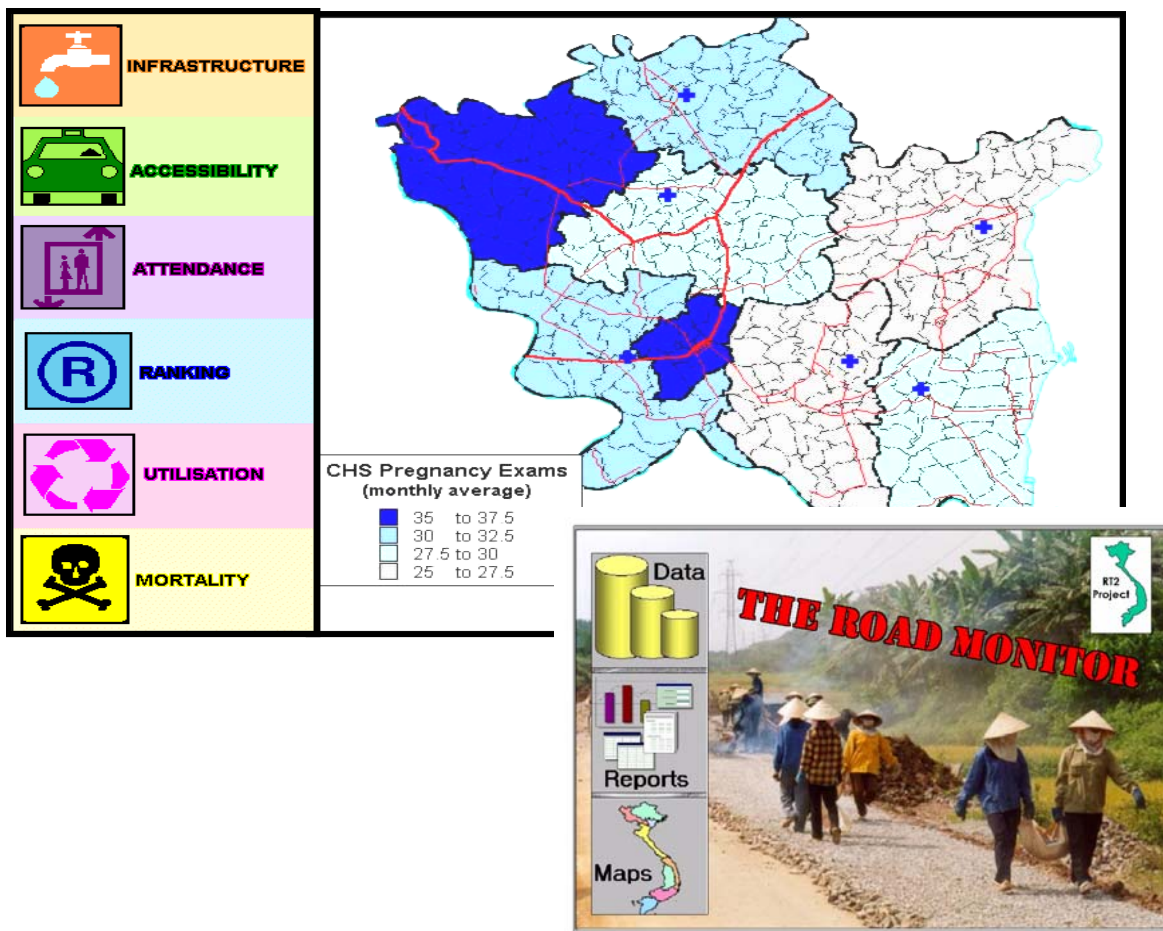




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GIS Integration in Monitoring & Evaluation (M&E) Applications



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CONTENTS

M&E projects with mapping components	3
The DISH (Vietnam Malaria Control Project).....	3
The WATERmapper (UNICEF Vietnam)	4
The BaseLiner (EC Health Systems Project)	5
The MEDIC BaseLiner (Support for Disadvantaged Areas Project)	7
The COMPAS (UNICEF Vietnam).....	8
Aspects of GIS Integration.....	9
Availability of Map Data.....	11
The Display of M&E Spatial Information.....	12
1. Status Maps.....	12
2. Comparison Maps	13
3. Ranking Maps.....	13
4. Trend Maps	13
Interface Issues	13

M&E Projects with Mapping Components

GEOBIZ is a Vietnamese registered Joint Stock Company and is a solution provider of GIS applications. It has successfully integrated several Monitoring and Evaluation (M&E) database with mapping components, pioneering the use of spatial visualization in a field that requires the analysis of project-based data and identification of trends over time.

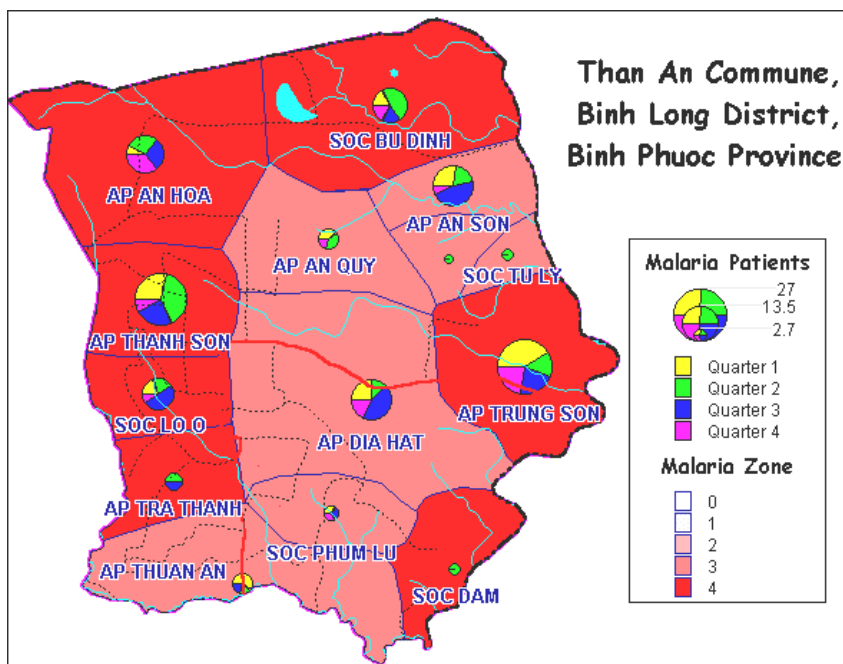
This paper studies the various projects and sectors where this type of application development has been deployed in Vietnam (notably in rural healthcare and education, national park management and rural infrastructure). Requirements of the various projects for GIS functionality are outlined. Additionally, explanation is provided of the different GIS platforms that are deployed to fulfill those stated requirements.

