ENVIRONMENTAL IMPACTS OF REFUGEES: A CASE STUDY

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INTRODUCTION

The sudden arrival of some 1.5 to 2.0 million Rwandan refugees to Zaire beginning in July 1994 created serious economic and environmental problems for the host country, in addition to aggravating an already-difficult socio-political and economic situation (Ministere du Plan et de Reconstruction Nationale, 1994; Ministere de l'Environnement, de la Conservation de la Nature et du Tourisme, 1994). The environmental impacts of the Rwandan refugees in North and South Kivu, Zaire, are significantly more serious and critical than the Zairean government and all the multilateral and bilateral agencies currently realize.

Concerned about the serious environmental impacts of the Rwandan refugees, both potential and existing, the United Nations Development Programme (UNDP) fielded a mission to rapidly assess the important

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environmental dimensions of the problem; identify a set of priority action proposals with some preliminary indications of costs that could be submitted to various donors as possible stand-alone interventions; recommend how best to incorporate effectively environmental concerns with humanitarian efforts in future refugee crises; and recommend additional activities that UNDP should undertake with respect to the environmental impacts of the refugees, either in Zaire or the region (Zaire, Rwanda, Burundi, and Tanzania) (Biswas, Tortajada Quiroz 1994). The rapid assessment took place in Zaire on October–November 1994.

The UNDP mission was the first serious attempt to comprehensively assess the environmental impacts of refugees at the macro level. A detailed analysis has yet to be undertaken. Further, in environmental terms, all the recent emphasis has been on environmental degradation that may have forced some people to become the so-called 'environmental refugees' and *not* on the environmental impacts created by the refugees themselves.

Because the most critical environmental impact of the Rwandan refugees on Zaire is deforestation, the main emphasis in this paper is on the forestry sector and the associated environmental factors. Other impacts on the environment—waste disposal, germplasm loss, poaching, changes in land use, and drinking water—will also be discussed briefly.

ZAIRE: A COUNTRY PROFILE

Zaire, the second largest sub-Saharan country, had an estimated population of 41.3 million in mid-1994. The current average annual population growth is 3.1 percent and the national average population density is 18 per km^2, ranging from a low of 10 per km^2 in the south, north, and the Zairean Basin, to a high of 45 in the eastern highlands (table 1; see also figure 1).

From 1980 to 1990, Zaire's GDP declined from $14.76 billion to $9.56 billion (current prices and exchange rates), and the GNP per capita fell from $611 to only $228. The public deficit now represents nearly 20 percent of GDP. Export income declined steadily during the late 1980s, and external financial support to the country is now almost nonexistent. During the first seven months of 1994 almost all economic sectors declined compared to the same period in 1993 (UNDP-World Bank 1992).

Table 1. **Selected economic and environmental indicators for Zaire**

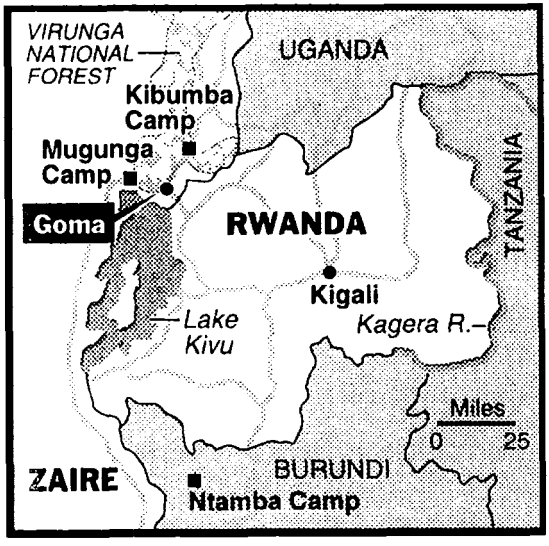
	1980	1985	1990	Average annual growth (%)	
				1980-85	1986-90
Population (millions)	25.48	29.49	34.46	3.0	3.2
GDP (US $, billions, current prices and exchange rates)	14.76	7.51	9.56	-15.2	5.0
GNP/capita (US $)	611	268		-9.4	-1.6
Food production index/capita (1986-1988 = 100)	102	102	96	-0.1	-1.0
Cereal import volume (10^3 metric tons)	350	320	336	-6.6	-7.5
Food aid (10' metric tons)	69	138			1.0
Urban population as % of total population	34.2	36.6	39.5	4.4	4.6
Life expectancy at birth (years)	49	51	107	7.2	
Infant mortality/thousand	111	102	39		
Illiteracy rate, (above 15 years) Males	23	21	16		
Females	69	47	39		
Arable land (10^6 ha)	7.07	7.15	7.18		
Forest & woodland (10^6 ha)	177.6	175.0	174.0		
Roundwood production for fuel & charcoal (10^6 m^3)	24.6	28.1	32.6	3.1	3.2
Fuelwood consumption (KT oil equivalent)	5,739	6,682	7,581*	3.1	3.2*

