Millennium Cities Initiative Earth Institute | Columbia University



NIMA LAND USE MAPPING PROJECT

REPORT and **MAP SET**

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1. INTRODUCTION

Land is the stage on which all human activity is conducted. Human use of land or "land use" encompasses myriad different activities ranging including, food production, provision of shelter, recreation, extraction and processing of materials, etc., as well as the bio-physical characteristics of land itself (Briassoulis 2009). Land use concerns the function or purpose for which the land is used by the local human population and can be defined as the human activities which are directly related to land, making use of its resources or having an impact on them (FAO 1995, 21).

In many low-middle income countries, the lack of data covering most land use and land cover, especially in Africa, has necessitated the need to develop an information management system to catalogue most of these important land resources (Twumasi et al, 2006). Ghana is no exception to the generally poor state of information about land use. Accra, the capital city, is developing at a dramatic rate, with significant increases in land use, however basic (and more detailed) information on this condition remains lacking. Without such data, planning and development efforts are fruitless.

Over the last few years in Ghana, various measures have been undertaken to promote sustainable landuse planning and management including the implementation of the Land Administration Project (LAP), a community-driven land-use planning and management program to introduce a more sustainable land management system. It also has the objective of formulating a comprehensive land policy framework that offers direction for efficient management and use of land (Government of Ghana, 2003). For the above target to be met, and as part of the efforts to develop Accra as a Millennium City, there is a need to develop a detailed foundation database on the various land use activities, which will aid better planning and development. This project therefore endeavors to contribute to Accra's land use and community infrastructure data by providing a GIS database on Nima, one of the city's most deprived communities.

1.1 BACKGROUND

Nima is situated approximately 5 miles north of Accra Central. Its boundaries are ring road (south), Kanda Highway (east, between Nima and Kanda Estates), the Accra Girls Secondary School (north) and the Odaw drain westward (Owusu, Agyei-Mensah & Lund, 2008). The community is administratively split as "Nima East and Nima West" with the Nima Highway running through them. Though there are two different assemblymen for Nima East and Nima West, many residents do not recognize the boundary – it is Nima one and the same. The Odaw drain runs from Kanda Estates through Nima East and West as well, which also serves as a boundary reference between Nima and Maamobi.

1.1.1 Demographic Profile

Agyei-Mensah and Owusu (2009) studied patterns of ethnic segregation for Accra based on the 2000 Census conducted by Ghana Statistical Service ("GSS"), finding that Accra was more likely to show

| Table 1.1 Population and location guotients for Nima, based on Ghana Statistical Service 2000 Cer | sus result. |
|---|-------------|
|---|-------------|

| | Akan | Mole-Dagbon | Ewe | Ga-Dangme | Other | Total |
|-------------------|--------|-------------|-------|-----------|--------|--------|
| Population | 13,758 | 8,976 | 9,077 | 6,591 | 17,428 | 55,830 |
| % of Total | 24.6% | 16.1% | 16.3% | 11.8% | 31.2% | |
| Location Quotient | 0.6 | 2.3 | 1.1 | 0.4 | 3.7 | |

an economic pattern of segregation based on historical conditions, rather than ethnic patterns of segregation. Agyei-Mensah and Owusu (2009) described Nima as a low-class residential area of migrants, as distinct from neighborhoods such as James Town, which are overall indigenous. The main ethnic groups in Nima hail from various regions of Ghana, including the Ashanti region (Akan -25 percent), northern Ghana (Mole-Dagbon -16 percent) and the Volta region (Ewe-16 percent). Nima's ethnic makeup is best understood when analyzing the location quotients of different ethnic groups, based on the overall population of Accra. The high concentration of northern ethnic groups (Mole-Dagbon and Other) is highlighted by the corresponding location quotients in the figure below. Islam is the predominant religion in Nima, followed by Christianity.