The DISH (Vietnam Malaria Control Project)

The **DISH** (District Information System for Healthcare) was designed in 1999 as a Health Information System that would be suitable for use by District Health Centre Managers. Its purpose was to analyze data collected monthly to identify problems of public health importance. It also identified resource needs to resolve problems (funds, personnel, time, supplies, facilities), thus leading to the development of a rational budget.

The **DISH** integrates the stored information from two other separate databases, the [HIS](#) and the [PID](#). The former is an application that collects the same information (in a digital format) as the monthly district report from the District Health Centre director. The HIS

program was developed by the Vietnam-Australia Malaria Control Program (VAMCP).



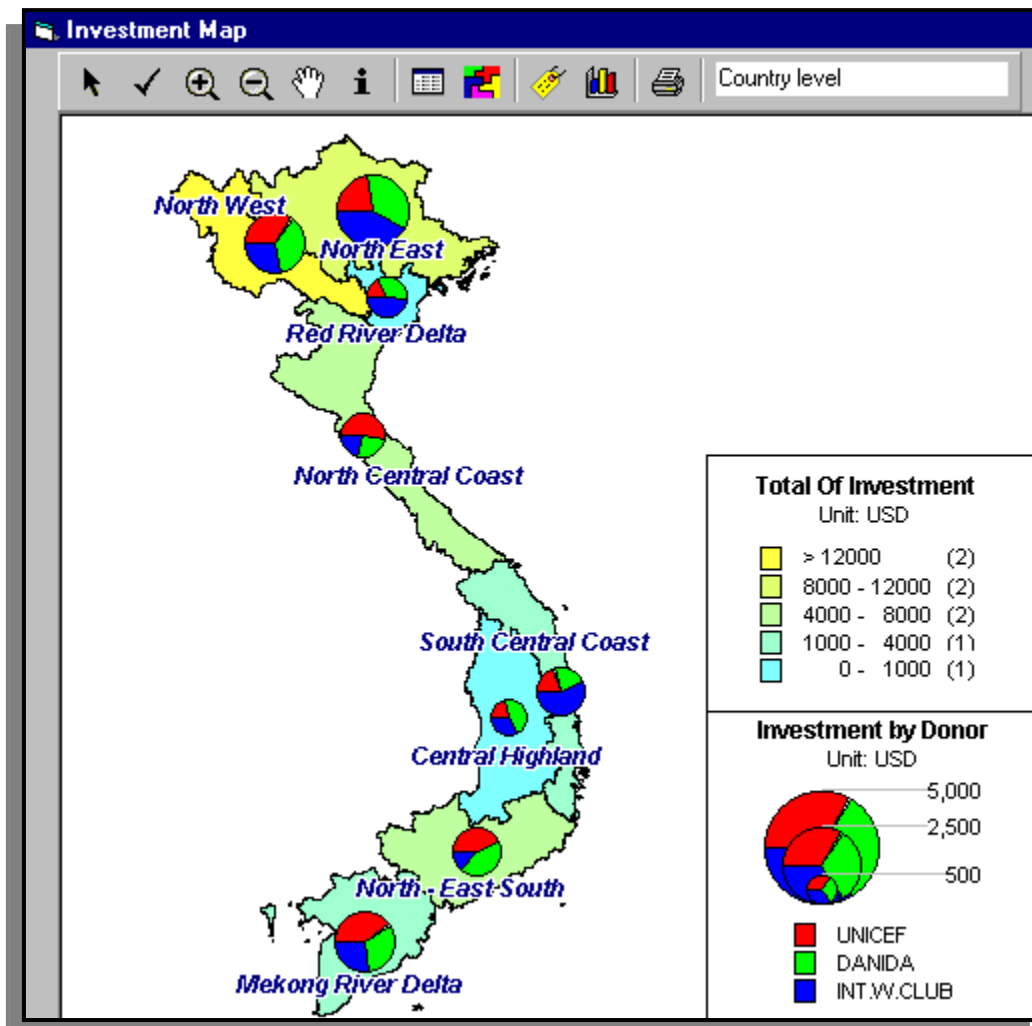
Maps produced from this database provided important information about the distribution of malaria patients and the mortality rate at commune level. It will also help monitor other important components of

malaria control such as blood slide results, vector control activities and drug inventories.

The PID database has been developed for directors of Provincial Malaria Stations (PMS) to create their own financial work-plans and assist in allocation of resources. When this data is linked to the DISH, the distribution of funds and resources can be displayed on a map. Additionally, the PID will be able to extract HIS data to assist in the process of monitoring fund allocation and activity progress.

The WATERmapper (UNICEF Vietnam)

The WATSAN Section of UNICEF Vietnam created a database application (the Rural Water Supply Monitoring System (RWSMS)) to serve as a simple monitoring and planning tool for the rural water supply sector in Vietnam. All water supply implementation & parameter data available in this database has been collected from monthly progress reports submitted by provincial RWS departments over the last decade.



The WATERmapper program is created in Visual Basic programming language with the integration of OCX MapX. It links the available data in Rural Water Supply Monitoring System Database (RWSMS) to visualise and display in a map format. The WATERmapper also has other basic functions of a GIS application.

WATERmapper is a mapping management program that creates reports of attributed data on the administrative map background. The program creates maps automatically and easily. Information layers which are displayed by WATERmapper depend on what kinds of data RWSMS can display on the map.

- Types of water supply projects.
- Coverage rate.
- Distribution and numbers of wells
- Donor-financed distribution
- Material distribution

