27th WEDC Conference Lusaka, Zambia, 2001

PEOPLE AND SYSTEMS FOR WATER, SANITATION AND HEALTH

Money from waste

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1500 REFUGEE WOMEN in Dadaab refugee camp made Ksh. 4.5 million (USD 56,250) from waste in a period of twelve months during 2000/2001. In the process, they mopped 80 metric tons of plastic waste paper from the environment, earned an average disposable income of Kshs. 250 per head per month, acquired life-time skills in weaving and waste recycling, and introduced durable, yet relatively cheap shelter and housing material into the rural and peri-urban market segments. Perhaps of even greater importance, their attitude to waste has changed forever. And many have learned lifelong skills that they will carry along with them back to their home countries.

Introduction

As the 21st Century starts, we face the challenges of a new millennium. Economic imbalances, changing social structures and the ever - increasing civil and tribal animosities constitute a great challenge, resulting to large population displacements. The ever-worsening refugees' situation presents new problems that must be dealt with in addition to those not yet conquered. Besides this, changing values of the society and the globalization of problems relating to technological advances and lifestyles call for courage, determination and quest for fulfillment in unearthing the environmental challenges involved.

Evidence exists to demonstrate that large-scale displacement of people, characteristic of many recent refugee and internally displaced person crises, can result in adverse environmental disasters. The scale and suddenness of refugee movements can rapidly impact on the natural resources base of the hosting environment. Where the hosting environment is already under stress, as it is for instance in many arid and semi-arid regions of Africa and Asia, the sudden influx and settlement of refugees, usually involving huge populations over a limited area, can seriously threaten the stability of local ecosystems, the economic activities dependent on them, and the welfare of local communities.

The little noticed Environmental Impact: how refugees in Dadaab are meeting the challenge

Although deforestation tends to be the most apparent negative environmental feature of refugee situations, other visible impacts may include soil erosion, loss of wildlife and non timber products, loss of biodiversity and outdoor air pollution caused by the concentrated use of biomass fuels, depletion or contamination of aquifers, indiscriminate solid waste dumping (with a choking proportion of plastic waste). These effects are more often than not regarded as less obvious and critical impacts, but can nonetheless be a serious threat to the health of both the host and the refugee community in the long run. Nevertheless, while these challenges are perceived within the global framework, the onus of solving them lies within every one's potential and issues must ultimately be solved, implemented and managed at the local levels. It is therefore timely to revisit the whole question of how best to promote, ensure, and sustain a healthy environment in refugee camps and similar precarious settlements.

Refugee women in one of the Dadaab camps weave awaypolythene waste into cash - and mop up the environment .

Some of the sustainable measures towards this goal are being demonstrated in Dadaab refugee camps in Northeastern Kenya. Here, a CARE Kenya innovation with an integrated approach has transformed over 80 metric tons of waste plastic paper into a staggering Kshs 4.5 million (USD 56,250) for 1500 refugee youth and women. The purpose of this paper is to share some of these experiments and experiences with related missions elsewhere, be they slums, IDP (Internally Displaced Persons) camps or refugee camps. It is also emphasized that response and mitigation for the potential environmental impacts should begin on day one of the life of a (refugee) camp, not several years later as has been the general practice the world over - at least up until early -nineties.

About Dadaab refugee camp

Dadaab refugee camp is located in the North Eastern Province of Kenya. CARE Kenya has been the lead-implementing partner for UNHCR in the three Dadaab refugee

camps of Ifo, Dagahaley, and Hagadera since 1992. The registered refugee population for the three camps was 132,366 people in August 2001, half comprising women while a quarter are children between ages 2-11 years.. The majority of the population is Somali (95%) while the rest comprise of Sudanese, Ethiopians and Ugandans. Dadaab is an isolated town ship situated 110km to the North East of Garissa town and about 100km from the Somalia border. There is no link to the national power grid . Boreholes, averaging 150m deep, provide the only dependable water source and are powered by diesel generating sets.