1.1.2 Land, Municipal Services, and Local Economy

Land in Nima was, and continues to be owned by the Odai Kwao family, a Ga family from Osu. They gave custodianship of the land in the early 1940s to the Futa family of the Fulani tribe from West Africa. Land was initially used for cattle pasturing in order to slaughter and sell at the market in Accra Central (Owusu, Agyei-Mensah & Lund, 2008). Migrants began settling in larger numbers after World War II, when troops returned to Accra from the Gold Coast (Yankson 2000; Essamuah and Tonah, 2004; Owusu, Agyei-Mensah & Lund, 2008). Migrants continued to arrive in Nima under the Futa Family's blessing; by the 1950s, settlement development became increasingly problematic as spatial planning was never implemented. This no doubt played a role in Nima being termed a zongo, or "stranger's quarters" due to the large influx of migrants and uncontrolled development. Zongos in Accra have a history of neglect in terms of municipal service provision relative to other communities in Accra. As such, sanitation, accessibility and waste management have long been a major hindrance to the public health of the community.

People are "on the move" (Owusu et al. 2008) in and out of Nima based on their ability to find better places to live and strategic locations to those with networks

Table 1.2 Education attainment of population aged six years and older in Nima, based on Ghana Statistical Service 2000 Census result.

| Education attainment | Percentage | |
|--------------------------------|------------|--|
| Have never attended school | 34% | |
| Completed primary school | 26% | |
| Completed middle school | 27% | |
| Completed postsecondary school | 2% | |
| Any Tertiary education | 2% | |

in the area. Owusu et al. (2008) conducted in- depth interviews with 24 residents of Nima and seven community leaders, finding frustration among the youth due to the lack of jobs and opportunities. Low academic achievement also impacts the ability of local residents to obtain jobs, and, more important, properly paid jobs. Academic achievement in Nima is shown to be low by the GSS 2000 Census, with a very large percentage of the population never having attended primary school and very few residents receiving anything beyond a secondary education.

The 2000 Census also showed a strong reliance on informal activities among local residents, with 54 percent of economically active individuals being selfemployed and an additional 15 percent dedicated to unpaid family labor or apprenticeship; with the additional sector spread between the public sector (slightly less than 30 percent) and formal private employment (close to one percent).

The interviews by Owusu et al. (2008) also demonstrate the extent of Nima's connections to international markets, with flourishing import businesses and 50 percent of the households interviewed receiving remittances from family living abroad. Overall, the interviewees highlighted the importance of the development of Nima Highway in bringing new businesses to the area, including the first bank in the neighborhood.

Islam plays an important role in Nima. Those interviewed by Owusu et al. (2008) ranked (in order of importance) religion, family presence and economic reasons as the main reasons for people's presence in Nima. Islam creates a series of links, religious obligations and transnational social networks that provide, among other things, shelter and food for visitors and strangers in need. Islam was also the locals' main explanation for the relatively low reported levels of crime within Nima.

1.1.3 Study Area

The study area is in Nima East, which is considered the most deprived area of Nima, according to authorities at the Accra Metropolitan Assembly as well as to opinion leaders in Nima. The area is considered to be deprived due to poor housing stock, overcrowding, and servicing of infrastructure, community facilities and sanitation.



Map 1. Study area

1.2 OBJECTIVE

This project focused on investigating and documenting the land use, associated economic activities and community infrastructure within Nima East, which will provide data for future planning and research for the MCI program.

The project involved:

- Inventory and mapping of the use of building structures (land use)
- Mapping of community facilities
 - o Water
 - Water taps
 - Community water pumps
 - Fire hydrant
 - Water vendors
 - Water boreholes & wells
 - Water tanks
 - Pipelines & meters
 - o Sanitation
 - Public WC & latrines
 - Public baths
 - Ablution bays
 - o Electricity
 - Power stations
 - Converter / transformers
 - Side generators
 - o Solid waste
 - Waste containers
 - Dump sites
- Transportation
- o The classification and conditions of road networks within the study area
- o Tro-tro (minibuses) routes
- o Tro-tro (minibuses) stations

1.3 METHODOLOGY

1.3.1 Data Collection

The first step in this study was to collect existing geographical information ² on the city of Accra and Nima and to contact local authorities, leaders and representatives. For the purpose of creating links with the local authorities, a meeting was held with the Assembly member for Nima East, as well as an introductory meeting with local chiefs, religious leaders (imams and pastors) and opinion leaders, which took place on July 1st, 2010. The meetings resulted in an agreement on the area and scope of study, and a general blessing for the MCI team to conduct their research.

