreases, it is likely that the poaching pressure on animals from the Virunga National Park will increase because of Zairian and the refugee activities. The Conservator for the southern part of the Park has only 10 guards, who have not been paid for several months and accordingly they have very little incentive to perform their duties. It is not uncommon to find that guards themselves are forced to poach for survival. Nor do they have appropriate surveillance equipment to control poaching over such a large area. Accordingly, the guards are likely to have very little impact in terms of controlling poaching.

Changes in Land Use

There are many land-use changes implications due to the presence of the refugees. Probably the most important is vegetation destruction and deforestation at the camp sites and surrounding areas. All the camp sites are now almost devoid of vegetation. However, if the refugees return to Rwanda in the near future, and careful and sustained efforts are made to rehabilitate the camp sites, there will probably be no long-term adverse environmental impacts in terms of land-use changes.

The potentially more serious problem is likely to be on the current buffer zones of the Virunga National Park and within the Park itself. Sections of the buffer zones and the Park have now been deforested, including uprooting of the trees. If a significant number of refugees stay for another 6 months or more, which is now a distinct possibility, it is highly likely that the refugees will begin agricultural activities in the deforested areas. While the timing of deforestation in 1994 has meant that it was too late for sowing this year, March 1995 would be a critical time to note what may happen. Even if the refugees move shortly after initiating agricultural activities, it may be difficult to reclaim the land for afforestation since there is a probability that Zairians will take over the deforested land to continue the agricultural practices initiated by the Rwandans.

Parts of the buffer zones of the Park and the Park itself have already suffered some land-use changes. Defecation areas for the Kibumba Camp are in these areas, as well as some administrative quarters of UNHCR, Oxfam and other organizations. While total area of land used for such administrative reasons is not large, the fact that these official structures are negatively located is conceptually wrong and symbolically dangerous. The fact that the relief agencies are constructing a road in the Park indicates the lack of environmental awareness and sensitivity of their staff members.

Drinking Water and Health

In terms of UNHCR camp siting policies (8–10), the availability of clean drinking water is a priority requirement. However, in certain camps like Kibumba, there is simply no water available at the site and hence water has to be transported long distances from various sources. Because of the volcanic nature of the land around the camp, thus far all drilling attempts by Oxfam and Sida to locate water have been unsuccessful.

Currently, MSF (Holland) is providing 1.5 mill. liters of clean water per day to Kibumba, while THW (Germany) provides purified water to the Goma area (6). UNHCR would like to provide a minimum need of 10 L person⁻¹ day⁻¹ in all of the camps. The average water consumption per person in the various refugee camps of North Kivu in mid-October varied from a high of 11.1 L day⁻¹ at Kibumba to a low of 5.3 L day⁻¹ at Kituku, a new site.

In terms of water-quality deterioration, there is no specific evi-

dence thus far that the refugees have had any significant impact. While we were informed in Kinshasa that the activities of the refugees at Goma have polluted Lake Kivu, the analyses carried out by THW (Germany) do not indicate notable water contamination. In fact, the main water-quality problem of the Lake Kivu is an abnormally high concentration of phenol (at least 4 times the permissible concentration of 0.005 mg L⁻¹ recommended by WHO). It is difficult to see how the activities of the refugees could have increased the phenol content of the lake water.

The main health problems is diarrhoea. Dysentery is being reduced, and the occurrence of cholera has not been observed for some time. Malaria (*Plasmodium falciparum*) has been a chronic problem. All these diseases are water-related. Poor hygiene and sanitary conditions have meant delousing. Delousing was initiated in the Kahindo Camp in mid-October.

CONCLUSIONS

On the basis of the extensive field investigations carried out by the authors, the environmental impacts of the Rwandan refugees in North and South Kivu are more serious and critical than the Zairian government and the multilateral and bilateral agencies realize. Because of the seriousness of the situation, and their potential national, regional and global implications, urgent actions are necessary to ameliorate the adverse impacts.

Deforestation is unquestionably the most serious environmental effect in Virunga National Park, which is a national as well as international treasure in terms of biodiversity (11, 12). Clearly, the Park and the refugee camps can not co-exist, if long-term environmental damage continues to be inflicted on the Park. While much of the damage can be rectified, given national political will and international assistance, any further environmental degradation could have long-term adverse implications for the natural resources of the Park. While any remedial action taken to ameliorate the environmental impacts on the Virunga National Park is unlikely to be effective, unless the refugees are moved from its vicinity, we recommend that a policy be developed urgently for its long-term integral management. Such a process could start with a review of the "General Plan" which was prepared earlier under EU sponsorship.

On the basis of the findings, it is essential that the staff of the relief agencies be sensitized on the potential environmental impacts of their decisions and actions. Most staff members appear to believe that these impacts are not significant and thus acceptable, especially when compared to the emergency life-saving aspects of their work. The staff need to be made aware that both the urgency of their relief measures and proper environmental planning need to proceed side by side to ensure there are no long-term adverse impacts on the host country as well as on the refugees.

This paper assesses only environmental impacts caused by Rwandan refugees in Zaire, however, there are many other dimensions to the environmental impact of regional refugee crises. This includes potential environmental impacts when refugees return to Rwanda and Burundi, and the impact of the remaining refugees on Zaire and Tanzania. In order to ensure that the environmental impacts are kept to a minimum, the refugee crisis needs to be analyzed on a regional basis. This aspect has not received any attention so far.

The current financial status of Zaire implies a need for external financial assistance to ameliorate the environmental impacts of the Rwandan refugees. Unfortunately, the national implementation of internationally funded projects is somewhat weak. Accordingly, it would be necessary to enhance the capacity of selected national NGOs and organizations like IZCN and INERA in terms of project implementation.

Zaire does not have a proper environmental data base. While

the national report to the UN Conference on Environment and Development Rio 1992 (4) is a step in the right direction, much remains to be done. Without a proper environmental data base for the country, it would not be possible to manage the natural resources and the environment efficiently.

Today, Zaire has no holistic strategy for national environmental management, nor a sufficient cadre of trained professionals who could carry out environmental impact assessments. In the absence of a national strategy and a core group of trained professionals, sectoral strategies like the environmental impacts of the Rwandan refugees will not be easy to develop and implement. Preparation of a national environmental strategy should receive immediate attention.

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