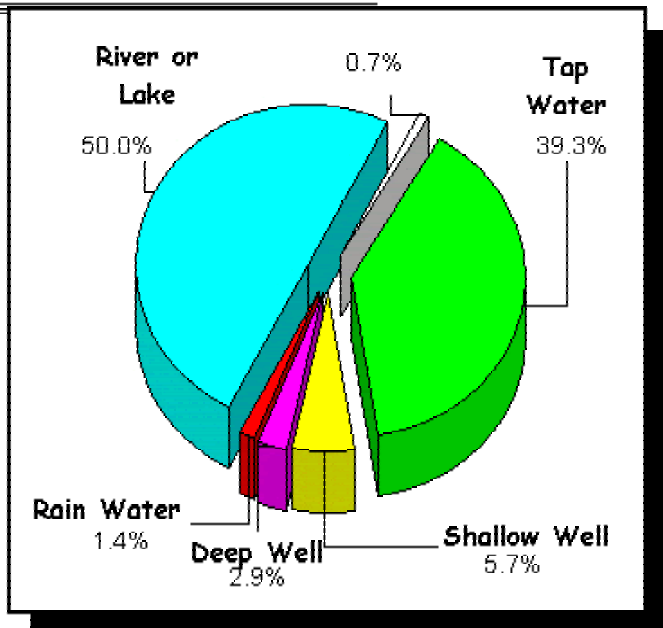
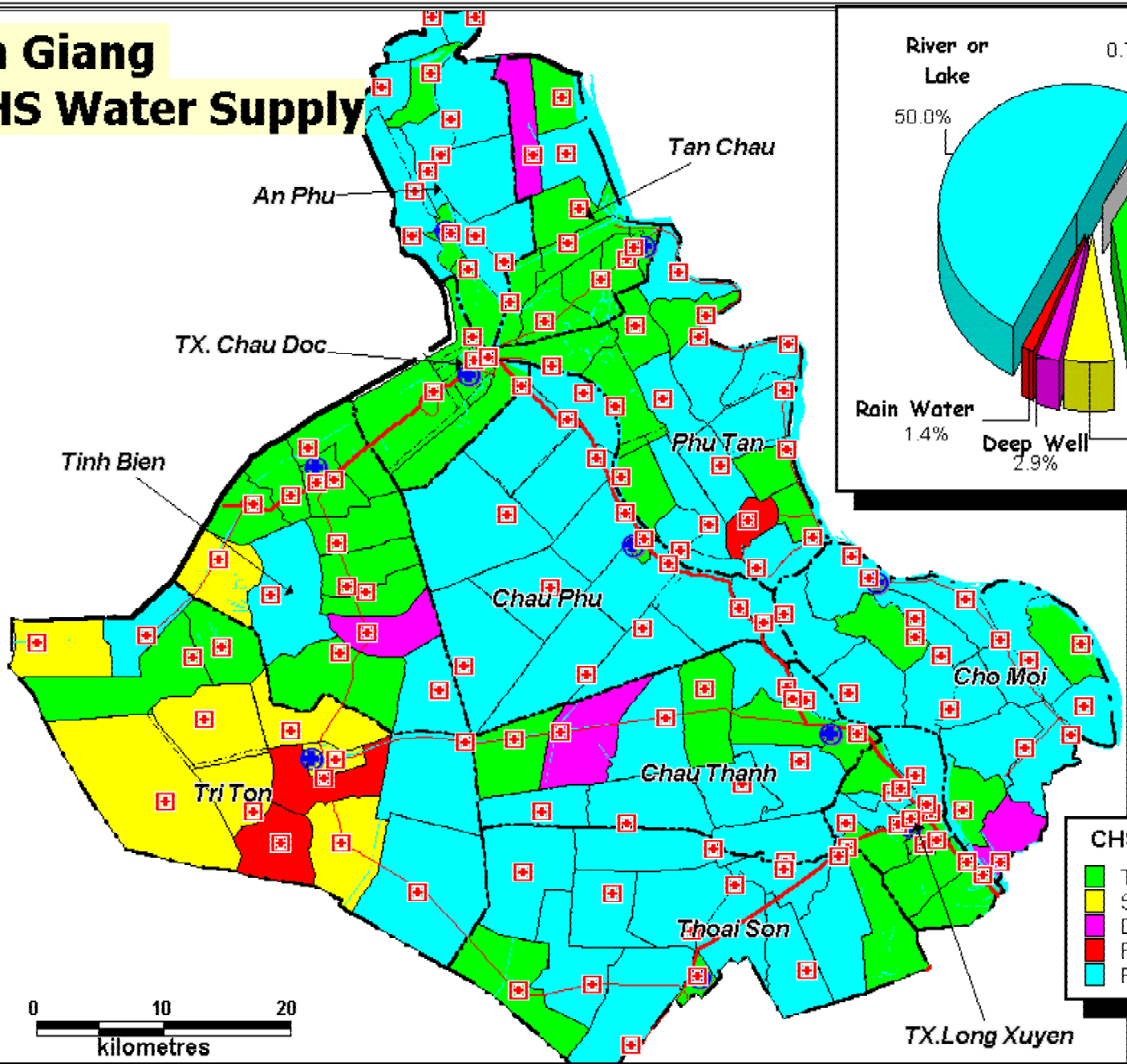
The BaseLiner (EC Health Systems Project)

An extensive and detailed baseline survey of 3 provinces (Thai Binh, Binh Thuan & An Giang) was conducted in July and August 2001. The results of the baseline survey were required to be viewed spatially. The baseline survey was conducted with the primary intention of providing a suitable mapping application to display the appropriate indicators. These indicators, when mapped, would assist healthcare administrators with the means of visualizing the information in a manner that they may not have seen or used before.

The objective of the study was twofold. The first was to conduct a mapping survey which collected baseline data at the local village level. This data was considered to be of primary importance for the successful implementation of the BaseLiner application. The information required for each village consisted of such things as its geographical boundaries, population, main economic activity, available healthcare services, number of schools and wells, etc. When mapped, this information proved to be extremely useful in identifying spatial correlations and patterns in the provision of rural healthcare services. It also helped to determine a number of key indicators suitable for use in an integrated M&E database and mapping application.

The second objective was to conduct a brief questionnaire that addressed the issues of health service provision and utilization. The types of questions belonging to this survey sought to determine key factors such as the time taken to get to the villages' respective Commune Health Centre (CHC), as well as the actual distance traveled to reach the CHC. Utilization rates of each CHC were also determined along with such other issues as drug use, curative activities and reference conditions.

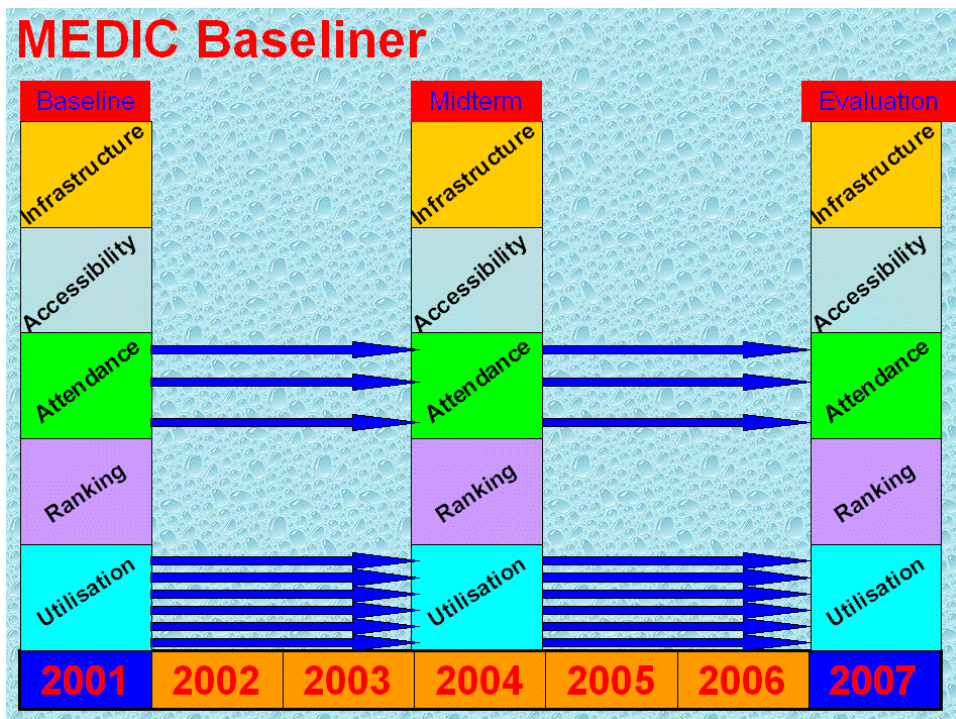
An Giang CHS Water Supply



CHS Water Supply	
Tap Water	(55)
Shallow Well	(8)
Deep Well	(4)
Rain Water	(2)
River or Pond	(70)

