

# Building and Endangering Urban Landscapes: the Case of Construction Wastes in Bamenda Cameroon

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## Abstract

Building and construction is an ongoing process in urban landscapes given the available technology, obsolescence in buildings and the need to improve on the urban scenery. This activity is however accompanied by the generation of huge amounts of degradable and non-degradable wastes which if not well managed can constitute an eyesore and a potent danger to the urban population. Construction waste can also be of immense economic benefits to the population and the construction industry because it can be salvaged, recycled and reused. A random sampling of wastes generated at selected construction sites for ten neighbourhoods (two within the Central Business District (CBD) and eight at the periphery) in Bamenda town indicate that construction waste represents large amounts of material such as zinc, wood, iron rods, broken tiles, sand and plastic which is often illegally dumped by roadsides, river banks and building sites. Poor waste disposal/handling methods cause health and environmental problems such as flooding, and pollution in the municipality. While, such waste generate income and provide cheap equipment/material to the population and construction industry through informal recycling and reuse for other purposes, there is need for improved management as part of a growing movement toward sustainable city development due to increasing population and urbanization.

**Keywords:** building waste, recycle strategy, informal recycling

## 1. Introduction

Increasing population and the need for improved housing in third world urban areas has boosted the construction industry in terms of materials/equipments demanded and the population employed. This industry also has far reaching its impact on the environment by way of tones of wastes generated. The construction industry is responsible for producing a whole variety of different wastes. The amount and type of such wastes depend on factors such as the stage of construction, type of construction work being undertaken and the overall practices on site (<http://www.cardiff.ac.uk/archi/programmes/cost8/case/waste/construction.waste.html>). Approximately 40% of the generated waste globally originates from construction and demolition of buildings (Guilberto, 2007). Waste generation in quantity and variety has increased due to acceleration of urban population growth and increase in spontaneous settlements. Such increase also leads to many informal activities (Achankeng, 2003). Much building waste made up of materials such as bricks, concrete and wood damaged or unused for various reasons during construction can be as high as 10 to 15% of the materials that go into a building. Since considerable variability exists between construction sites, there is much opportunity for reducing this waste (Bogner et al., 2007). According to Ferguson et al. (1995), over 50% of the waste in a typical United Kingdom landfill could be construction waste. Craven et al. (1994) reported that construction activity generates 20 to 30% of all waste deposited in Australian landfills.

Direct dumping of untreated building/construction wastes in rivers, seas, and lakes, result in the accumulation of toxic substances in the food chain through the plants and animals that feed on them (Medina, 2002) which seriously affects the health of residents located closer to dumpsites. Adebayo (2001) reinforces the ideas of Salam Abu (2010) by explaining that waste on construction sites is enormous in most African countries, with dumping taking place in landfills and sometimes with other hazardous material, and in other instances left on the site, often in the case of smaller construction sites.

Waste Hierarchy places waste management strategies in preference of their prevention potential. The “3 Rs” Reduce, Reuse and Recycle are crucial, as they remain the most important practice of most waste strategies. The aim of the waste hierarchy is to extract the maximum practical benefits from products and to generate the minimum amount of waste. There are three basic steps for construction waste management- Reduce, Reuse, and Recycle. Reduce is basically preventing waste from appearing. So it helps if those building materials come in with pre-planned sizes and well estimated quantities. Reuse is using the existing materials instead of throwing it away. Pipes, ceiling fixtures, bath fixtures, lamps, electrical sockets, bath tubs, shelves, cabinets can all be used to some extent. Recycle is somewhat limited since it only allows those items that could really be used (Symonds, 1999). Material recycling capabilities can make use of most construction waste.

Recovery opportunities for building materials cannot be developed by builders alone but must be done in cooperation with waste haulers and processors, local and state solid waste officials, and product manufacturers. The efficient use of resources is a fundamental issue of green building construction. This means reducing, reusing, and recycling most if not all materials that remain after a construction or renovation project is a major step in the waste management process. Responsibly managing waste on construction sites is a vital component of a sustainable environment and economic development. There is the absence of specialized services with the duty to formulate and implement policies on building and construction waste in the municipality. This notwithstanding, building wastes constitute a mixed blessing for the population of Bamenda because recycling of some waste components minimises its effect as a hazard in the city.

Bamenda experiences a yearly growth rate of 7% (INS, 2010). This population needs to be housed and the response is the increasing rate in the construction of buildings and related services. Like any rapidly expanding city this settlement exhibits hundreds of construction sites which produce waste in large quantities. The waste includes materials such as broken tiles, bricks, plastics, metals, glass, wood and others. However, there exists very little awareness of resource-efficient construction practices in the municipality. These wastes are often bulky, have high density, occupy considerable storage space and constitute a potent hazard to the population as it is dumped carelessly by the roadside or in communal waste bins. The local council on her part has paid little attention to this poor attitude of the population which can have very far reaching consequences. The resultant effect is disruption in the free flow of pedestrians and vehicles, silting of culverts, flood enhancement and pollution. However, either due to resource shortage or inefficient infrastructure, not all of this waste is collected and transported to the final dumpsites. Given that collection and disposal of such waste is improperly done, serious consideration must be given as to how it impacts on peoples’ health and the environmental.