For the purpose of collecting existing information, the MCI team partnered up with the Ghana Geological Survey Department and the Urban Management Land Information System (UMLIS), both of which generate key GIS data and maps for the city. Local boundary files, building shape files (with LAP codes by structure) and road shape files of Ayawaso East Sub-Metro were provided by UMLIS. Additionally, a partnership with local NGO CHF International arose out of mutual interest in mapping Nima East. Subsequently, CHF International agreed to provide geographical information on water availability and infrastructure, initially gathered as part of their Water Access for Sanitation and Hygiene for the Urban Poor ("WASH-UP") project. Based on this information and in line with the objectives of the overall project, the plan for field work was developed.

The first step in the field work was the demarcation of the study area (Nima zones II and III). The zones were demarcated with the help of the Nima East Assemblyman by walking the boundaries with the MCI team, tracking the path with GPS equipment. This was later plotted on the base map of Nima East.

To gather information regarding land use and roads through an inventory of the research area the research team was divided into three groups (including personnel from CHF International). This allowed for the study area to be further divided into three sec-

 $^{^2}$ Geographical information gathered was in the form of ArcMap 9.0 (or above) shape files, with its corresponding data attributes and projection.

tions with each group assigned to a section. Inventory of land use spanned approximately four days. Direct observation was the main technique employed for the identification of the various purposes for which land was being utilized. Where necessary, informal enquiries were made to verify the type of activity. This was followed by the inventory of roads and walkways within the study area. The inventory focused on the accessibility of the roads, their width and physical conditions.

Solid waste, sanitation and electricity services were shown to the researchers on the days outlined above by the Assemblyman and local youth group leaders; GPS readings were taken at each of these locations, and their main attributes were documented. Information on tro-tro stops and routes was also provided, including the specific tro-tro stop GPS readings, which were taken together with the route and final destination of the tro-tros that serve the specific stop.

1.3.2 Data Classification

LAND USE

Land use data was classified in the following ways: a) Residential, b) Commercial, c) Small scale production, d) Public use, e) Utilities, f) Open space, g) Parking, h) Mixed with no public use and, i) Mixed with public use. Further information was taken for all of the classifications. A detailed description can be found in Appendix I.

WATER

Water data collected in the field were classified based on function and ownership, with the following categories:

> **Boreholes:** Privately-owned water sources that require certification and approval from Water Resources Commission. Hardly anybody applies for this approval.

Community water meter: GWCL-installed meters to measure the amount of water flowing into a community. This helps in detecting water lost as a result of leaks, broken distribution pipes and illegal tapping of water.

Water meter: Measuring device at approved receiving ends of water connections designed tomeasure the quantity of water consumed at the end.

Water main valve: point controlling water flow on the primary distribution network.

Fire hydrant: GWCL designated high pressure point for filling and refilling of Ghana Fire Service Tenders.

Water pipe line: PVC and HDPE pipes that carry water from the GWCL primary distribution lines into individual houses.

Water vendor: Individual who usually stores water and offers it for sale to other people.

Water tank: A container for holding or storing water for later use or for sale. There are various kinds such as concrete, PVC, and fiber glass.

SANITATION

Public WC & latrines, public baths and ablution bays were categorized according to their ownership (private, public or religious)

SOLID WASTE

Recorded elements were classified by type and operator. In this case only waste containers were found in the study area, all of them operated by ABC.

ELECTRICITY

Recorded attributes were noted with their position. Only transformers were found in the study area.



Map 2. Zone 2 and 3 in Nima East

ROADS / WALKWAYS

Different classifications were formulated based on the information gathered in the field. Roads were classified according to their accessibility to motor vehicles, whether or not they were paved, and their width based on a natural scale of how many individuals can simultaneously walk in the road/ walkway.

Tro-tro routes were individually delineated in the corresponding map; stops were not classified since all routes made all of the stops.

1.3.3 Data Processing and Analysis

An attribute database was developed in Microsoft Access 2007 to store the information gathered in the land use and roads inventories. Information on land use pertaining tothe structures in the area was later joined with building shapes in Arc Map 9.3.1 using the LAP code of each building (NTBK in the attribute table of the final Arc Map file). The roads were digitized based on the tracks and later joined with their observed attributes.

GPS readings of the location of infrastructure regarding solid waste, electricity, sanitation and tro-tro stops were downloaded in WGS 1984 format and then projected into the Accra Grid for the purposes of measurements. The corresponding attributes were added to the resulting elements.