The MEDIC BaseLiner (Support for Disadvantaged Areas Project)

- Methodology
 - Data is collected for one baseline year and entered
 - A base set of reports is generated for the baseline year
 - Data is collected for a later year to compare with the baseline year (e.g. project midterm, project end or follow up some time after the end of the project)
 - The same base set of reports as for the baseline year can be generated for any other year
 - A set of comparison reports can be generated to compare any pair of years with data available
- Viewing/Reporting
 - There are three levels of viewing baseline data:
 - Province (by districts or by communes contained in the province)
 - District (by communes contained in the district)
 - Commune (by villages contained in the commune)
- Data may be viewed for one year only (base set of reports) or may present changes between any two selected years
 - Graphical reports (column diagrams)
 - Situation maps (e.g. infrastructure, accessibility & ranking)
 - Comparison maps: standardized color settings (green for improvement, red for decline and grey for unchanged situation).

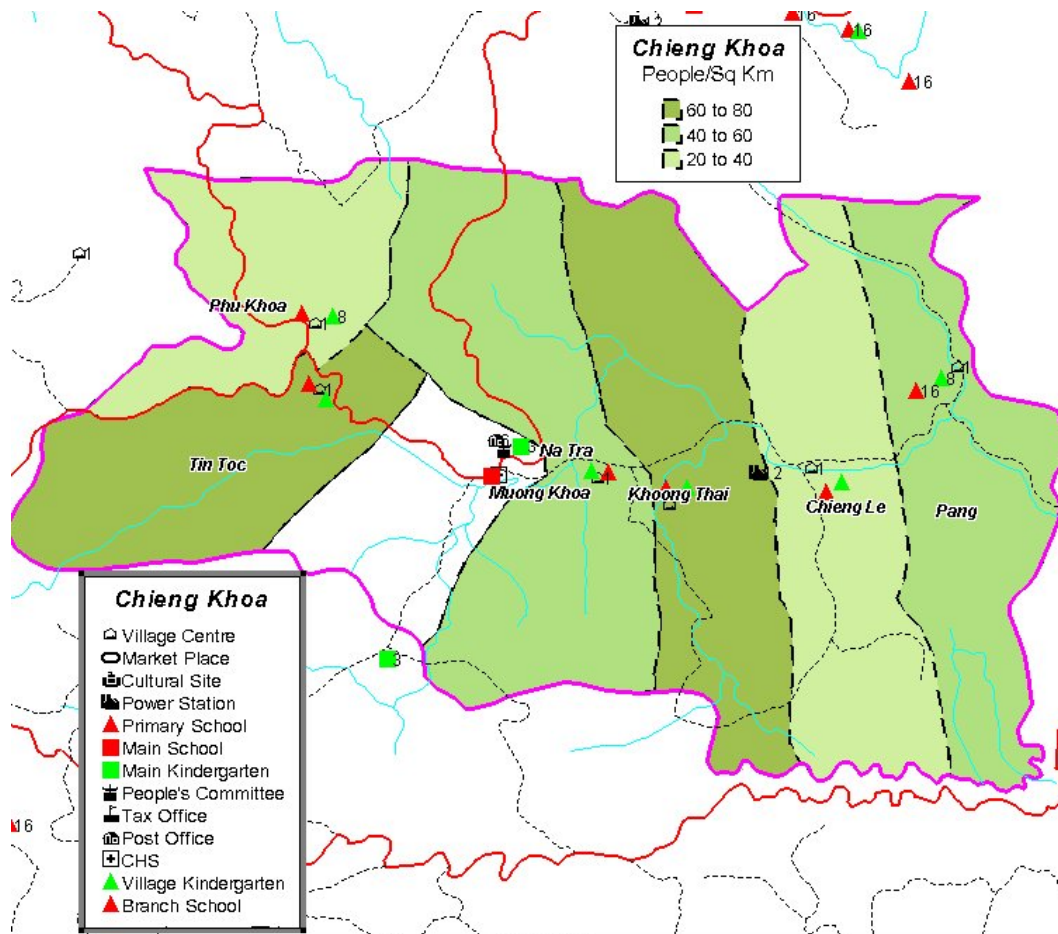


The COMPAS (UNICEF Vietnam)

COMPAS is an acronym for *Community Monitoring Progress Assessment System*. It has been designed to input annual survey data and output maps and reports for monitoring purposes. The surveys are conducted at the start of every academic year (around October or December) and are intended to be self-assessments that each community will conduct for their own schools and kindergartens.

Data is collected in the field on paper forms and then digitally entered into the system. Two classes of data are collected. The first class is concerned with measuring qualitative indicators of child-friendliness. A questionnaire has been specifically created for measuring the child-friendliness of all the primary schools and kindergartens that are part of the UNICEF Education Programme. The other class of data that will be used in the **COMPAS** will be quantitative data that measures indicators of attendance and utilization of primary schools and kindergartens.

A further requirement of the **COMPAS** is that village mapping will be employed as an integral part of the system. It is a requirement of the programme to spatially locate each main school and kindergarten and their associated clusters of branch schools and kindergartens. The means to achieve this is by producing and distributing Commune Maps for preliminary identification of school and village locations, as well as specific information concerning each village (eg. location of Commune Health Station, PO, etc.).