*Up to 1989
(Source: UNDP-World Bank 1992).

Life expectancy at birth increased from 49 years in 1980 to **53** years in 1990. During the same period, infant mortality per thousand declined from 111 to 91. The total illiteracy rate among persons over 15 years was 28 percent in 1990: 39 percent for females and 16 percent for males (UNDP-World Bank 1992).

The agricultural sector represents about 30 percent of the GDP and accounts for 75 percent of the active population. Although *35* percent of the land area is suitable for agriculture, only 3 percent is actually cultivated and another 1.5 percent is used for grazing. In November 1990, average annual salary was estimated at **$240;** rural annual income was estimated at $80 per person (UNDP 1994).

Figure 1. **Map showing location of camps in Zaire**



The New York Times

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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 has all of the African biotypes, with flora made up of about 10,000 known plant species (some 3000 of them endemic) representing a unique source of valuable forest products and medicinal plants. The major vegetation types include the Congo rainforest of the central basin, the savanna woodland in the far northern and southern regions, and the high altitude forests to the east.

Outside the rainforest areas and the wood and grass savannas, which are largely free of droughts, the country offers conditions that are very favorable to cropping and grazing of livestock. The most urgent threats to the flora and fauna of Zaire are increasing population pressure and slash-and-burn cultivation; together these factors have led to the acceleration of natural resources degradation and to **a** noticeable trend toward destruction of the rainforest. Almost 400,000 ha of forests are cleared every year for farming and for fuelwood (UNDP 1994).

Zaire's four national parks (all of them World Heritage Sites) include an area of 5.5 million hectares. Of all the protected areas of the world, only Virunga National Park has two endangered ***Gorilla gorilla*** subspecies, *G.g.* ***berengei*** and *G.g. graveri*. It also has the highest number of mammal species (more than 200) in Africa and is the richest protected zone for birds—698 species (Delvingt et al. 1990). The economic importance of the park is very significant for North Kivu. Tourism has created much employment; it is estimated that more than 17,000 persons live directly from the natural resources of the park (mainly fishing). Because of tourism, during more stable periods and before the present problems, the annual income of the Virunga National Park has reached $1 million dollars, mainly because of the presence of the gorillas.

In the Virunga National Park, deforestation and poaching have a particularly alarming impact and represent the most direct threats on the preservation of the park and its ecosystem (Languy et al. 1994). A comparison of the severity of the various environmental threats is shown in table 2.

Charcoal production is the main reason for deforestation in the Virunga National Park and also the most destructive. The park has been divided into 'parcels' among the population, who sell their products for $5 to **$8** a bag to retailers or directly to consumers. Collection of fuelwood is also a general phenomenon in all the sectors of the park. Wood is used for construction as well. Sticks, 4–8 m long and 5–10 cm diameter, form the 'skeleton' of the

most popular houses, along with ***yise*** (adobe). Boards and other construction materials are also produced in the park, but this activity is less prevalent in the park and its impact, although important locally, is overall less serious.

Table 2. **Main threats on Virunga National Park and their impacts.**
(Impact: from very important (+ + + + +) to weak (+)).

Activitv	Impact
Poaching: external	+ + + + +
internal	+ + +
Deforestation (charcoal, fuelwood, and construction)	+ + + + +
Farming (violation of park borders)	+ + + +
Infrastructure inside park (village for fishermen)	+ + + +
Fishing overexploitation	+ + +
Domestic animals	+ +
Slash-and-burn cultivation	+ +
Mining	+ +
Negative effects of tourism	+ +

(Source: Languy et al. 1994)

The other national parks were not specifically included in the appraisal, but their particular assets are vulnerable, particularly if refugee camps spread. For example, Garamba National Park covers an area of some 500,000 ha and includes one of the rarest land mammals of the world—the wild northern white rhinoceros. It is also a remarkable sanctuary for over 6,000 elephants, 32,000 buffaloes, 3,000 hippopotamuses, and northern giraffes (UNESCO no date). The Salonga National Park, with an area of **3.6** million ha, has almost one-half of the tropical forests of Africa and is considered to be the largest equatorial forest reserve in the world (UNESCO no date).