1.3.4 Limitations

The study area was set as a result time constraints and the human resources available to the project; therefore, the mapping of other areas of Nima East was postponed and will be completed on subsequent trips. The areas studied for this iteration of the project were chosen based on their reputation among AMA and community leaders for being the most deprived.

The land use inventory comprised only the observations of the researchers, as no interviews were conducted with the users or inhabitants of the structures. This was due to the fact that the overall project did not receive IRB certification, thus limiting the interactions the researchers could have with human subjects. Street width was measured based on a human scale and left open to the criteria of the field researcher, with no objective measure of this attribute.

During the meeting with local chiefs and religious leaders, participants expressed their interest in acquiring more information about the ownership and ownership structure of buildings in Nima, however this request was not incorporated into our research due to lack IRB certification and time limitations.

The inventory of community facilities managing solid waste, sanitation and power was limited to the facilities identified by the Nima East Assemblyman and youth group leaders during the fieldwork. However, no additional facilities pertaining to these areas of urban life were found during our independent fieldwork in the study area. The accuracy of the spatial locations gathered through the GPS readings is generally subject to an error of 10 to 16 feet, 95 percent typical.

2. RESULTS

2.1 LAND USE



Map 3. Land use of building structures

Figure 2.1 Land use in Nima zones II and III (by percent of structures)



Figure 2.2 Structures with Residential, Commercial, Small- scale production and Public use in Nima zones II and III (by percent of structures including mixed- use buildings)



Figure 2.3 Structures with Residential use in Nima zones II and III, breakdown by type of housing (by percent of structures including mixed- use buildings)



Figure 2.4 Structures with Commercial use in Nima zones II and III, breakdown by type of commercial activity (by percent of structures including mixed- use buildings)



Figure 2.5 Structures with Small- scale production use in Nima zones II and III, breakdown by type of activity (by percent of structures including mixed- use buildings)



Figure 2.6 Structures with Public use in Nima zones II and III, breakdown by type of activity (by percent% of structures including mixed- use buildings)



76% of School structures are dedicated to primary education 96% of Schools are private schools. Just one public school identified 32% of School structures are dedicated to Islamic schools or/and are attached to a Mosque

2.1 COMMUNITY FACILITIES

2.2.1 Water facilities



Map 4. Community facilities (water 1)

2.2.1 Water facilities (continued)



Map 5. Community facilities (water 2)

2.2.1 Water facilities (continued)

Nima, despite its central location, has been grappling with a poor water supply for decades and it is not uncommon to find many households depending on vendors to buy water on a daily basis. This situation has even given rise to water porters, who fetch water for residents for a fee, balancing water from a staff on their shoulders. According to an interview conducted by Adams (2010), very few settlements have a continuous water supply throughout the week. It is important to note that significant amounts of treated water pumped from the water head works at Kpong and Weija are lost due to leakages in the lines.Aqua Vitens Rand, a joint South African - Dutch company is operating the facilities of Ghana Water Company Limited ("GWCL") and is charged with providing for the water needs of the general public.

Nima is located on a terrain with rising and falling relief with Kanda, Mamobi and Accra New Town bordering it on lower grounds. This may partially account for its predicament with regards to water supply. The situation has compelled some residents to install in-line suction pumps to draw the little water that manages to enter the distribution system in Nima. Unfortunately, this illegal action deprives the majority of residents from receiving water; leaving them with no option but to purchase water from those who are drawing it out from the lines.

The main GWCL line serving Nima runs parallel to the Kanda Highway with nodes designed for individual connections. However, according to the residents, some of the nodes have higher water pressure as compared to others. We were not able to substantiate this with the GWCL.

2.2.2 Sanitation facilities



Map 6. Community facilities (sanitation)

2.2.3 Solid waste and power facilities



Map 7. Community facilities (solid waste and power)

Generally, sanitation in Nima is poor. Adelaide (1995) noted that disposal sites in Accra are situated a considerable distance from inhabitants or sellers. This discourages inhabitants and sellers from making use of them, meaning that they resort to littering. This might be a contributing factor to Nima's poor sanitation. The sparse distribution of waste containers for the zone of study can be seen in Map 7, with no container in zones II and III.