Aspects of GIS Integration

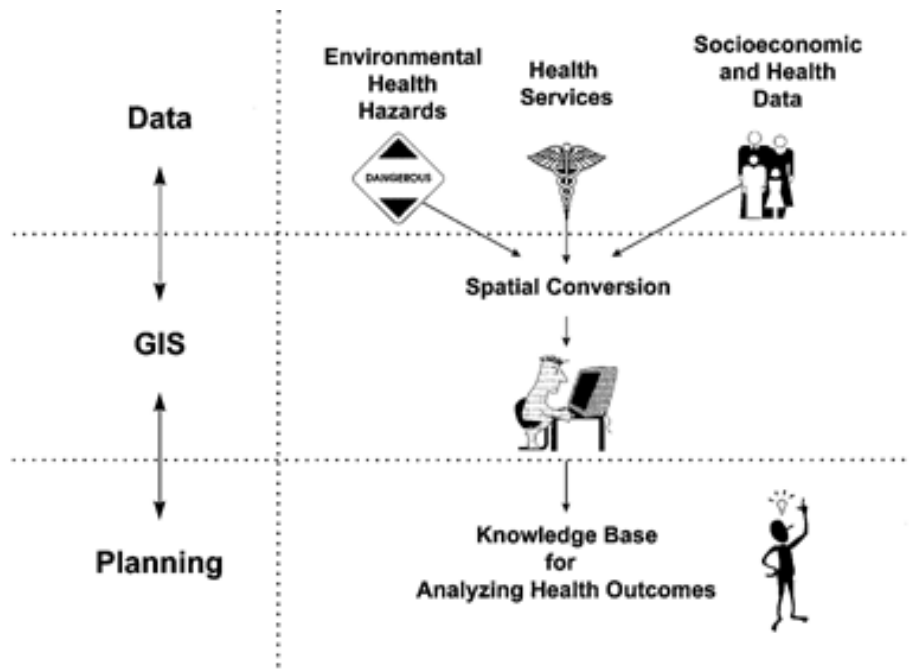
While the previous case studies may suggest a certain degree of uniqueness, each application was developed to meet similar needs. All monitoring databases essentially collect the same sets of data at regular intervals, and it is the change in the original condition that such applications are designed to report. The change in the original condition may be an improvement or deterioration, and it may vary in its magnitude or size.

The constant factors in any M&E application are:

- A baseline to measure progress and impact against
- Careful selection of indicators that can effectively measure how the project's objectives are being realized
- The tracking of these key indicators over time and space
- The measurement of the impact of interventions, the range of activities that are planned to reach the project objectives

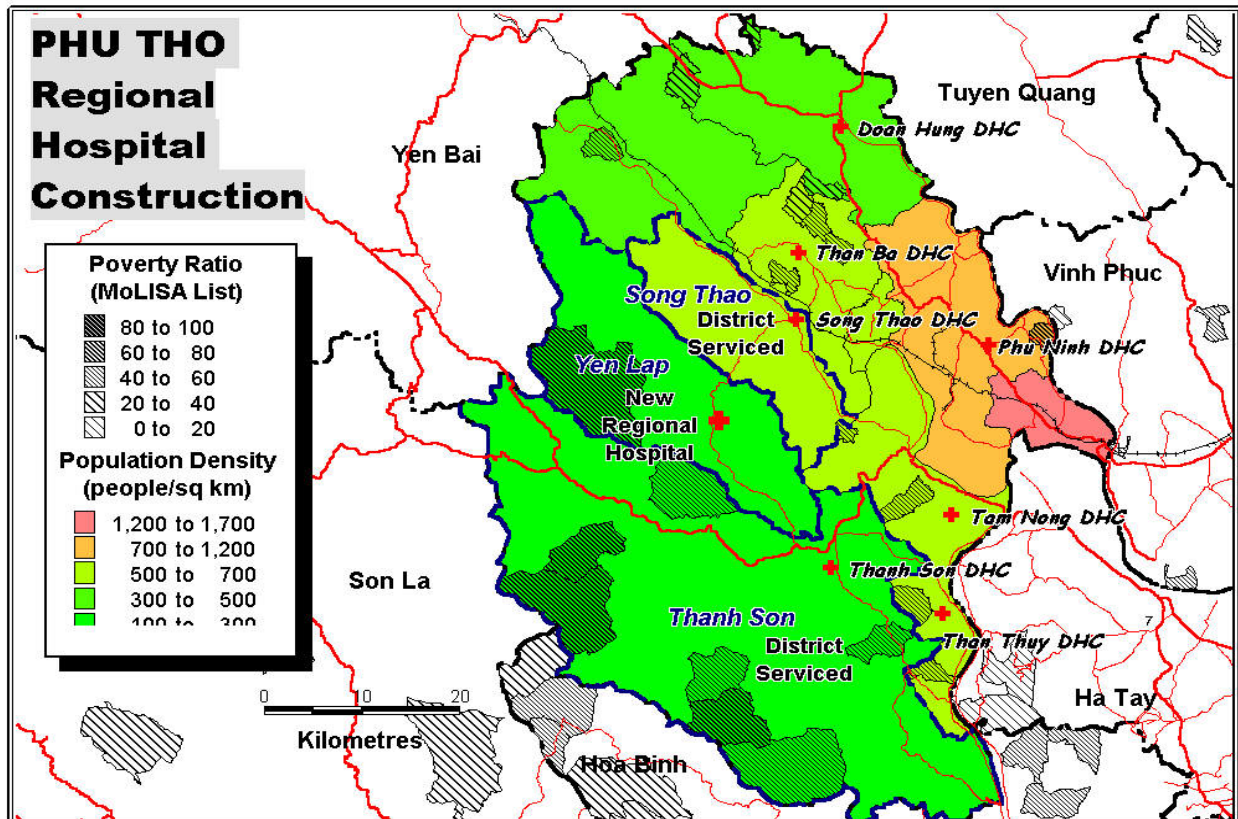
The implementation of a database management information system is usually required to facilitate M&E data collection and reporting. When integrated with GIS, the linking of maps to the M&E databases can often provide greater insight and provide tools that assist project stakeholders in better decision-making.

Most M&E systems are usually concerned with the mid-term and end-of-term reviews of project performance. However, more frequent and regular data collection can also be used for M&E purposes. When coupled with participatory workshops, the communities being monitored can study and analyze monthly M&E reports. Based upon the results,



they can discuss how to improve conditions and thus realize project objectives quicker and more effectively. This was a primary intention of the MEDIC Baseline – a tool for use by both the project team and for communities at the commune level.

Traditional GIS analysis combined together with regular M&E reporting can benefit the local community in many other ways. As outlined in the schematic on the previous page, a GIS analysis of socio-economic and demographic data can be useful for planning



The MEDIC Baseline was created with a specific intention in mind – to provide a GIS interface to an existing M&E application. More often, the integration of GIS functionality into M&E applications is usually an afterthought or a value-added feature that is planned to be inserted later.