The fourth national park in Zaire, Kahuzi-Biega, is not well-known. Because of its location, however, it almost certainly contains distinctive examples of flora and fauna that merit protection from the damage caused by widespread deforestation of the region. Ways of protecting the park due to the anticipated higher rate of local economic activities have to be considered in the near future (UNESCO no date).

ENVIRONMENTAL IMPACTS OF RWANDAN REFUGEES

On the basis of a rapid field assessment carried out by the authors, the main environmental impacts of the Rwandan refugees in the North and the South Kivu provinces of Zaire are described and discussed below.

Deforestation and Associated Environmental Problems

Unquestionably, the most serious environmental problem created by the Rwandan refugees is deforestation within and around all the camps. Extensive deforestation can now be observed in the city of Goma and its neighboring areas in North Kivu and the city of Bukavu and its neighboring areas and the Ruzizi plain in South Kivu, where all the Rwandan refugee camps have been sited thus far.

The Zairean government has estimated that the South Kivu region lost 3,750 ha of forest land within three 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 Nyrakavogo-Parizi Clinic—but also used the furniture in many of these buildings as fuelwood. The deforestation around all the refugee camps is already substantial. Further, not only is the process continuing unabated, it is even accelerating in some areas.

At least until early 1995, no refugee camps were located near the Kahuzi-Biega National Parks, so deforestation as a result of refugee activity was not observed. However, if the Rwandan refugees stay in South Kivu for any significant length of time, there is a distinct possibility that the Kahuzi-Biega National Park could be affected in the future **As** the fuelwood and forest products are depleted near the existing camps, the refugees could be forced to exploit the nearest major forest—Kahuzi-Biega—for products, both for their own use and as a commercial activity.

In North Kivu, the most severely affected parts are in Coma and its surrounding area and in the Virunga National Park. In Goma, the total deforested areas have been estimated at 300 ha. This includes trees along the roads; in the compounds of schools, hospitals, and churches that were occupied by the refugees; and on Mont Goma. Probably the most starkly deforested area is Mont Coma, which was deforested in only three days to such **an** extent that not even a single tree is standing at present.

The refugees at the 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:

- **Kugo-Kibati.** Government estimates affected area to be 7,200 ha.
- **Mugunga**. Deforestation is caused primarily caused by heavily armed Rwandan army personnel. Devastated area estimated to be 4,675 ha.
- **Kubare-Kalengera-Katale**. 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 unquestionably significant.

Virunga National Park

While deforestation around all the 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 in the park itself or within its buffer zones. The UNHCR (United Nations High Commission for Refugees) estimate of the number of refugees in these camps on 6 October 1994 was Kibumba–135,000; Mugunga–125,000, and Katale–110,000 (see table **3).**

Inhabitants of Mugunga camp, as have those of many other camps, have already started full- scale economic activities—selling charcoal, fuelwood, and other forest products and poached meat. These have currently become large-scale commercial activities. The area deforested is approximately **5** km long and as wide as 4 km in some places.

A much more detailed picture of deforestation caused by refugees is available for the Kibunlba camp near the Virunga National Park. On the basis of initial studies carried out at Kibumba, deforestation generally takes place in four distinct waves.

In the first wave, people collect deadwood from the areas of the park that arc nearest to the camp. Since nearly all the deadwood has been collected from the **park** periphery, refugees now have to walk some two hours inside the park (about 8 km) to collect deadwood. The area affected by this phase of activity is currently estimated at 9 km by **8** km. During.the second wave, refugees cut dead or live branches from trees, but not the main stems. In the third wave, they cut the main stems; and during the fourth and final wave, refugees take out the roots of the trees.

