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**UNICEF-SUPPORTED INITIATIVE FOR DEVELOPING A GIS-DRIVEN
COMMUNITY-BASED DEVELOPMENT MONITORING AND EVALUATION
SYSTEM (CBDMES) AS A TYPE OF ANTICIPATORY DISASTER MANAGEMENT
INFORMATION SYSTEM (ADMIS) IN GHANA**

Presented by

E. Amamoo-Otchere: Executive Director
Benjamin Akuetteh: Application Specialist

Centre for Remote Sensing and Geographic Information Services (CERSGIS)
University of Ghana, Legon
cersgis@ug.edu.gh

ABSTRACT

Though in the 1990s the development paradigm focused on sustainable development and the environment, the results for Africa has been opposite – a decade of social, economic and political disasters, whose contribution to poverty has been enormous. Everywhere there is the growing incidence of HIV/AIDS, low levels of technology use in national life, particularly in economic production, communication, health and education. Not only rural-urban migration has increased but also across frontier transfer of poverty has risen with refugees. Within the urban scene loss of trust in the central government's ability to create employment has expanded the informal sector with huge accumulation of slump landscapes.

People learning to put their welfare into their own hands has led to the growth of Non-governmental organizations (NGOs) and Community-based Organizations (CBOs). Transparency and accountability, the two basic conditions for accessing development funds for sustaining initiatives are difficult to probe for lack of data management system that can easily store, retrieve, update and analyze the uses of the funds and evaluate the outputs. Lately, Geographic Information System and Management Information System are being recognized as the appropriate monitoring and evaluation tools for planning sustainability of poverty-alleviation projects.

This paper discusses a case in Ghana in which UNICEF has taken the initiative to commence a community-based development GIS-related base map for its long-term monitoring and evaluation system. The digital base map has been compiled by CERSGIS based on the use of satellite images, Global Positioning System observations of community locations, government gazetteer of communities, existing but outdated topographic map, local knowledge of the grass-roots level decision-makers and opinion leaders concerning distribution of communities and their vital attribute data. The results have been found to be very appropriate for developing a community-based decision support system for project planning, implementation monitoring and evaluation. The Ministry of Local Government will eventually need this kind of digital geographic datasets for each of the hundred and ten districts, and also an operating system to manage the data for the Government's poverty-reduction strategic planning.

1.0 BACKGROUND

The Integrated Community-Based Development (ICBD) Programme is a multi-sectoral programme of cooperation between UNICEF and the Government of Ghana.

The main objectives of the ICBD are to reduce high levels of infant mortality, under 5 mortality, malnutrition and maternal mortality and enhance the quality and access to basic education in six administrative districts in northern Ghana. Two of the districts are located in Upper East Region (Bulsa and Bawku-East) and

four in Northern Region (Savelugu-Nanton, Zabzugu-Tatale, Yendi and Tolon-Kumbungu).

The strategies of the ICBD programme are:

- to increase the capacity of district assemblies and sector departments to plan and coordinate the delivery of basic services;
- to increase the quality and access to basic services, emphasizing maternal and child health, basic education, nutrition, water and sanitation and household food security
- to increase awareness at community level by empowering communities to assess and analyse the situation on child survival, development and protection. Communities are encouraged to take action against identified problems and priorities through self-help, and with the support of the DA which will coordinate support of NGOs and other external agencies.

Existing Monitoring and Evaluation systems in ICBD

Since the inception of the programme, the district assemblies and departments have been supported to collect information on the situation in the district, which affects child survival and development. The information has been collected through

- multiple indicator household surveys,
- anthropometry surveys, and
- routinely collected information of existing monitoring systems

From household surveys, indicators are available on malnutrition, access to safe water, school enrolment, occurrence of diarrhea and fever, consumption of iodated salt, exclusive breastfeeding, in five of the six focus districts.

From the routinely collected information, epidemiological and infrastructure based information is available. For example, the District Water and Sanitation teams have acquired information on water sources, and their functionality in each community. The MOH has acquired institution-based information on maternal and childcare issues, outpatient clinic information. The Community-Based Surveillance System of the MOH is operational only in Northern Region, providing valuable information on the incidence of several diseases such as polio, CSM, incidence of guinea worm, data on mortality of children and mothers. Ghana Education Service routinely collects information from every school on school attendance, enrolment and performance rates, etc.