## **2. The Study Area and Methods**

### *2.1 The Study Area*

Bamenda is the administrative capital of the North West Region with a population of over 400 000 inhabitants (2010 estimates). It controls six divisions and is a major road junction linking all the divisions. This emerging urban centre ranks fourth in population after Douala, Yaounde, Garoua and Maroua in Cameroon. Its 7% annual population increase has been very spectacular over the past ten years, overtaking towns like Bafoussam and Nkongsamba. Given the rapid growth in population, it is obvious that this settlement plays the function of a regional pole for its immediate population and the entire Region. As a matter of fact, building and construction has become a very large industry due to the quest for a home by many residents. Physically, the town is developing on two distinct relief features. There is ‘Down town’ built on a relatively low lying plain (approximately 1200m above sea level) dissected by streams with a low gradient and a highland section (Station) of over 1500m above sea level. The difference of over 45° in gradient between both areas has enabled an easy and steady discharge of run-off into river courses under natural conditions should the natural ecology be left undisturbed by human activities (Nyambod, 2010).

### *2.2 Methods*

Building sites identified for this study are those where structures for family, business and institutional use are under construction. A total of 332 new building and rehabilitation sites were identified within 11 neighbourhoods between December 2011 and April 2012 for sampling. Only neighbourhoods having over ten building sites involving large projects like multiple housing were considered in order to appreciate the management of huge quantities of wastes generated. The Commercial centre and Meta Quarters were considered in spite of their small number of on-going building works due to their centralised location, high traffic, dense population and housing. It was imperative to find out how building waste is managed in the commercial areas compared to residential areas. Data on on-going constructions were obtained from the Bamenda City Council and were based on the number of building permits issued between June 2010 and December 2011. 130 users of

construction wastes were randomly interviewed to decipher its impact on the latter and the environment. Ten sites where such wastes are recycled were observed to assess the scale of the activity and the impact on employment and waste management.

### 3. Results and Discussions

#### 3.1 Generation and Disposal of Building/Construction Wastes

Huge quantities of wastes are generated during and after the construction phase which can be abandoned for several weeks before being cleared for disposal or used in the production of other materials as seen in Table 1. Findings reveal the high level of illiteracy and ignorance exhibited by over 75% of the workers at construction sites concerning the various categories of wastes and the threats to man and on the environment. In such sites, only broken tiles and zinc are separated from other wastes since they can be sold for recycling.

Soil waste originates from foundations, septic tanks and suck way to form mounds which sometimes are abandoned for several weeks to develop into bushes in front of some uncompleted sites. In certain instances, loose soil particles are washed into culverts where they cause blockages and flooding in neighbourhoods like Nkwen. The point here is that disposal of building waste is poorly organised. Results indicate that building waste disposal is undertaken by builders and only a limited fraction usually less than 5% is cleared by the municipality. The former makes use of some public bins, valleys, stream courses or roadsides as their dump sites.

Table 1. Type of construction waste generated and some uses

Type of waste generated	Utility of material in the construction industry	Some uses of construction waste
Soil	Bricks for walls	Refilling of pot holes on streets, moulding of mud blocks for further construction activities.
Iron rods	Rods for pillars, eves, decking	Recycled to produce other construction materials like balusters and decorative pillars, smelted to produce grill surfaces.
Zinc	Roofing sheets for roofs and insulation	Melted to produce kitchen utensils like pots, dishes, cutlery, cake tins, sieve and graters
Wood	Plank for roofing, door/window frames and ceiling	-Smaller pieces of wood are used as fuel wood. -Larger pieces of wood are recycled to produce beehives, didactic material for schools such as rulers, triangles and compasses.
Plastic containers	Paint for decoration of walls	-Plastic containers are used for waste collection and to fetch water in homes. -Used in homes to store food stuff.
Broken tiles	Tiles for walls, bathrooms and decorations	-Broken tiles for floors in other construction sites, toilet seats, and flower pots.