Table 3. Summary of camp water and sanitation indicators

Indicators	Kibumba	Katale	Mugunga	Kahindo	Kituku
Refugees in camp	135000	110000	125000	50000	17000
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 taps available	592	422	468	260	33
Persons/water pt.	228	261	267	192	515
SANITATION					
# of defecation areas	8	0	3	8	0
Size of defecation area (m^2)	6000	0	600	1814	0
# of provis latrines drop holes	6486	0	0	0	0
# of definitive latrines drop holes	0	1240	1826	2200	148
Persons/drop hole	21	89	68	23	115
# of waste points-rubbish	424	16	306	9	1

Source: J. Comerford, UNHCR-WATSAN Coordinator, Goma, Zaire. STATISTIC WATSAN: Dr. Rwamucyo Eugène, TAC. 17.10.1994).

After all the four waves have been completed, the area concerned is not only devoid of trees but also is likely to suffer accelerated soil erosion, especially during the rainy season.

While the above four waves were actually observed in the Kibumba camp, it is assurncd that a similar process is taking place in forests near other camps. A study was carried out by UNHCR and GTZ (Deutsche Gesellschaft für Technische Zusammenarbeit GmbH) on the extent of fuelwood collection between 28 September and 2 October, a period of five days. Twenty main paths from the Kibumba camp to the park 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 who carried back to the camp such forest products as of greenwood, green poles, deadwood, and straw, and weights of the loads carried. The numbers were randomly double-checked.

The observations give some idea of the extent of damage that is being inflicted by the refugees on the park every day. **An** average of 19,090 people used the 20 paths to collect forest products every day (32.6 percent were women, 33.9 percent men, and 33.5 percent children). **A** total of 406 metric tons of wood was carried to the camps through these 20 paths each day (the average load carried by each person was 21.2 kg).

It should be noted that the forest loss observed is only through 20 main paths 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 7,000-10,000 m^3/day. Viewed from any angle, this is a staggering rate of deforestation each day.

GTZ is now providing 400m^3/day of fuelwood from plantations to the various orphanages and the Kibumba camp, and is also planning to introduce fuel-efficient stoves in the camps. The authors consider that it would take months to get a significant number of the refugees to use the improved stoves; in other words, it would be along time before there is any perceptible difference in total fuelwood use. **A** quicker and more effective solution might be changing the individual cooking system (three stones for **a** wood fire) to communal kitchens.

Soil erosion and landslides

Extensive deforestation, including uprooting, is resulting in accelerated soil erosion in most camps and their surrounding areas. The problem was further aggravated by the onset of the rainy season. While erosion can be observed in and around refugee camps in Goma, the problem is really serious, and often critical, in the camps around Bukavu, which are often on steep slopes and on alluvial soil. Absence of terracing and proper drainage channels, as well as a near-total destruction of vegetation of these slopes by the refugees, means serious erosion and formation of ever-deepening gullies with each heavy rainfall. The soil erosion and mudslide problems are likely to become increasingly serious in the future with each rainy season and each heavy rain. 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.

Human waste

Disposal of human wastes is becoming a critical issue since generally no waste treatment is being done at any camp, 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 excavating pit latrines is problematical. Natural depressions are being further excavated and converted into latrines, but this is only a temporary solution because there is not yet a cost-effective and feasible way to deal with such pit latrines when they 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 such difficulties, it was decided to concentrate defecation in specially designated areas that could be more effectively managed. For example, Kibumba now has a defecation area covering some $6000 m^2$. 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 3.

But 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 various areas, including the Virunga National Park. From Kibumba alone, it is estimated that 150 metric tons of excreta are transported each month and dumped in other areas without any additional treatment.

Another environmental problem is how to manage the defecation areas during the rainy season. Heavy rainfall and the consequent storm runoff are 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 *at any camp* on a long-term basis.

Solid waste

Disposal of solid wastes 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 **3).** From these waste points, the rubbish is collected and disposed of at other locations. In some camps, for example in Bukavu, solid wastes are dumped at the periphery of the camp and then burned. Parts of solid wastes from the Kibumba camp, including disposable diapers, have simply been dumped in the Virunga National Park in the past.

Medical waste

Safe disposal of medical wastes and corpses presents another set of problems. In Goma, Medicins Sans Frontiers (MSF) (France) collects and incinerates medical wastes. Generally the 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 all their activities. Medical wastes have been dumped straight into the Virunga National Park by some NGOs; subsequently, the wastes are scattered all over by monkeys, baboons, and other animals. Such disposal practices clearly could have significant health 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 at mass graves;

unfortunately some of the early mass graves were quite shallow and were exposed after heavy rainfalls. Because of the volcanic rocks around Kibumba, grave digging is often not a feasible option.