Some of the data collected have been converted into electronic databases, however most of this information is not yet linked to a geographic database for GIS. In the past few years however, the ICBD programme has strengthened capacity in the districts in order to visualize and utilize available information through training of the multi-sectoral Monitoring and Evaluation Teams. As a result, the departmental staff have manually visualized some of the infrastructure and epidemiological information on district maps. This has been demonstrated during the development of medium term development plans where data have been utilized for realistic priority and target setting, and during review meetings on the implementation of district annual action plans. The major disadvantage of the manually made maps is that not all communities in the district are reflected and near-real time display of information on infrastructure, epidemiology, etc. is not possible.

Information on the situation of about 50-70 target communities per district, is or will soon be available. This mainly qualitative information is obtained during the community empowerment process using participatory rural appraisal tools such as village mapping, child and seasonal calendars and Venn diagrams. A community based monitoring system is being developed to include information on the

- progress made in the community empowerment processes (when it started, which priority areas were identified and when these were implemented),
- access to basic services (e.g: where is the nearest health center, school and water source)
- interventions supported by the project (e.g: introduction of micro credit scheme, information sessions, safe drinking water supply, sale of bed nets) and
- impact indicators related to child survival and development (e.g: school enrolment, vaccination coverage, and malnutrition).

In addition to this information, the earlier mentioned Community Based Surveillance System of the MOH provides information on the occurrence of child and maternal mortality and several diseases in each community of Northern Region.

2.0 OBJECTIVES OF USING GIS IN ICBD MONITORING AND EVALUATION SYSTEM:

The main objective of using a geographic information system is to strengthen the documentation on the lessons learnt, progress and experiences in the ICBD programme. This, on its turn will facilitate and inform the planning and action process for UNICEF, national, regional and district level partners.

In more specific terms, the GIS should enable the organization and its partners:

1. To visualize the location of focus districts and target communities on a map
2. To visualize the access to education, water, sanitation and health services in the district and target communities (e.g WHO standard radius of access of health services $\leq 8\text{km}$, education facilities $\leq 5\text{km}$)

3.0 UPDATING THE COMMUNITY MAP WITH SPACE IMAGE AND GPS

The approach taken

The following were mobilized for use to create the community-base map.

I. Equipments:

GPS receiver (Trimble TDC1)

Multimedia projector

Laptop computer

II. Data Sources:

MOH GPS point data provided by UNICEF to be validated

VIP settlement data in digital (source: digitized survey settlement data)

Survey Topographic data (hard/soft copies)

- Footpaths/tracks layer
- Rivers/streams layer

Road layer (Feeder roads database developed by CERSGIS with GPS)

Image maps of Landsat 7 ETM+ regime of year 2000/2001 (hard/soft copies)

III. Attribute Data

- Tabular list of settlements in the VIP database on all six districts.
- List of all MOH settlements captured with GPS to be validated.
- Government gazetteer of communities per district
- Current list of settlements compiled by the district assemblies as at 2001(master list i.e. Update of Legislative Instrument)

Sensitization and participatory workshop organization at each district

In each district CERSGIS gave a brief overview of satellite image interpretation and its potential for updating spatial databases. The digital layers were projected on a screen from a laptop with a multimedia projector. The use of digital data allowed zooming at varying scales to reveal detail information when necessary by using Arcview-GIS as the software. The objective of this exercise

was to have an up-to-date settlement database reflecting the current situation at the districts by validating the position and existence of all the GPS points of settlements captured by MOH. After the validation, new settlements that have sprang up over the years after the Topo map compilation were identified and added to the database, first by digitizing on screen, and second, by marking their positions on the hard copy image maps. Those that were non-existent were removed from the database.

The current list of settlements held by the district assemblies was used as the master list to cross check the total number of settlements within the district. The visual and positional accuracy check was done by overlaying the ancillary data and MOH GPS point layer on the satellite imagery as backdrop in bands 543 (see *Image 1*). This band combination showed a clear contrast in vegetation cover and built-up areas. The convergence or intersection of tracts and footpaths mostly indicated the existence of settlements/communities. The VIP data was used as a guide in the validation. Each settlement was checked for positional accuracy and name spelling. Those that were not found in both the VIP and MOH layers were digitized. Old settlements that were no more in existence but were in our database were marked and deleted and new ones that have been established were also captured on screen.