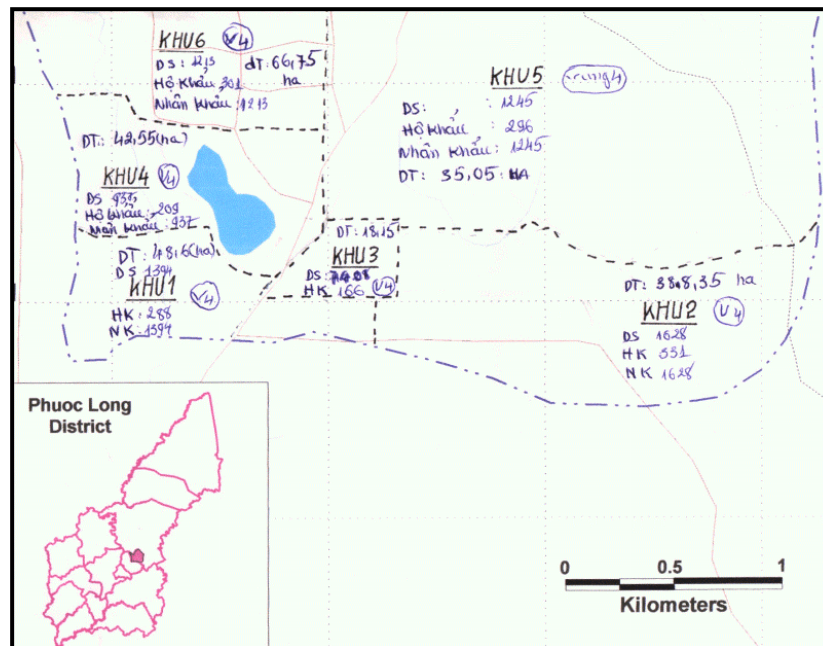
Such was the case with the WATERmapper. The database had been developed and deployed several years prior to the application being appended to it. The mapping functionality was provided by inserting an OCX control (MapX) into the database reports – the user could launch the mapper directly from the database.

However, the EC Baseline and COMPAS were designed from the ground-up as a total package. Both involved an extensive baseline survey conducted over several provinces. The baseline surveys were conducted with the primary intention of providing a suitable mapping application with appropriate data on the indicators. The surveys were devised as means for collecting the sort of M&E data that was appropriate for GIS integration. Both qualitative (eg. a school’s child friendliness) and quantitative data could be mapped.

Availability of Map Data

The two applications mentioned previously (the EC Baseline and COMPAS) required the collection of village-derived data. In order to display this data in a map, boundaries of villages had to be provided. As there is no central agency in Vietnam where this information is stored, a unique solution was developed.

Blank commune maps in A3 layout format (showing roads and infrastructure) were printed out and delivered to the respective administrative bodies at commune level. They were asked to complete the maps and indicate where village boundaries were, as well as any related infrastructure. The response was always overwhelming in terms of effort and details reported. The quality of mapping was also of a high standard, despite the fact that there was no cartographic or surveying instruction given.



Data collected by this means is not spatially accurate of course; it is a relative approximation. For most M&E applications though, this suffices. For many other rural development projects, this approach offers the quickest and most cost-effective means of collecting this often vital but unavailable data. For the EC Baseline application, the baseline survey identified the boundaries of over 2,500 villages in Thai Binh province.

One of the main difficulties encountered in acquiring digital spatial data of Vietnam is to obtain reliable and up-to-date road network data. Because of the rapid rate of development in many provinces and the paucity of digital data availability, many infrastructure projects are seriously handicapped by not knowing where roads are located. Once again, GEOBIZ fashioned a ready response – this time via the use of survey teams of motorcyclists trained in the use of GPS.

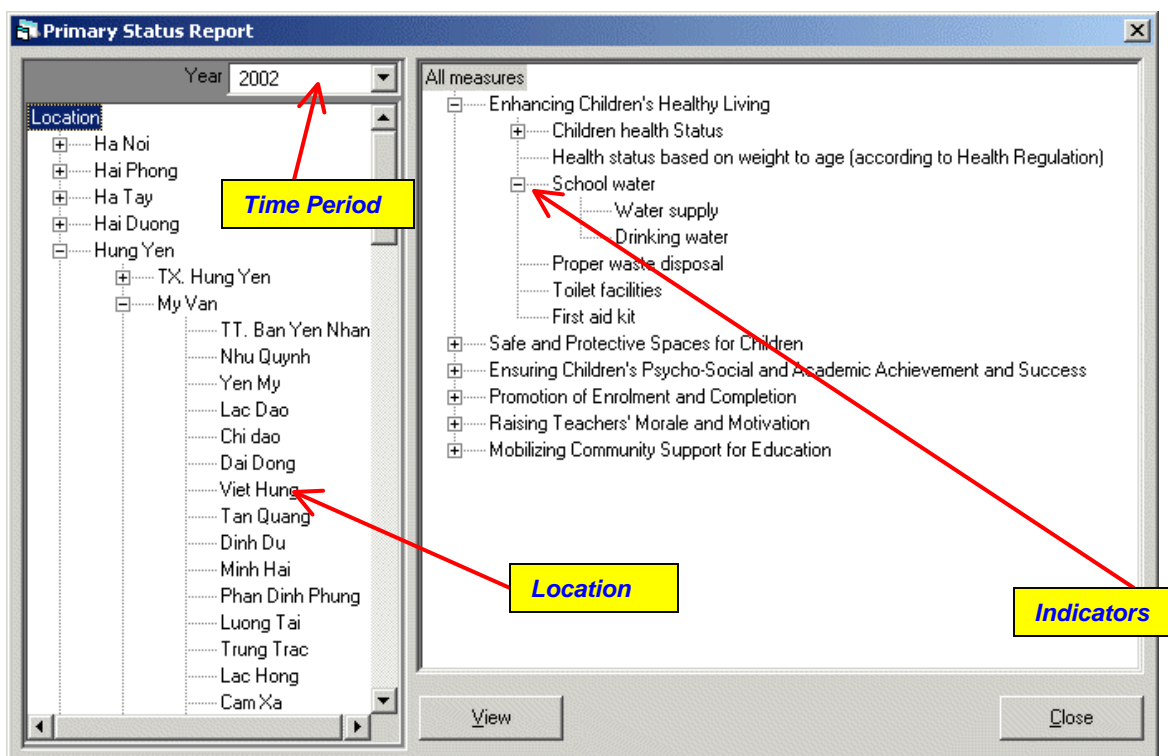
Once the limitation of Selective Availability (SA - for distorting the accuracy of the GPS signal) was removed by the Bill Clinton administration in 1999, new opportunities presented themselves. It was now feasible for road data to be picked up with 10-metre accuracy. Using portable hand-held Garmin receivers, the solution was quickly implemented and cost-effective – for industry and donor-funded projects alike. The Tate & Lyall sugar mill in Nghe An province was not able to schedule its fleet of trucks for cane-harvesting – until the surrounding rural roads had been extensively surveyed using this method.

The Display of M&E Spatial Information

Generally, for purposes of mapping, there are four general requirements for M&E. This is our broad experience, and one based on the development of several different types of M&E applications. Each requires a different method of analysis of the M&E database to produce the appropriate maps.