Loss of Germplasms

The main objective of the National Institute of Agronomic Studies and Research (INERA) at the Mulungu Centre near Bukavu is to conserve and improve genetic resources. According to the center's director, initially only **4** hectares of INERA land was requested to settle 4,000 refugees. But currently some 60,000 people occupy more than 60 ha of experimental area of the center. The director is concerned that up to 100 ha of INERA land may be finally used for the refugees.

The refugees have totally destroyed the 60 ha of experimental area they are occupying. This includes loss of genetic resources in chinchona and coffee, agricultural experimental fields, and part of an arboretum. Most serious clearly is the loss of 47 clones of chinchona and **40** ha of clones of coffee. The chinchona clones were developed over a period of 15 to 20 years of experimentation to especially suit the Zairean conditions. Since there is no appropriate storage facilities at Mulungu, no germplasms could be stored. The chinchona and coffee clones are probably irretrievably lost.

Loss of the agricultural experiment fields means that soil fertility experiments that were being carried out for the last five years are lost and no new experiment can be carried out until the refugees move out of the INERA experimental land.

Poaching from National Parks

Even before the arrival of the refugees, poaching was a serious problem (Languy et al. 1994). 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 as a commercial activity and consumed in the camp.

In other areas, however, short-term impact of the Rwandan refugees appears to be a reduction in poaching. This is because the refugees come with cattle, which they sell. This step appears to have reduced the general pressure to poach. As the supply of cattle decreases, however, it is likely that the pressure to poach animals from the Virunga National Park will increase from both the Zairean and the refugee activities. The conservator for the southern

part of the park has only 10 guards; they have not been paid for several months and consequently have very little incentive to perform their tasks properly. It is not uncommon to find that the guards themselves are forced to poach for their own survival. Nor do they have appropriate surveillance equipment to control poaching in such a large area. Accordingly, the guards are likely to have very little impact in controlling poaching by any perceptible amount.

Changes in Land Use

There are many land use change implications because of the presence of the refugees. Probably the most important one is due to the vegetation destruction and deforestation at the camp sites and surrounding areas. **All** the camp sites are now almost devoid of any vegetation. If the refugees return to Rwanda in the near future, and careful and sustained effort is 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 six months or more, which is now a distinct possibility, there is a high probability that the refugees will initiate agricultural activities in the deforested areas. While the deforestation in 1994 came too late for sowing that year, March 1995 became a critical time to note what could happen. Even if the refugees leave shortly after initiating agricultural activities, it may be difficult to reclaim the land for afforestation; there is a high probability that the Zaireans may take over this 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 very fact that these official structures are located where they should not be is conceptually wrong and symbolically dangerous. The added fact that the relief agencies seriously considered constructing a road in the park only indicates the overall lack of environmental awareness and sensitivity of their staff members.

Drinking Water and Health

In certain camps like Kibumba, no water is available at the site so it must be transported long distances from various sources, Because of the volcanic nature of the land around the camp, all drilling attempts by Oxfam and SIDI (Swedish International Development Agency) to find water have so far been unsuccessful.

MSF (Holland) was providing 1.5 million liters of clean water per day to Kibumba, while THW (Germany) provides purified water to Goma area (Biswas, Tortajada Quiroz 1994). **UNHCR** would like to provide a minimum ration of 10 litres per person per day in all 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 litres per day at Kibumba to a low of **5.3** at Kituku, a new site.

In terms of water quality deterioration, there is no specific evidence thus far that the refugees have had any significant impact. While the authors 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 any notable water contamination. In fact, the main water quality problem of Lake Kivu is an abnormally high concentration of phenol (at least four times the permissible concentration of 0.005 mg/litre recommended by WHO). It is difficult to see how the activities of the refugees could have increased the phenol content of the lake water. Other explanations are likely (Biswas, Tortajada Quiroz 1994).

In terms of current health problems, the main one is diarrhoea. Dysentery is being reduced and 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 is necessary. Delousing was initiated in the Kahindo camp in mid-October 1994 (Biswas, Tortajada Quiroz 1994).

