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CBMS-NRDB and Its Uses in Poverty Monitoring

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Introduction

Undertaking poverty monitoring strategies has been one of the priority tasks that many local government units (LGU’s) have pursued. Since the emergence of many monitoring systems, most of the LGU’s have their presentations and dissemination of summarized information from the gathered data in the form of tables and numerical figures such as databoards. However, it has been perceived that numerical figures are not always easy to interpret and appreciate particularly to laymen and folks of a community, e.g. village, barangay, purok, and this is furthermore induced by the direction of severity of an indicator.

Moreover, the devolution has led many authorities to further probe poverty attributes down to the smallest and basic unit of the community—the household. Nonetheless, this task is not easy if one has to generate tabulations for each of the household in each of the poverty attribute. As a corollary, it has been desired to improve presentations of summarized data in such a way that many could plainly appreciate and probe poverty characteristics even at the household level. One way deemed feasible is presenting summaries geographically.

Many LGU’s have utilized geographic information system (GIS) softwares in mapping indicators such as ESRI’s Arcview. This has been an advantage since a geographic image and status of a community such as a municipality is being depicted through its barangays changing their images according to severity of characteristics. Additionally, locations of households can also be displayed with differential colors according also to their attributes.

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Even so, many LGU’s are not capable of procuring license for such expensive softwares. Hence, cost became a hindrance in making presentations and analysis geographically especially to those government units that have computers but cannot afford a GIS software.

This led the MIMAP-CBMS Coordinating Team advocate the use of Natural Resource Database (CBMS-NRDB), a freeware developed by Richard Alexander\(^3\), which is capable of storing spatial (shapefiles) and non-spatial (texts and numbers) data as well as generating maps, reports and graphs ideal for presentation and analysis of poverty attributes in the community.

NRDB was originally developed for the provincial government of Bohol in the Philippines. Its purpose was to establish an expandable database for their environment office to cover the various ecosystems of the province. It was also adopted by the provincial government of Palawan, Philippines as part of their Community-Based Monitoring System (CBMS). It was initially installed in the provincial government offices in May 2001 and used for collating data collected by individual municipalities. The software was subsequently installed in the municipal offices as a tool for managing and presenting their own data. The CBMS-NRDB was complemented by the use of GIS, which was used for the presentation, and analysis of information.

Recently, CBMS-NRDB was also employed as a mapping tool in the municipalities of Camarines Norte who are conducting CBMS, i.e. Municipalities of Basud, Labo, Mercedes, San Lorenzo, San Vicente, Sta. Elena, and Talisay. Thereafter, MIMAP-CBMS Coordinating Team has encouraged all government units interested in conducting their own CBMS to use CBMS-NRDB.

\(^3\) A British volunteer, who spent three years working for the Bohol Environment Management Office, through the assistance of Voluntary Service Overseas (vso.org.uk). The project was supported by the British Embassy and the European Union.

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Software Description and System Considerations

CBMS-NRDB is simple yet very helpful software that can be installed to any computer, with relatively minimal requirements, under the Windows platform. The whole program is free and readily downloadable (http://www.nrdb.co.uk) from the net.

The installer occupies no more than five megabytes of memory and the main program takes up no more than six megabytes of disk space. The NRDB software will run even on relatively low specification PCs, early Pentium processors with 16MB RAM for instance. This one good point implies that the main consideration is the amount of spatial data and size of the main data that is to be stored in the database and to be displayed on maps. If a user is producing relatively simple maps with only a few hundred nodes, barangay for instance, then a low-end specification machine may be able to run the software. Therefore, the program does not entail users to have powerful computers to run the database.

On the other hand, it is more advisable that LGU’s house a fairly potential computer particularly if they are producing maps with thousands of nodes (such as at the provincial level for the Philippines). A large number of nodes accompanied with indicators eats up a large memory and cannot be handled by early computers. Furthermore, having a CD-Writer is highly recommended for it is very useful for backing up and distributing the database. Specifically, an ideal specification for a computer to run the database is as follows:

Windows 98/2000/XP
MS Office
1,000 Mhz processor or above
128Mb RAM
Colored Monitor
CD-Writer
Desktop scanner
Desktop (color) printer

From the specification above, it can be seen that aside from Windows Operating System, NRDB-CBMS basically needs Microsoft Office, particularly MS Excel and MS Access, principally for data management. Excel and Access play a vital role in the organization of the database.

**Core Features and Capabilities**

The CBMS-NRDB amalgamates the basic capability of GIS software and the fundamentals of a database manager program. It integrates in a single database file all vital spatial data being fed by the user (i.e. shapefiles) and the indicators generated (e.g. CBMS survey) through a series of protocols.