Refugees live in densely populated (about 8000 people per sq. km) villages called blocks. The shelters comprise makeshift huts with walls and roofs made of stick thatch. Plastic sheeting is occasionally distributed by UNHCR. Security in the whole of North Eastern Kenya is precarious, with frequent armed bandit attacks on settlements to rob, kill or rape. Communication network is bad, with hardly any gravel roads. Birth rate in the refugee camps averages 8% per annum. Women and girls below 17 years of age comprise about 49% of the population. The daily food ration from WFP averages 1900 Kilo calories per person per day.

CARE's main sector activities in the camp are food warehousing and distribution, water supply & environmental sanitation, primary & secondary education and community rehabilitation services. Since 1994, there has been a gradual shift in implementation strategies to include community partnership with an innovative approach.

From Watsan to Watesan: Focus on Environment friendly programming.

During mid-1999, the then Water and Sanitation (Watsan) sector reviewed its approach to sanitation from mere waste collection and disposal to include a recycling and re-use process which mops up non-biodegradable and reusable waste. Focus broadened from strictly Public Health to Environmental Health. The sector henceforth became known as Water and Environmental Sanitation (WES, popularly known as "**Watesan**")

Although some form of plastics recycling and reuse was already an existing practice in several countries including Kenya, much of it is at individual or small group level in city slums and back streets. In Kenya, the Dadaab *polystrand* industry is increasingly becoming known for being a large scale waste plastics re-use initiative that does not involve conventional industrial processing. At least 80 metric tones of polythene bags that used to litter the camp environment for years until 2000 have disappeared. Today, there is no noticeable trace of waste polythene in the Dadaab camps and immediate neighbourhood. Polythene waste now has to be *imported* from neighbouring towns such as Garissa, the provincial capital, in order to sustain the *polystrand* production.

The size of impending disaster

Sudden large-scale population movements have adverse effects on the environment and thus exacerbate the social, economic, ecological, health and political conditions of the host communities.

Dadaab refugee camps are huge makeshift cities that sprouted virtually overnight. The amount of solid waste generated within such a settlement can be quite enormous and its associated dangers varied. These may range from the aesthetic to serious health risks. Of particular importance are admixtures of harmful substances e.g. oxides of sulphates and nitrogen and also total suspended particles. The major source for these is combustion of solid fuels for energy generation and open burning of the fast accumulating solid waste.

Plastic waste caseload

In Dadaab refugee camps, animal dung constitute the highest percentage of solid waste by volume (50%), followed by putrescible waste (25), rags and scrap metal (15%) and paper (9%). Plastic waste used to constitute just about 1%, yet it used to be the most scattered and prevalent eyesore before the *polystrand* innovation. Waste plastic is increasingly becoming a global environmental menace. The myriad of uses of plastic and its cheapness has made it a ubiquitous, accepted part of people's lives. It is seen as a panacea for the packaging industry. However it's non-biodegradable qualities makes it expensive and dangerous to dispose of.

Plastic consumption has been ever increasing since its introduction in the 1920s, causing rapid changes in people's lifestyles. Billions of tons are consumed in the world everyday. About 1% by weight of the total solid waste generated in Dadaab camps constitutes of plastic bags. This tallies well with the global statistics of waste plastic paper production. In Kenya alone at least 6,700 tons of plastics are consumed every month translating into 80,400 tons every year (EAED 2000). Out of the monthly consumption, 3000 tons are said to be in the form of buckets and cups, 2500 tons as plastic sheets, 1000 tons of polyvinyl chloride (PVC) used in a wide variety of household, agricultural and industrial applications including pipe conduits for electrical wiring and 200 tons for bottles. Of particular interest are the plastic sheets normally used as packaging materials and especially more so as wrappers and bags everywhere.