These exercises were done at the district assembly collectively with district assembly staff and grass-root decision-makers.

Image 1

Image 2:

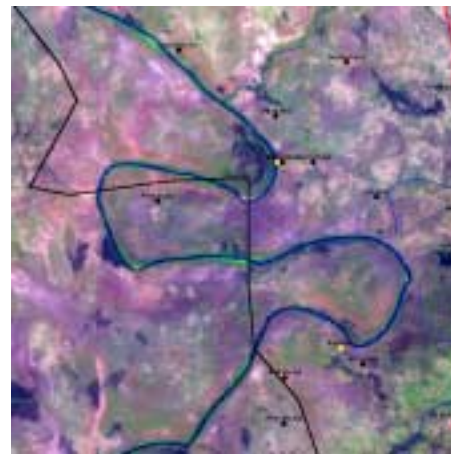
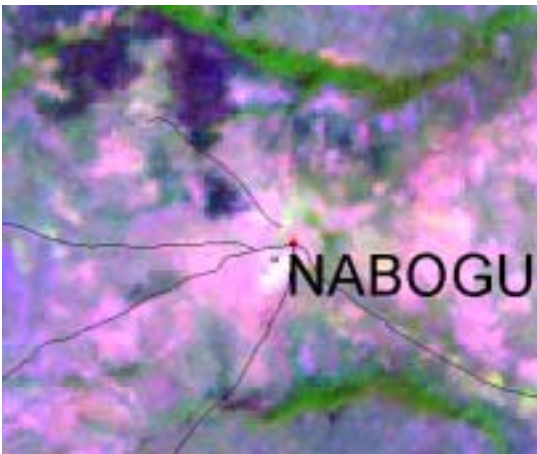


Image 1: *Community location shown in red (VIP) and in white (MOH GPS data) both lying at the centre of intersecting footpaths/tracks and roads (black lines).*

Image 2: *Highlighting district jurisdiction boundary problem*

Summary of results as per observation and changes made during the field visit

DISTRICT	CHANGE OF SPELLING OF NAME	COMMUNITIES RELOCATED/ MOVED	NEWLY INSERTED/ CAPTURED	SETTLEMENTS NOT EXISTING (DELETE)
YENDI	47	8	63	11
ZABZUGU-TATALE	33	9	18	8
TOLON-KUMBUNGU	17	32	4	0
SAVELUGU-NANTON	19	46	30	1
BAWKU EAST	51	7	58	5
BUILSA	32	7	38	2

Field Remarks

The adopted procedure was followed for all the six districts visited. The use of satellite imagery as backdrop in combination with the vector layers proved to be very handy in assessing the accuracy of location and spatial extent of settlements to be validated as well as the delineation of the district boundaries. This approach showed that most of the work could be done in the office with the data and information available backed by the rich experience and knowledge of the district teams. All the six districts visited had problems with the existing demarcation of the district boundaries.

Although this procedure has proven to be cost effect and time saving, there is the need for a further accuracy check on newly inserted communities by GPS to justify the technique adopted.

GPS field validation

The GPS survey was carried out in 3 districts from 10-17 March 2002 by CERSGIS. The survey involved the collection of community centers in Zabzugu-Tatale, Bawku East and Builsa districts. The location parameters taken into account were

latitude and longitude in the WGS 84 coordinate system. A community base station was made available to enable differential correction.