**Database Organization and Features**

*Open Database Connectivity Standard (ODBC)*

The software works under the *Open Database Connectivity (ODBC) Standard*, a standard for connecting between software applications and databases.\(^4\) This means NRDB-CBMS could connect to any database application with a suitable database driver and since CBMS-NRDB is also a database manager, it can hold a large database. The default database application and driver used is Microsoft Access. Thus, in most government units utilizing CBMS-NRDB, an MS Access file (*.mdb) is associated with their database. This file holds all the records fed in by the user such as spatial data, figures, indicators, names and IDs, and other information. Furthermore, since CBMS-NRDB uses this standard, it could connect to other databases such as a networked Oracle or SQLServer.

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\(^4\) Definition of Terms, NRDB Tutorial.pdf.

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Hierarchical Features and Attributes

The database structure consists of a hierarchy of features defined in a data dictionary and grouped into several sectors inside the program. Each feature here is a group of data being included in the database arrayed in a ladder-like manner confined in one-to-one or many-to-one relationship or parenting. For instance, a database of a municipality would be composed of an array of barangays/villages, then under each barangay/village would be an array of puroks/zones and under each purok/zone would be an array of households.

Moreover, each feature has corresponding attributes. These represent characteristics of features and other variables, e.g. the area of a municipality, its population and its ‘map’ of physical/geographical boundaries. These attributes can assume values in Boolean (Yes or No), coordinate, polyline/polygon, text, or numeric form. In the case of CBMS, aside from physical boundaries, associated attributes could be proportion of households with income greater than or equal to the poverty threshold, prevalence of malnutrition, employment rate, etc.

The number of values an attribute could assume is related to its feature parenting, i.e. if the feature is parented as many-to-one or one-to-one. The array from municipality to households is apparently one-to-one. However, features can branch to other features. A barangay/village, aside from branching to a set of puroks/zones could branch to another ladder of features, e.g. barangay CBMS demography, barangay CBMS indicators. This is usually done to facilitate homogeneity of groups of variables. In this case, the relationship is many-to-one. An illustration of common feature hierarchy is as follows:

![Feature Hierarchy Diagram](https://example.com/feature-hierarchy.png)
Legend:

--- One-to-one

---- Many-to-one

○ Household

CBMS-NRDB as a Spatial Database

As mentioned, CBMS-NRDB is an integrated basic and spatial database. In other words, since each hierarchical unit has associated attributes aside from the ‘map’ of geographic boundaries, maps and specific locations can be displayed with associated statistics and figures. For example, given that the municipalities have eight barangays, these barangays can be displayed not just geographically but also with their corresponding attributes, e.g. barangay employment rate, barangay poverty incidence, barangay crime incidence.

Spatial Data

A spatial data is a file or a set of files containing set of languages to form a map. CBMS-NRDB obtains spatial data by generating shapefiles, which is a file format containing spatial data such as coordinates, polylines and polygons. This file can be acquired in two ways. First, a map can be manually digitized using the accompanied digitizing program—‘Image to Shapefile’—where a scanned map image (*.jpg) can be overlaid and traced to generate coordinates and lines. Second, external shapefiles can be fed into the database like those used by ESRI’s Arcview. These consist of three files with the same names with extensions: *.shp, *.shx, and *.dbf, containing the spatial data, index and corresponding data, respectively. Aside from importing shapefile, CBMS-NRDB also supports exportation of these shapefiles to facilitate data transfer.

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6 Definition of Terms, NRDB Tutorial.pdf.

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Basic Data

Similarly, basic data such as names, indicators and other variables could be generated through encoding or by importing. CBMS-NRDB facilitates data encoding and editing and automatically refreshes the linked MS Access data. Another way is matching data types with an external encoded data. For instance, the set of indicators is encoded in MS Excel (*.xls) format instead. This file can be readily imported provided that the values assumed in the external data match the data types and structure in the database. Other compatible files that could be imported in the database are Text files (*.txt, *.csv) and dBase files (*.dbf).

Other Essential Aspects

Time-series Attribute

Whenever a feature is generated and a fixed date attribute is always automatically added. This, in turn enables users not just track the flow of data inside the database, but also add some time-series element in the data. For instance, if a set of indicators is imported into the database, CBMS-NRDB asks the user for the date. Therefore, making the data in each time period, e.g. reference year, uniform in date will enable simple time-series analysis on the data.