In the past, the many tons of polythene sheets and bags used in Dadaab per year ended up dumped or blown crudely at choked dumping sites. In all the three camps, wind blown paper bags trapped in the branches of hedges gave the impression of a major orchard crop. At the dumpsites the smoke could be seen bellowing away, the result of half hearted attempts to burn the non-biodegradable plastics. As a result, over 80 tons of plastic bags had accumulated in the Dadaab environment over a period of nine years.

An integrated approach:The Income from waste concept

The double cutting edge

The stark consequences of impeding environmental hazards as a result of the ever increasing plastic waste prompted

the Water and Environmental Sanitation sector of CARE Kenya's Refugee Assistance Project (RAP) in Dadaab refugee camps to innovate a project on waste plastic paper reuse/recycling. Waste plastic recycling is just one of the half-dozen recycling industries (popularly termed as RRIG-Refuse Recycling with Income Generation) going on in Dadaab. The cardinal objectives of the polystrand industry is to:

- Change peoples' attitude to waste – from a negative perception of waste as evil, to a sanitized conception of waste as a valuable resource in the wrong place.
- Mop the non-biodegradable eyesore from the environment.
- Provide strong, durable and affordable wall & roof screening for latrines and huts.
- Generate income for women, youth and children, thus combating poverty.
- A sustainable, cost - effective and replicable screening material that enables broader service coverage for the poor on lean resources.

Production process

The waste paper bags recycling involves ripping and twinning polythene bags into strands (*polystrands)* and then weaving the strands to form 1m x 1m mats called *polymats*. The unit fabric is the *poly-strand* or rope from which may be woven a wide range of products. In Dadaab, the major finished product (polymat) is used for latrine superstructure screens. Other products include doormats, baskets, hats, belts, and trays. The process line involves waste plastic "paper" collection, sorting, washing and disinfection, twinning and eventual weaving into finished products.

The raw material for the polystrand is the polythene tube or "paper" bag (of light density) as it is commonly known in Kenya. The polythene bags are raked from hedges, dumpsites and open spaces by members of the public (called scavengers or simply, collectors). Group members may also collect and sell to their own groups. The polythene is collected without discrimination on basis of colour, size or quality.... hence, promoting the underlying goal of cleaning the environment

Production of polymats started in April 2000 and by the end of July 2001, there were 44 active women groups in the 3 camps with a total of 1510 members. Sixty per cent of group members have been trained in weaving skills and group operations. Experimentation with the hand loom during late 2000 showed good potential for mass production, and it will be launched for production (alongside hand weaving) during 2002. The experiments also showed that diversification of polystrand products into hybrid (e.g. interweaving plastics with textiles) would diversify the product range further.

Project size

Total production recorded by August 2001 stands at 25,000 polymats produced over a period of 15 months. One polymat size 1m x 1m costs Ksh.150. 00 (USD 1.9). Recorded earnings from polymats only since January 2000 stand at Kshs 4.5 million (USD 56,250). This is equivalent to Kshs 300,000 (USD 3,846) monthly over a period of 15 months.

The weaving activities are undertaken by self-help groups, registered with the Watesan Sector. A group comprises of a minimum of 13 and maximum of 200 registered members. Membership is open to women, and youth. The bulk of the weaving is done at household level. However, different groups have a central place where they store common materials and products, share common or bulk tools and exchange ideas and skills.

Each group member is paid for his or her individual product. 3.5% of the gross proceeds goes towards the sanitation tool maintenance kitty of the Section where the member resides. 25% goes to maintenance and repair, detergents and raw materials (waste plastic paper). Besides skills training, CARE has trained group members in group dynamics, record keeping, marketing, savings and investment opportunities. Groups weave and sell the finished polymats to CARE which issues to needy refugee households for latrine screening. The weavers use the additional income to supplement food, health, education and sanitation service rations from the agencies. Previously, latrines were screened using empty gunny sacs, which wear out and have to be replaced within 3-4 months. Polymats are more durable (2-4 years), they are made locally, and help mop up the environment.