NEED FOR A REGIONAL APPROACH TO REFUGEE AND ENVIRONMENTAL PROBLEMS MANAGEMENT

The authors considered exclusively the current environmental impacts of the Rwandan refugees in Zaire. Before the findings of this mission, the general feeling among the relief agencies involved was that while the Rwandan

refugees had some environmental impacts, these were not significant and did not require immediate priority action. Only a few environmentally aware relief workers felt otherwise. It is now clear that, at least in the few places we studied, the refugees had significant impacts on the environment.

The regional dimension of the environmental impacts of the refugees is still unknown. Any regional analysis should include the following environmental considerations:

- Impacts of the Rwandan refugees in Zaire, Burundi, and Tanzania
- Impacts of the Burundian refugees in other neighboring countries
- Potential environmental impacts of the Rwandan and the Burundian refugees when they return to their own respective countries
- Assessment of the potential impacts in Zaire and Tanzania if it is decided that the refugees will be moved to new camps and/or will stay for prolonged periods of time in existing camps

What is now urgently needed is a rapid assessment of the environmental impacts of the Rwandan and the Burundian refugees on the whole region so that the total cumulative impacts can be kept to a minimum. Consequently, it is recommended that a mission on the regional environmental impacts of the Rwandan and the Burundian refugees be considered a priority. The outputs of the proposed mission could be the following:

- A detailed assessment of the current environmental impacts of the refugees in the four countries concerned
- Environmental impact assessments caused by the (possible) movement of the refugees to new camps and/or to their own countries
- Estimation of the current, as well as probable future, cumulative regional environmental impacts in the four countries concerned
- Identification of policy options to reduce the cumulative environmental impacts in the whole region to a minimum
- Costed action plans including project/program briefs, which could be submitted to donors as stand-alone interventions
- Other recommendations and/or proposals as considered appropriate

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 significantly more serious and critical than the Zairean government and

the various multilateral and bilateral agencies currently realize. Because of the seriousness of the situation, and the potential regional, national, and global implications, urgent actions area necessary to ameliorate these adverse impacts.

The most serious environmental impact is unquestionably the deforestation of the Virunga National Park, which is not only an international treasure in terms of biodiversity but is also a major tropical forest (UNDP-World Bank 1992; WWF-IZCN 1994). The park and the refugee camps cannot co-exist with impunity. Long-term environmental damages will continue to be inflicted on the park with each passing month. While much of the current damage can still 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 at present to ameliorate the environmental impacts on the Virunga National Park is unlikely to be effective, unless the refugees are moved from its vicinity, the authors 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 (European Union) sponsorship.

On the basis of these findings, it is essential that the staffs 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 so are acceptable, especially when compared to the emergency life-saving aspects of their work. These workers must 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 to the host country as well as to the refugees.

The authors only assessed the environmental impacts of the Rwandan refugees in Zaire. There are many other dimensions to the environmental impacts of the current regional refugee crisis, including potential environmental impacts when most of the refugees return to Rwanda and Burundi, and impacts of the refugees remaining in Zaire and Tanzania. In order to ensure that the total environmental impacts are reduced to a minimum, the refugee crisis needs to be analyzed on a regional basis. This aspect has not received any attention thus far.

Because of the current financial crisis, Zaire needs external financial help to ameliorate the environmental impacts of the Rwandan refugees. Unfortunately, the national implementation capacity of internationally funded projects is somewhat weak. Accordingly, the capacity of selected national NGOs and organizations like IZCN (Institut Zairois pour la Conservation de la Nature) and INERA should be enhanced with respect to project implementation.

Zaire does not have a proper environmental data base. While the national report to the UN Conference on Environment and Development is a step in the right direction (Ministere de I'Environnement, de la Conservation de la Nature et du Tourisme 1992), much remains to be done. Without a proper environmental data base for the country, it is not possible to manage the natural resources and the environment of the country efficiently.

Furthermore, Zaire currently has neither a holistic strategy for national environmental management, nor a sufficient cadre of trained professionals to carry out environmental impact assessments. In the absence of a national strategy and trained professionals, sectoral strategies to deal with 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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NOTE: The suggestions of the authors have resulted in two grants so far: (1) $11 million from various donors to rectify the environmental problems identified, and (2) $250,000 approved by the Global Environmental Facility as urgent assistance to preserve the biodiversity of the Virunga National Park.