Displaying Maps

Map display is recently one of the most attractive aspects in presentations especially in government units since they just not see the status of their domain numerically but also geographically.

CBMS-NRDB enables users to display maps in the usual way plus incorporate color ranges. If poverty incidence in the puroks of a barangay and the households living there is being mapped, one could specify color ranges according to severity of the indicator. For instance, rising poverty incidence accompanies lighter shades of blue and descending poverty incidence accompanies darker shades of blue. Also red could be assigned to poor households and green to non-poor ones. Thus, if color
ranges are properly specified, then in one look of the whole municipality, depressed barangays and households could be easily pinpointed instead of just looking at figures.

Furthermore, CBMS-NRDB supports multiple layers of maps, also known as thematic mapping; therefore, other structures can be displayed such as wells, elementary and secondary schools, health centers, halls, road networks, rivers, and other structures vital for planning.

Reports and Graphs

Aside from maps, CBMS-NRDB can yield reports and graphs through specific attributes by features. Basic time-series tables can be generated through queries so that output can be filtered according to desired date, or range of values. Also figures such as histograms, time-series graphs and pie charts, which are labeled with date, can be made to make plain analysis of trends.

Projections and Global Positioning System (GPS)

CBMS-NRDB supports projection which is a mathematical conversion between real world spherical coordinates in degrees of latitude/longitude and the two dimensional Cartesian coordinates (x,y) displayed on maps. This is defined in the beginning of setting up a database.

Since external data could be imported, coordinates identified through global positioning (GPS) system can be fed into the database. GPS is a system of receiving spatial positions, using a hand-held receiver, from satellites. The coordinates generated are converted into text files and imported to the database.

Software Limitations

There are several features in the CBMS-NRDB that functions much like of a GIS. However, as it is not a full GIS, as it is database software with mapping tools, the analysis that can be done are limited to thematic mapping and visual analysis.

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7 Definition of Terms, NRDB Tutorial.pdf.
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All data in the CBMS-NRDB have been defined in the data structure of the software. This needs to be done only once but it is very important to get the structure right as this will make using the database much easier. To avoid, redoing things, the user could configure ahead before actual construction.

Although CBMS-NRDB are able to produce maps, charts and reports, manipulation of features of these tools are very limited unlike when maps are viewed in a full GIS software and charts and reports are prepared using MS Excel. Meanwhile, as it is compatible with these programs, it becomes a minor drawback of this software.

**Utilization in poverty monitoring**

The CBMS was designed to provide policymakers with regular and frequent information on the possible impacts of macroeconomic adjustment policies on the welfare of households, particularly those belonging to the *vulnerable* groups of the society. Thus, it features selected indicators chosen based on the *multi-dimensional* character of poverty and have been confined to *output* and *impact* indicators.

LGU’s implementing the CBMS conducts a complete enumeration survey of households in their locality. Results of the survey are then manually processed and encoded in an excel file for further processing, computing and analysis. The excel format is compatible to CBMS-NRDB making it easy to import encoded information.

Processed data results are then deposited in the CBMS-NRDB together with other relevant information. As a database, it is able to store vast amount of data as long as it is defined in the data structure of the project. Data for local government units such as municipalities and villages can collate, store and manage data in a single or multiple CBMS-NRDB files, if preferred. Data can also be expanded over time to accommodate new data and/or time-series data.

CBMS-NRDB, with its simple mapping tools, adds an exciting medium for easier comprehension of data. This software is timely with the popular usage of geographic information system software or GIS. Although not a full GIS, CBMS-NRDB makes use of maps in referencing data. Moreover, it also comes with conventional tools such as graphs and reports.

**Maps as tool for poverty monitoring**

Using CBMS-NRDB, the indicators are mapped and used in the validation exercises, which are participated in by policymakers, village and municipal leaders, volunteers and other concerned citizens of the community.
Participants in the validation exercise are able to appreciate the status of households, their locality and even higher geopolitical level in terms of the selected indicators through maps. Problems are better understood in the area because it is able to show the severity of a problem in certain localities and identify poor households in terms of the different dimensions of poverty.

On their part, planners and policymakers are able to design and implement programs/projects to address the identified problems and target beneficiaries of these programs/projects. Alternatively, it becomes an opportunity to monitor existing programs/projects leading to better allocation of limited resources in the locality. Also, the CBMS-NRDB maps are used in drafting of socioeconomic profiles and in development planning (i.e. land-use planning and annual investment plans).

Not only is it useful for LGU planners and policymakers but other participants such as laymen and ordinary members of the community benefit much as the maps show conditions right at their own households. Provided with these information, ordinary people can also monitor and evaluate the effectivity of programs/projects implemented in their community.