City council vans hardly collect building waste for disposal due to its bulk and composition (mixture of degradable and non-degradable materials). A concrete soil heap contains non-degradable material and can weigh up to 20 tons which is excessive for the specially designed vans used for domestic waste transportation. To buttress this point, a driver of the waste collection company, revealed that;

*“...waste from construction sites are not transported by the council vans because the vehicles are designed to evacuate only household waste. By the way, construction waste usually contains metals which can even damage the trucks. We can only dispose of empty bags of cement if found by the way...”*

Building waste is therefore collected and disposed of haphazardly in various sites/zones in Bamenda. They can be dumped into pot holes (43.9%), transported to the dump site at Mankon (25.6%), and along roadsides, river banks, farms and other unregulated dumping grounds (20.5%) and sold to recyclers (10%). Soil and broken blocks is a conspicuous feature on the street along Old Town near the New Finance building, Mile 4, Ntarinkon and Ngomgham streets. Actually, no street is safe from building waste and this constitutes a serious hazard for road users and the environment.

When waste from building sites block gutters and increase frictional drag during rainstorms it can be dangerous for the city because it accelerates flooding. This state of affairs was also confirmed by studies conducted by Fombe (2006) on solid waste dumping and collection in Douala where poor dumping habits, limited and

ill-adapted waste collection facilities have had untold consequences such as the discharge of irons from corrosive metals into running water and wells.

The fact is that illegal dump sites destroy the beauty of the City of Bamenda. Building wastes strewn along road sides such as the Veterinary Junction to Old town axis, Mile 2 and Foncha Street create disorder. Illnesses are also an outcome of the poor management of waste from building sites. Findings reveal that workers, who clean up waste from building sites, are not protected. They sometimes cannot afford it or generally complain that the mask makes them uncomfortable. The situation is especially dangerous for painters given the long term effects of hazardous substances that get into their lungs. 17% of respondents at the building sites admitted to have had a cold or cough during the collection, transportation and disposal of waste from the sites.

Waste deposited on roadsides and other open spaces is subject to wind erosion. Winds are frequent in February and transport loose sand, soil and cement particles. This increases the amount of greenhouse gases in the atmosphere. The study cannot really estimate the quantity of particles released to the atmosphere. It should however be noted that the effects on human health and the environment is very important. Mahayuddin et al. (2010) also notes that in Malaysia construction waste represents large amounts of material that are often illegally dumped by roadsides, river banks and many other open spaces. This is a common phenomenon in cities with poor waste collection systems and the absence of regulations related to its management.

Carelessly dumped corrosive metals discharge irons that are dissolved in running water to contaminate streams and plants. When cement is washed away by rainwater into the streams, it increases its turbidity. This water is used downstream for bathing and washing of clothes and cars. Scarcity of water in the dry season obliges households to resort to the polluted streams for drinking and cooking. Other health problems arise from the use of cement paper to package foodstuff. Cement can cause skin irritation and severe respiratory tract infections. Burning of waste from construction sites is not uncommon and this poor habit causes the release of CO<sub>2</sub> and NO<sub>2</sub> into the atmosphere that contributes to climate change. Poon (2000) reported that the waste generated by the building and demolition of construction projects forms a large proportion of environmental waste in Hong Kong.

### *3.2 Building and Construction Waste as a Utility*

Waste from building and construction works can be of immense use to the construction industry and the population if well sorted out. Some waste can be transformed for reuse or recycled to produce other products. Findings reveal that up to 75% of building waste constitutes a utility for the local population. On site reuse of building waste takes place in most building sites. The study reveal that 91% of builders acknowledge reusing soil waste, concrete, wood, zinc, plastics, broken tiles, cement bags, broken blocks and others. Six per cent give out the waste for others to reuse and 3% do not know what happens to it. The recycling of building waste is a source of economic activity which generates income through job creation. The type of material bought from construction sites is usually broken tiles, pieces of zinc and metal. Dump sites also contain a lot of material for recyclers like broken tiles, zinc, metal and other recyclables which are scavenged by youths of between 12 to 25 years. The material is sold according to its weight (10kgs sells at 500 FCFA or approximately 1USD) and is often compressed to reduce its bulk.

Recycling in Bamenda is undertaken on a small scale for the improvement of livelihoods. Zinc and metals are recycled to produce kitchen utensils like pots, frying pans, cake tins, cooking spoons, charcoal pots, sieves, and knives. These are low cost products sold to households for domestic use and their prices are generally 3 times cheaper than those imported or manufactured in industries (Table 2). Broken tiles are also recycled in great quantities to produce toilet seats/wash basins and other items as shown Figure 1. These materials are highly demanded by most households for use in pit latrines and as wash basins. Over 75% of broken tiles from building sites are used to produce toilet seats, and flower pots while the rest 25% is bought for the same purpose.

Table 2. Comparative prices for selected manufactured, recycled and reused products and those recycled from construction wastes

Type of product	Average market price (FCFA)		
	Original product (imported)	Recycled product (local)	Gains (%)
Toilet seat	40 000	10 000	300
Iron rod (8")	2 700	1 000	270
Pot (8litres)	30 000	10 000	200
Cake tin/container (5/grams)	4 000	1 500	166.6

Nb. 1US Dollar is equivalent to 500 (FCFA).