1. Status Maps

These maps are intended to provide an overview of the results of each time a survey (or routine data collection) is conducted. The user will be required to first select the year, followed by the location, followed by the indicator. The reporting is dynamic, so the user will be able to choose any aggregation of individual indicators or sub-indicators. All output will clearly identify the criteria used in the selection process.



2. Comparison Maps

These maps are devised to provide comparisons between two similar entities. The user can compare year to year, or two locations, or two members from the same analysis group (eg, enrollment types in education, or gender types in hospital). Generally, thematic maps produced from this type of map will display column graphs of selected entities.

3. Ranking Maps

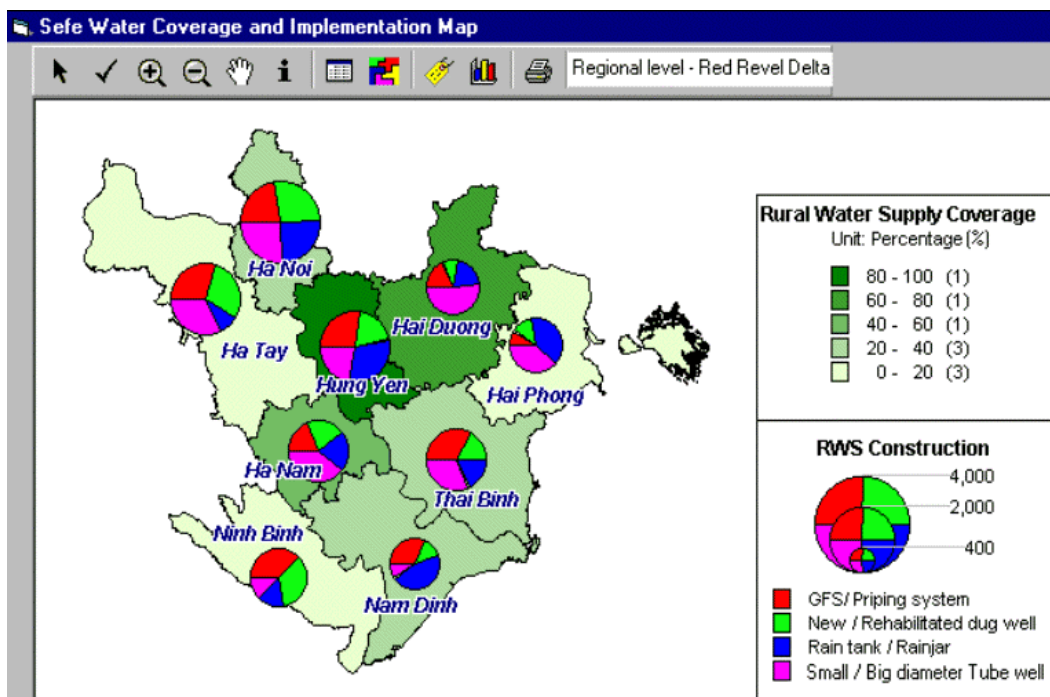
It is customary to assess performance and progress by ranking entities of the same class or group. Thematic maps are usually graduated symbols or, in the case of bivariate mapping, ranking can be displayed as colour ranges.

4. Trend Maps

This type of mapping is very important for M&E. If data for the same indicators are routinely collected over a long period of time, historical trends can be observed. The success or failure of interventions can be noted. These types of thematic maps are ranged by colour – shades of red for decline of condition, shades of green for improvement.

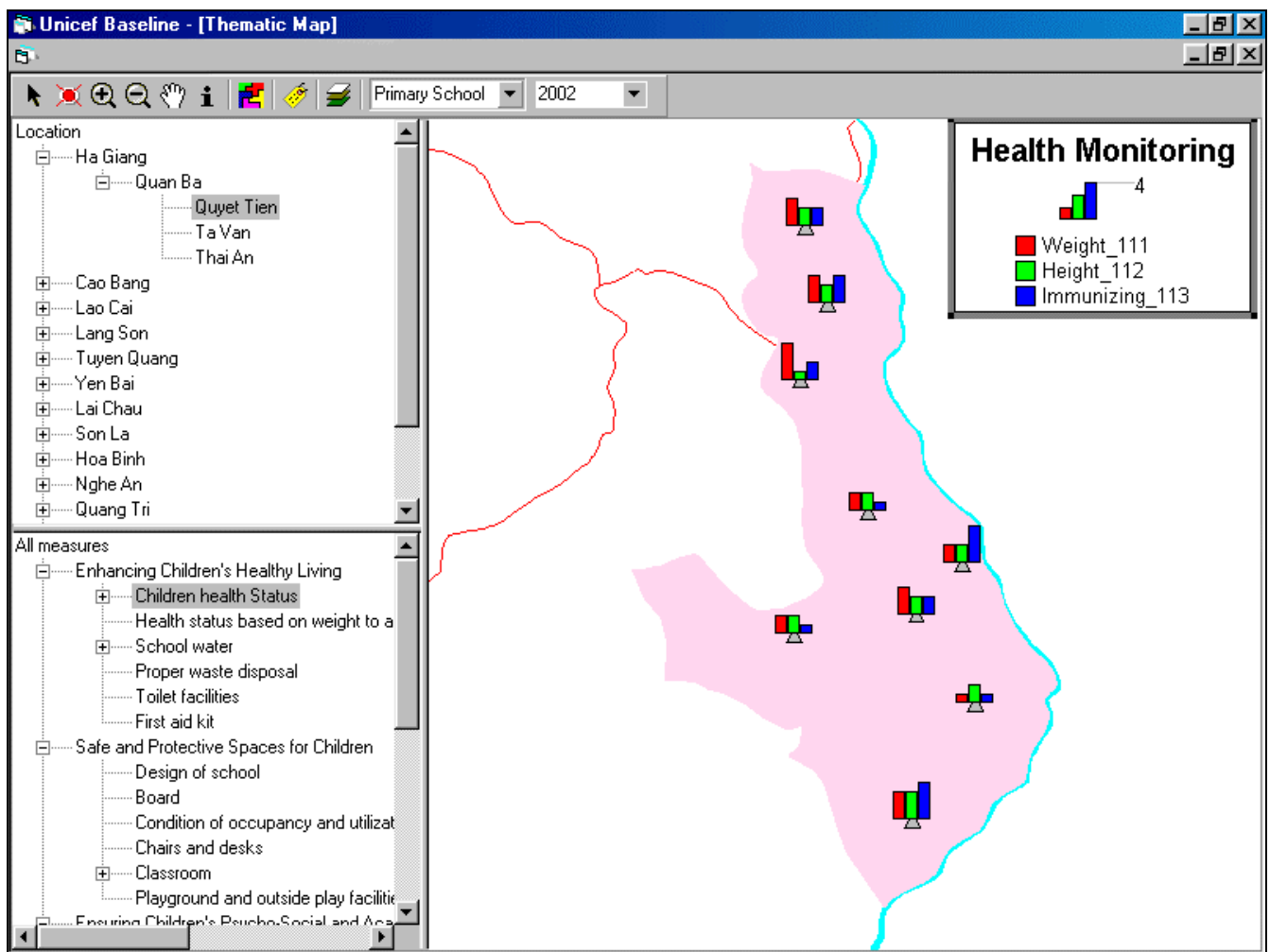
Interface Issues

In developing mapping for use in M&E applications, the interface design should be made as simple and easy-to-use as possible. Most users are not proficient in using the customary desktop mapping and GIS products. They perceive the mapping component as ‘value-adding’ to the more routine tabular and graph reporting.