Below are examples of CBMS-NRDB-produced maps. These are actual data results of CBMS collected in 2002. Map 1 shows the elementary school participation rate, (refers to the number of children ages 6-12 years old attending elementary school over the population of 6-12 year old children) one of the CBMS indicators focusing on education. The municipalities are color-coded in four colors. Green and light green depicts data that are significantly above and above national average while pink and red reflects data that are below and significantly below national average.

Map 2 follows the same color scheme as in Map 1. This shows elementary school participation rate at the village level in the municipality of Brooke’s Point.

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Map 3 shows the elementary education situation at the village-level. The village is divided into 5 puroks (known as “puroks”) and colored in shades of blue (the darker the color, the better is the performance) depending on its data on elementary school participation rate. The dots in the map represent households. The green dots are those households with all children aged 6-12 attending elementary school, the red dots connote households with at least 1 child aged 6-12 not attending elementary school and the white dots are those households without children aged 6-12 years old during the survey period.

Maps 2 and 3 make use of thematic mapping. Thematic mapping refers to adding different map layers in a single display such as the sample Map 3. There are five map layers comprising this map. They are road networks, river network, purok boundaries, location of elementary school and households. Adding more layers in the map gives more meaning for the situation in the area.

Map 4 gives another example of thematic mapping. This map contains green and red dots depicting households with and without access to safe water supply. This is another CBMS indicator focusing on access to basic services. Information about
the location of existing wells, its functionality, depth and its quality of water are very useful in planning to a new well. From the map, we can see cluster of households without access to safe water. Planning a new well also involves information about the source of water, whether it is potable or not. From the list of land management units, only a few are not suitable for setting up a new well. These are areas mainly in the coastal and lowland zone: Mangrove areas/Nipa, Fishpond (tidal flooding and high salinity) and infilled valley (low water conductivity). Lastly, a new well should be located in clusters of households without access to safe water supply. Map 5 shows the same map with selected sites (shown as gray polygons) where a new well can be located.

Map 4. Information for locating a site for a well, Brgy. Isumbo, Sofronio Española, Palawan, 2002

Map 5. Alternative sites in siting a well, Brgy. Isumbo, Sofronio Española, Palawan, 2002
Aside from the maps, CBMS-NRDB software can also provide data in charts and simple tables (also known as Reports).

**Charts**

CBMS-NRDB offers chart options such as Histogram graph, Time-series graph or Pie Chart. Chart 1 is a histogram showing the elementary school participation rate in several barangays in Brooke’s Point, Palawan.

As every data in the file have a date associated with it, it becomes easy to produce reports for time-series data comparison. This is very useful in evaluating and monitoring the effectivity of certain programs/projects implemented in the locality.

Chart 1 shows the comparative data for 2000 and 2002 on the elementary school participation rate in selected barangays in Brooke’s Point, Palawan. As we can observe, data values for most of the barangays declined in 2002. As of date, the provincial and municipal CBMS teams have not completed validation of these data to explain know the reason for the drastic changes in the data.

**Chart 1. Elementary school participation rate, by Village, Brooke’s Point, Palawan, 2002**
Reports

CBMS-NRDB also has a facility that generates reports. By selecting values or using query, you can produce standard, time-series or sectoral reports. The same data used in Chart 1, Table 1 shows the comparative data for 2000 and 2002 on the elementary school participation rate in selected barangays in Brooke’s Point, Palawan.

Table 1. Elementary school participation rate, by Village, Brooke’s Point, Palawan, 2002
Summary

The CBMS-NRDB provides a database system that is easy to use and has a variety of tools such as maps, charts and reports for the user to analyze his data. The database can be expanded to accommodate time-series data and other relevant information helpful in further analysis. Its limit is in the availability of data.

Data on the different dimensions of poverty are easily understood using the tools in this program. The CBMS survey accomplishes the task of collecting these data while CBMS-NRDB functions as a database equipped with presentation tools useful in analysis.

It is very timely that this kind of software has a simple mapping tool yet it is free so users, especially from local government units, who cannot afford expensive GIS software, can avail of this program. Because of its compatibility with GIS and spreadsheet software, the CBMS-NRDB is also a good preparatory system for those who intend to adopt a full GIS software in the future.
This software comes with an easy-to-follow user’s manual. In the website where NRDB can be freely downloaded (http://www.nrdb.co.uk), Mr. Richard Alexander, also provide a venue for answering inquiries on technical details of the software.
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