Recycling generates income and creates employment to the local population at different stages of the process. Table 3 indicates the number of people involved in the recuperation, manufacture/recycling and selling of materials produced from such wastes. Data was obtained from four sites only and results do not reflect the situation for the entire urban area. According to a manufacture in Ndamukong Street, the use of aluminium/metal products engages an indirect workforce of 250 people in the production of various pots, knives, sieves and cake pans. Wood waste is recycled for the production of beehives, mats for fences and wooden furniture. In the case of kitchen utensils a few people are engaged since those who go around recuperating the zinc, iron rods or vehicle parts are the same involved in marketing.

Table 3. Employment in the manufacture of selected products from recycled building waste

Product	Stage of employment		
	Recuperation of waste material	Manufacture & selling	Total
Charcoal pots	8	16	24
Toilet seats/balusters	25	16	41
Wooden products	3	6	9

NB. Data is based on 4 sites in Bamenda. These are Veterinary Junction, Ntarinkon, Mile 6 and Ndamukong.

The construction of materials with broken tiles employs people at the different stages of collection, transportation, manufacture and marketing. However, the last two stages are handled by the same persons who sell on the spot or at fixed locations in the Central, Nkwen and Ntarikong markets where they operate at specialised locations.



Construction waste (demolition waste) ready for recycling



Aluminium pots manufactured from scrap corrugated iron sheets

Figure 1. Scrap corrugated iron sheets (A) have been recycled to produce aluminium pots (B) of various sizes solicited by most homes in both urban and rural areas

Source: Photo by Melvis N, 8/04/2012.

Marketing of these products generate income and employ youths in different domains of the informal sector. Production of aluminium pots is generally on request and supply of material by customer. For there is no specialised team to collect/supply the material recuperated from building sites. This illustrates the informal and poorly organised nature of the activity. Table 4 shows the relationship between the estimated amount of revenue generated per month by recyclers and the number of people employed. This shows a very high relationship of  $r = 0.87$  using the Pearson Product Moment Correlation Coefficient between the two variables at the 0.01 level of significance ( $p < 0.01$ ). Where just 1 to 3 people work in a small industry, the output is lower with monthly revenue of 20 000 to 30 000 FCFA (approximately 40 to 60 USD). Compared to those with over 3 persons employed in the recycling of construction waste who generate between 31 000 to 40 000 FCFA monthly which is above the country's net income/capita of 27 000FCFA (<60USD).

Table 4. Relationship between estimated monthly revenue generated by recyclers and number employed

Monthly revenue from recycling (FCFA)	Nº of people employed
20 000 – 30 000	<3
31 000 – 40 000	3 – 5
41 000 – 50 000	5

Recycled and reused construction waste comprises 75% of materials produced while just 25% is bought from hardware shops. Considering the input for a recycled product like toilet seats (Plate 3), sand and cement is non-waste material. It takes for example, 50kgs of cement and 200kgs of sand to produce 50 toilet seats. Alternatively, inputs cost between 35 000FCFA and 50 000FCFA for an output of between 250 000FCFA and 300 000FCFA; labour not inclusive. In cities like Bamenda with a weak manufacturing base, and given the rapid influx of unskilled migrants from the country-side, recycle and reuse of construction waste as a means of survival cannot be over-emphasised. This sector needs a much better impetus and economic space to boost development in the city. A better management of construction waste thus constitute an important utility of the urban population and the construction industry that needs to be addressed and organized for sustainable development.

#### 4. Conclusion

Building waste has increased enormously within the Bamenda urban space resulting from the expansion in the building/construction industry. This activity has been enhanced by greater affluence, more access to building and construction materials and urbanisation. The lack of proper management of such wastes by the industry and the local planning services makes it a major problem within the city as tons of unused materials are poorly discarded which creates serious environmental hazards through pollution and the blockage of streets within most

neighbourhoods experiencing the activity. Very insignificant efforts are being made to reuse and recycle these wastes by the community in general and the planning authorities in particular. Some local individuals on an informal basis have made efforts to render the wastes less harmful to the population and the environment through reuse and recycling for other purposes. This notwithstanding, there is need for greater awareness by the local population and planning authority to ensure environmental safety through safe disposal and reuse of the materials. Responsibly managing waste from construction sites is a vital component of a sustainable environment and economic development as part of a global drive towards sustainable cities.

The local planning authorities should adopt a more rigorous policy towards the handling and disposal of building and construction waste. It should be a joint effort of real estate owners, the municipalities and the urban population in general to adopt measures for the safe management of building waste that is toxic and cannot be reused, reduced or recycled. Special attention should be given to construction wastes like cement paper, wood, broken tiles and metals amongst others which can be reused and recycled. These wastes can constitute a veritable local industry for the maximisation of resources and the creation of more employment opportunities in this rapidly expanding urban environment.

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