2.3 STREETS/WALKWAYS

2.3.1 Width



Map 8. Width of streets



Map 9. Vehicular accessibility



Map 10. Pavement



Map11. Drainage



Map 12. Transportation (tro-tro routes)



Map 13. Transportation (tro-tro stops)

2.5 ELEVATION



Map 14. Elevation of Nima

3. NEXT STEP

An expansion of the study area will be required for a more complete understanding of Nima. This study focuses on "micro-data" meaning that the current state of Nima's economy, politics, religion and cultural life was not analyzed in this report; therefore, our research does not firmly establish the link between Nima and the rest of Accra in its broader development.

The study was also limited to structures with an LAP code (used for tax collection purposes) and missed informal structures not recorded in the geographic information provided by UMLIS. A high level of commercial and small scale production activity was observed by the researchers during field work, both in walkways and in areas that appear to be open space in the maps presented. A more detailed record and analysis of this activity would certainly help to complete our understanding of Nima.

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TECHNICAL NOTE

GPS Equipment used: Garmin GPSMAP 60Cx

APPENDIX – DATA CATEGORIZATION AND DEFINITIONS

LAND USE

| FID | Internal feature number (Source: FSRI): Sequential unique whole numbers that are |
|----------------------|---|
| | automatically generated. |
| SHAPE | Feature geometry. (Source: ESRI): Coordinates defining the features. |
| NTBK | Code assigned to every building by UMLIS for tax collection purposes, the codes |
| | identifies every structure |
| SECTION | |
| BLOCK | |
| PARCEL | Parcel number |
| BLDGNUM | Building number within the parcel |
| RATECLASS | Rate class of the building (for property tax purpose) |
| LANDUSE | Land use of the structure |
| Value | Definition |
| Residential | Structure with residential use |
| Commercial | Structure dedicated to the sale of products or the provision of services |
| Mixed with no public | use Structure with more than one use but that does not includes a public building |
| Mixed with public us | e Structure with more than one use and that includes a public building |
| Open space | Space free of construction |
| Public use | Structure dedicated for communities activities, provision of public services, religious and community organizations |
| Small scale producti | on Structure dedicated to the manufacturing or distribution of goods |
| Туре | Type of vacancy space |
| Value | Definition |
| Vacant land | Space free of construction open for development |
| Vacant | Developed unit currently vacant |
| Under development | Structure under construction |
| TYPE_P | Type of public building, the type of public use is capitalized in the first letter of the first |
| | word, if more than one public use takes place in the structure the two uses are |
| | separated in this column by a ";" |
| TYPE_C | Type of commercial activity in the building (Retail, Wholesale or Services), the type of |
| | commercial activity is capitalized in the first letter of the first word, if more than one |

activity takes place in the structure the two uses are separated in this column by a ";"

| Value | Definition |
|-----------|---|
| Retail | Sale from an ordinary store or at the regular customer price and in small amounts rather than in bulk |
| Wholesale | Sale in large quantities to other businesses (retailers) for resale |
| Services | Space dedicated for productive activities related to non-tangible goods. |
| TYPE_I | Type of manufacturing activity in the building (clothing, furniture, wood work, food or |
| | other), the type of small scale production is capitalized in the first letter of the first |
| | word, if more than one activity takes place in the structure the two uses are separated |
| | in this column by a ";" |
| SUBTYPE_P | Additional information on buildings with public use, in the case of schools information |
| | is arranged in the following way: "name of school"; level; ownership. |
| SUBTYPE_C | Additional information on buildings with commercial use, the specific retail, wholesale |
| | or service is included in this column, information for the different type of commercial |
| | activities is separated by a ";" |
| SUBTYPE_I | Additional information on buildings with small scale manufacturing use, information |
| | for the different type of manufacturing activities is separated by a ";" |
| MIXTYPE | Initials of the activities in the mixed use building separated by a space: Residential |
| | "RES", Commercial "COM", Small scale production "IND" and Public use "PUB". |
| HOUSETYPE | Category of the housing unit (residential use) based on the classification by the Ghana |
| | Statistical Service 2000 Census |

POWER

| Value | Definition |
|-----------|---|
| NOTE | Specific type facility type |
| TYPE | General type of facility |
| ALTITUDE | Trimmed value for elevation |
| POSITION | Long and Lat of the point |
| NAME | Number of WP in original research work |
| ELEVATION | Elevation above sea level (ft) of the site |
| SHAPE | Feature geometry. (Source: ESRI); Coordinates defining the features. |
| | automatically generated. |
| FID | Internal feature number. (Source: ESRI); Sequential unique whole numbers that are |