Future opportunities and development Research and Development

Plastic waste re-use in the form of the *polystrand* materials and to the scale being piloted in Dadaab is unprecedented, with a lot of potential for replication across many Kenyan, African and cities in other developing parts of the world. One of the key lessons arising from the Dadaab experiments so far is that further research is required to:

- Increase the life span, strength, and diversity of designs and models. (Ultra violet radiation is a challenge at the moment as it causes the plastic exposed in direct sunlight to shed)

A pit latrine with wall screening in Dadaab

- Enhance quality control
- Tools and skills development to diversify product range and to facilitate mass production.
- Replication of the technology worldwide.
- Improved competition of polystrand products in the global tarpaulin and heavy grade polythene market.
- Determine safe exit (or finale) disposal process of the polystrand waste into the environment or even recycling into other articles.

Presently, the major limitation to the envisaged research is funds.

Profit margin of the polymats industry

Environmental Education

Besides recycling and reuse, another area where CARE, refugees and a sister agency GTZ, are investing the lean resources availed by donors to address the hazard of environmental degradation is environmental education – in school curriculum and also at community and household levels. Results of a survey carried out by CARE in 2000 indicate that this has contributed to significant environmental awareness and bevaviour change among the refugee public, majority of whom are of nomadic and pastoralist background.

ITEM DESCRIPTION	TOTAL
a.Polyma a. polymats produced during year 2000	12,431
b.Polymat b. polymats produced Jan - Aug 2001	18958
c. Total in c. Inncome from polymats sale April - 2000 Dec 2000	1,815,324
d. Total in d. Gross income from polymats sale Jan- Aug Jan- August 2001	2,843,740
e. Income e. Income from other poly-articles sale – 2001	19,020
f. Expend f. Cost of raw materials, set up, training and produ and production - 2000	525,000
g. g. Costs in Jan -Aug 2001	783,993
h. Tools h. Tools maintenance kitty (TMK) Contributi contributions - 2001	105,934
i. Gross in I. Total gross income to groups (2000-2001) August 2001) (c+d)	4,659,064
j. Total pro j.Total production expenses (f+g + h)	1,414,927
k. Net inc k. Net income earned by the recycling groups sin groups since 2000 (i-j) **	3,350,071

***Excludes salary and wages for one officer and 3 casuals hired by CARE to facilitate and monitor RRIG activities.

NB: One Polymat unit measures 1m x 1m and costs Ksh 150 inclusive cost of waste plasticr. Plastic waste paper costs Ksh 8.50 a kilo or Ksh 10.00 inclusive transport. 3 kg is required to make one mat. The cost of production (materials, tools, training) amounts to 30- 40 %. Considering salaries, total production costs is in the range 50-60%,, giving a net profit of 50% -40%

Statistical source: WES Sector database.

Conclusions

To preempt and mitigate for potential environmental disasters, there is need to design sustainable and integrated approaches right from the emergency phase. Some of these approaches can be tailored to improve the economic well being of the population. Some of the measures, which are proving to be a success in Dadaab, include:: -

- Put in place a programming framework that defines sanitation beyond mere collection and dumping of refuse, to one that integrates phases of recycling /reuse.
- Environment rescue and recovery: to cater for the potential impacts of excessive clearance of ground cover vegetation. (In Dadaab, this is being done by a sister agency, GTZ)
- Devise innovative methods of environmental sanitation and management that integrate income generation from waste. This will help change people's attitude waste as an evil to positive conception of a resource in the wrong place, and promote sustainable involvement and ownership by the community .
- Education has long-term impacts and should be supplemented with short-term regulatory measures and public information messages on environmental protection. An integrated school curriculum at the initial stages of the camp settlement would instill a sense of responsibility to the school - going children who will transfer the same to society in general.

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[1] We would like to acknowledge the input of several colleagues in the sector. We also feel obliged cite the editorial comments by Wayne Nightingale, Assistant Country Director, CARE Kenya and Marangu Njogu, Programme Manager Refugee Assistance Project , as well as the plenary comments during the presentation to the Lusaka conference. This paper was accompanied with a power point show played to the plenary.

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