Some design tips:

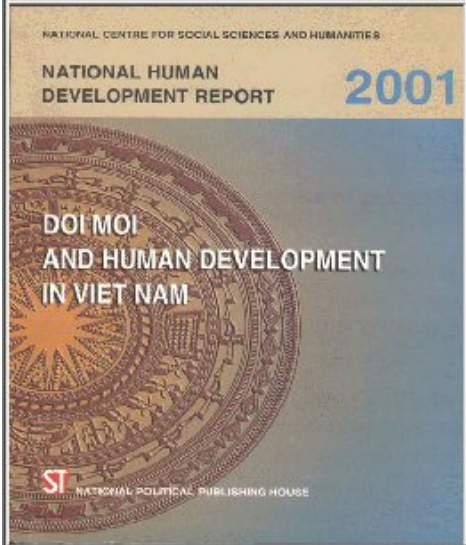
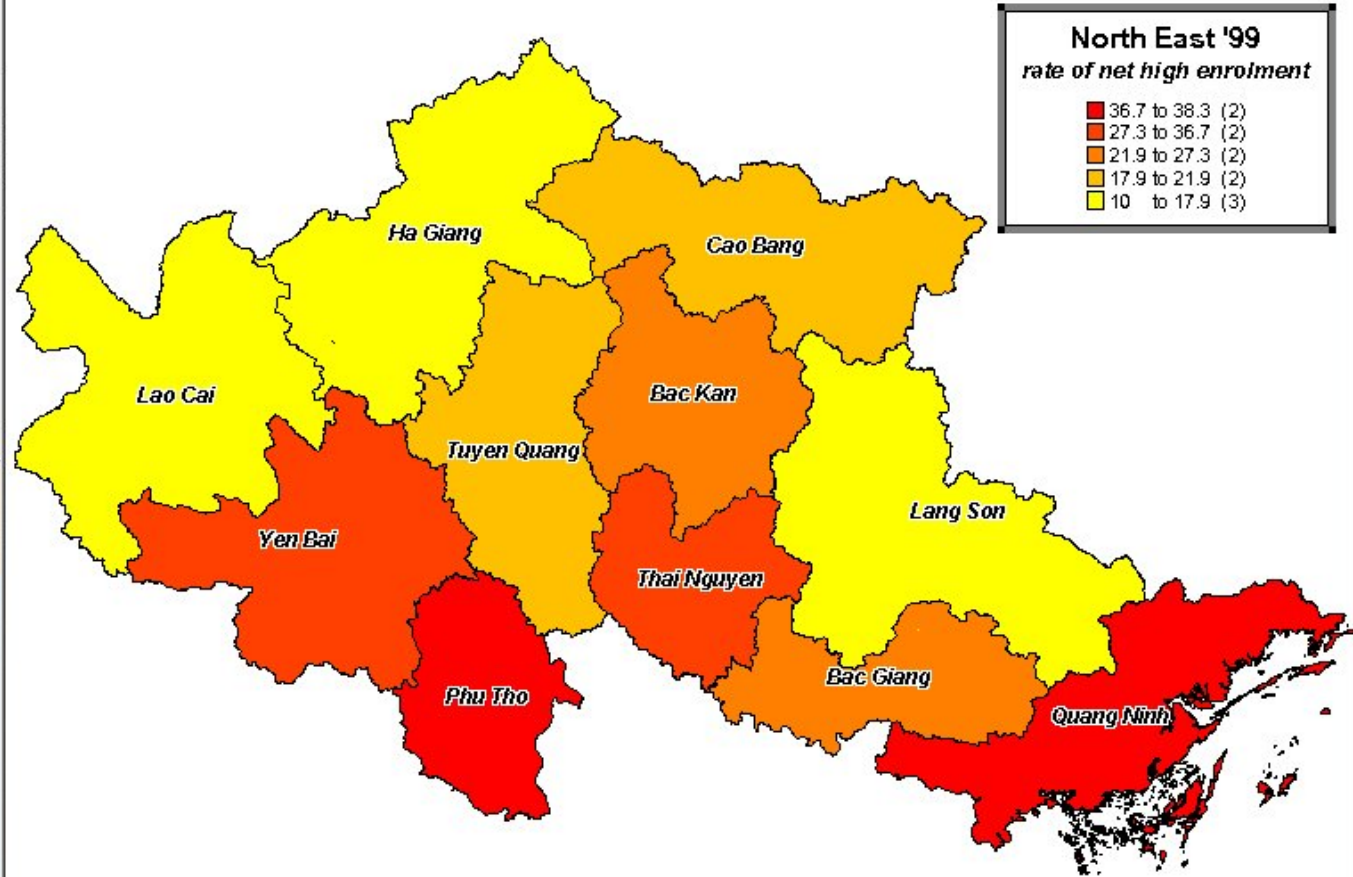
- Tools should be mainly for map navigation and querying of map objects
- Labeling should be an option
- Legends should be clearly titled and easily understandable
- Avoid clutter
- Use of hierarchical trees are often very helpful for users to select different levels – both of different administrative levels and different levels of indicators (as illustrated below)



Finally, map interfaces can be made to be very dynamic and include other multimedia features. Embedding documents, images, videos and audio files makes the mapping environment more interactive and fun to use. In the example shown overleaf, statistical data is displayed in a map window – users select indicators from the hierarchical tree. In the bottom left pane, users can additionally open the source document to reference.



- EDUCATION
 - Adults literacy rate '99
 - Net primary enrolment rate '99
 - Net secondary enrolment rate '99
 - Net high school enrolment rate '99
 - People having university graduate or l
 - Tertiary enrolment rate(as % total stud
 - Tertiary enrolment rate(per 100,000 pe
 - Tertiary enrolment rate(as % total stud
 - Tertiary enrolment rate(per 100,000 pe
- HEALTH
- HUMAN POVERTY
- HUMAN DEVELOPMENT INDEX



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