Transformer

High to low tension power transformer

ROADS / WALKWAYS

| NOTE | Notes on the road | | |
|----------------|---|--|--|
| Blocked | Road / walkway blocked, inventory was not performed | | |
| Not accessible | Road is not accessible by motor vehicle | | |
| Accessible | Road is accessible by motor vehicle | | |
| Value | Definition | | |
| ACCESS | Describes is road is accessible or not by motor vehicles | | |
| Blocked | Road / walkway blocked, inventory was not performed | | |
| Unpaved | Road is unpaved | | |
| Paved | Road is paved | | |
| Value | Definition | | |
| PAVEMENT | Describes if road/ walkway is paved or unpaved | | |
| Blocked | Road / walkway blocked, inventory was not performed | | |
| 3P+Vehicle | Three or more people can walk through this road/ walkway side by side and it is accessible to motor vehicles | | |
| ЗР | Three or more people can walk through this road/ walkway side by side | | |
| 2P | Two people can walk through this road/ walkway side by side | | |
| 1P | Only one person can walk through this road/ walkway side by side | | |
| Value | Definition | | |
| WIDTH | Width of the road / walkway based on a human scale | | |
| Piped | PVC piped drainage runs along or under the road / walkway | | |
| Blocked | Road / walkway blocked, inventory not performed | | |
| Covered | Covered drainage runs along or under the road / walkway | | |
| Open | Open drainage runs along the road either by the side(s) or in the center of it. If note specifies so the col road could be a drainage gutter | | |
| No drainage | No drainage was identified in the road | | |
| Value | Definition | | |
| | sides, the center or under the road. | | |
| DRAINAGE | Describes if drainage runs along the road / walkway; if so, drainage may run on the | | |
| SHAPE | Feature geometry. (Source: ESRI): Coordinates defining the features. | | |
| FID | automatically generated | | |
| FID | Internal feature number (Source: FSRI): Sequential unique whole numbers that are | | |

Notes on the road

SANITATION

| FID | Internal feature number. (Source: ESRI); Sequential unique whole numbers that are | | |
|----------------------|---|--|--|
| | automatically generated. | | |
| SHAPE | Feature geometry. (Source: ESRI); Coordinates defining the features. | | |
| ELEVATION | Elevation above sea level (ft) of the site | | |
| NAME | Number of WP in original research work | | |
| POSITION | Longitude and Latitude of the point | | |
| ALTITUDE | Trimmed value for elevation | | |
| TYPE | General type of facility | | |
| NOTE | Specific type of sanitation facility and name | | |
| Value | Definition | | |
| Public toilet (KVIP) | Refers to a Kumasi Ventilated Improved Pit facility | | |
| Public toilet (WC) | Refers to a facility with access to flowing water and drainage | | |
| Funding | Ownership structure of the facility | | |
| Value | Definition | | |
| Private | Publicly accessible facility privately owned and operated. Payment is required to use this facility. | | |
| AMA, East Ayawaso | Publicly accessible facility owned and operated by Accra Metropolitan Assembly through the local asseml (Ayawaso East). Payment is required to use this facility. | | |
| Religious | Sanitation infrastructure part of a religious facility, accessible to members of religious community and may by the corresponding religious organization. | | |
| HIPC Benefit / AMA | Funded by the Highly Indebted Poor Countries Benefit program. Publicly accessible facility owned and op by Accra Metropolitan Assembly. Payment is required to use this facility. | | |

SOLID WASTE

| FID | Internal feature number. (Source: ESRI); Sequential, unique whole numbers that are |
|-----------|--|
| | automatically generated. |
| SHAPE | Feature geometry. (Source: ESRI); Coordinates defining the features. |
| ELEVATION | Elevation above sea level (ft) of the site. |
| NAME | Number of WP in original research work. |
| POSITION | Longitude and Latitude of the point. |
| ALTITUDE | Trimmed value for elevation |
| TYPE | Type of facility |
| NOTE | Operator of the facility |
| Value | Definition |

Operated by ABC

Waste facility operated by ABC waste company. As of date of research, solid waste management in Acc outsourced to a number of companies. The operation of the site is defined by its location.