Resources available during field visit

- Field Vehicle
- GPS receiver and accessories
- Community base station
- Pathfinder office software
- Arcview 3.2a



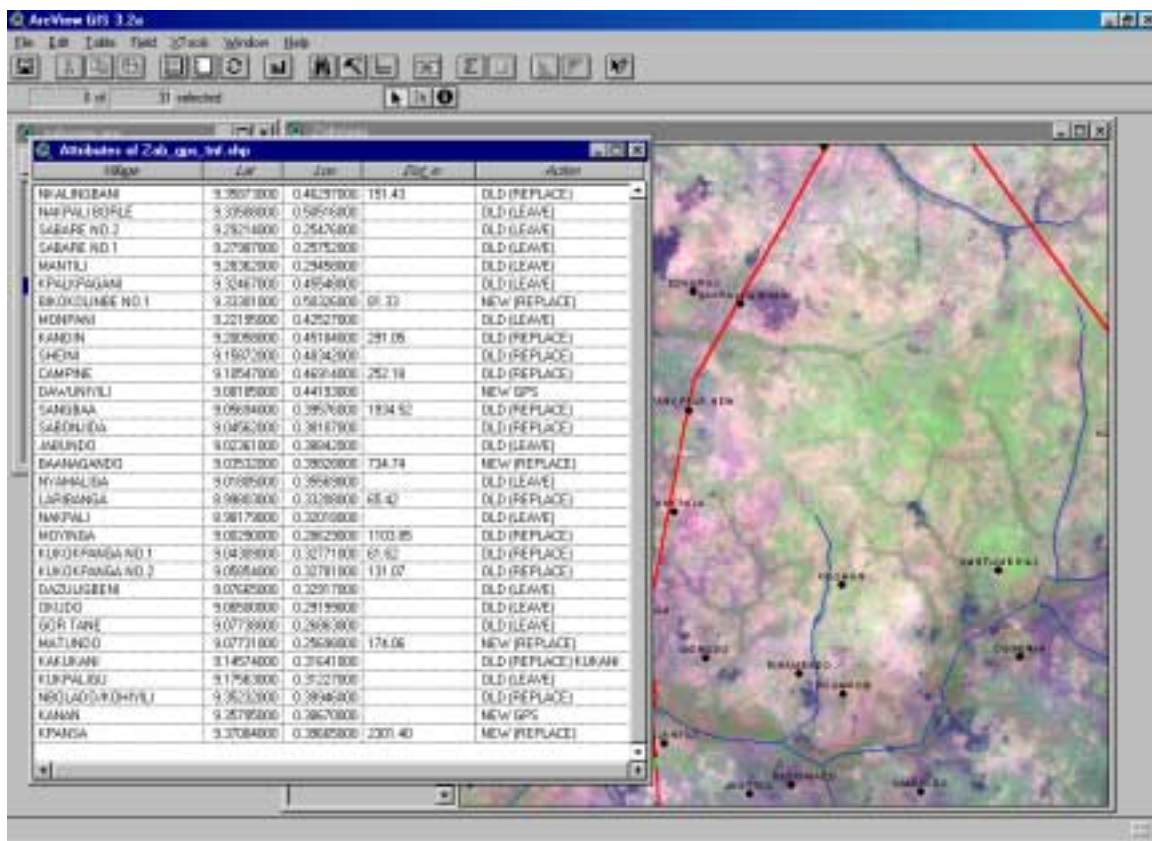
4.0 PROBLEMS

Some communities out of the list selected to be visited, were not captured due to accessibility and time constraints. It was quite difficult to locate the centers of communities in the Bawku East district due to the farming practices of households mixed with farm lots within communities. Some communities have migrated to areas with better soil fertility for farming hence have relocated and were no more inhabited.

5.0 RESULTS

Each randomly sampled community was captured with a GPS receiver. These points were processed and differentially corrected using CERSGIS community base station and transformed into the Ghana Grid coordinate system to allow comparison with relocated or newly inserted communities by the use of the satellite imagery and other ancillary data sets.

The table below shows a comparison in distance between the inserted communities and the GPS computed communities in meters in one focus district.



The newly captured GPS coordinates after confirmation was added to update the system. These newly computed GPS coordinates replaced existing coordinates of communities in the final list. The main aim of validation was to have a spatial and structurally harmonized dataset for an integrated community based monitoring system for rational decision-making.

Summary of updated communities/settlements per district

DISTRICT	MOH GPS points to be validated	Final list of updated communities
YENDI	281	329
ZABZUGU-TATALE	204	215
TOLON-KUMBUNGU	233	237
SAVELUGU-NANTON	129	157
BAWKU EAST	305	358

