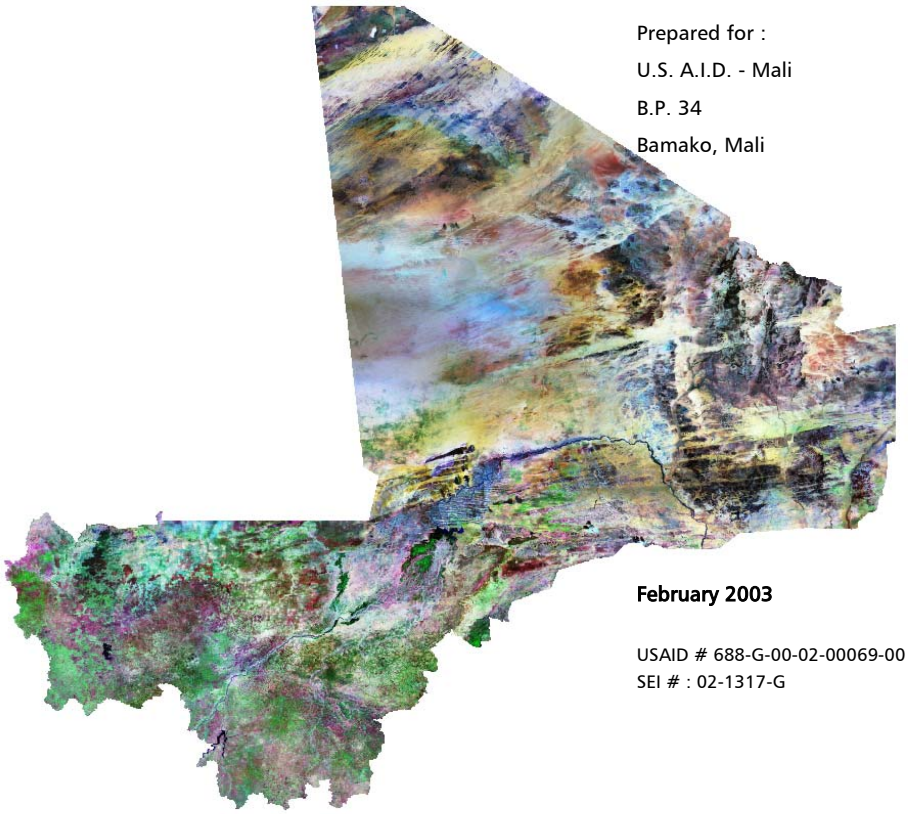
Creation of a Preliminary Atlas of Poverty/ Vulnerability & Assistance in Building an Information System for Mali



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Prepared by :

STONE ENVIRONMENTAL INC

535 Stone Cutters Way
Montpelier VT
05602 USA

Phone / 802.229.4541
Fax / 802.229.5417
Web Site / www.stone-env.com

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Jorge Oliveira
Bandia Cissoko
Karounga Keïta
Djibrina Barry
Mamadou Karounga Keïta
Gilles Courou
Bocardit Siré Ba Maiga
Mamadou Basséry Ballo
Khadidjatou Tall

The Stone Environmental, Inc. team:

David Healy
Andrew Stancioff
Möise Ballo

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ANNEXES

LISTE DES ACRONYMES

ASSACO	Association Santé Communautaire
AGRHYMET	Centre Régional AGRHYMET
BM	Banque Modiale
CARPOL	Cartographie Polyvalente
CERPOD	Centre d'Etudes et de Recherches sur la Population pour le Développement
CPS	Cellule de Planification et de Statistiques
CSAR	Centre de Santé d'Arrondissement Revitalisé
CSCOM	Centre de Santé Communautaire
CSLCP	Cadre Stratégique de Lutte Contre la Pauvreté
CSREF	Centres de Santé de Référence
DNEF	Direction Nationale de l'Education Fondamentale
DNSI	Direction Nationale de la Statistique et de l'Informatique
DNS	Direction Nationale de la Santé
DNDS	Direction Nationale du Développement Social
EDM	Energie du Mali
EDS	Enquête Démographique et de Santé
EMEP	Enquête Malienne d'Evaluation de la Pauvreté
ESI	Enquête Secteur Informel
EU	European Union
FLASH	Faculté des Lettres, Arts et Sciences Humaines
FMI	Fonds Monétaire International
ISO	International Standards Organisation
ODHD	Observatoire du Développement Humain Durable
ONG	Organisation Non Gouvernementale
PNUD	Programme des Nations Unies pour le Développement
PRODESS	Programme Décennal de Développement Socio-Sanitaire
RGPH	Recensement Général de la Population et de l'Habitat
SE	Section d'Enumération
SIG	Système d'Information Géographique
SNISS	Système National d'Information Sanitaire et Sociale
SOTELMA	Société des Télécommunications du Mali
TDRL	Taxe de Développement Régionale et Locale
UEMOA	Union Economique et Monétaire Ouest-Africain
USAID	United States Agency for International Development
USGS	United States Geological Survey

1.0 EXECUTIVE SUMMARY

A team of three Stone Environmental Inc experts (consultant team) conducted a three-week consultancy to review the availability, quality and utility of data and information as a prerequisite to creating a Malian Poverty and Vulnerability Atlas. This effort was funded as a grant from USAID Mali in support of its multi-faceted objectives and as well as those of other donors. This effort provides the beginning steps in building a national information system that will support the synergistic goals of USAID's multiple special objectives. In particular, this effort aids directly with the Information and Communication Special Objective. This Special Objective, (SO) proposes to address two problems: access to and the effective use and management of information.

1.1 Objectives

The overarching objective of this grant was to assess the availability, location, source, age and value of the data and information necessary to create a national Atlas of Poverty and Vulnerability. (Annexe 1-Terms of Reference). A second objective was to conduct an inventory and make a preliminary assessment of Malian capabilities in the public and private sector in order to evaluate the potential for creating long lasting partnerships in support of a durable and dedicated national poverty information and assessment system. As a part of this analysis the team reviewed the availability and requirements for a CSLP Poverty Monitoring and Evaluation System.

1.2 Accomplishments/Results

During the three week assessment the Stone Information and GIS Experts and their Malian Consultant from the Geography Department of the University of Bamako:

- Visited 24 relevant organizations and met with over 50 individuals (Annexe 2-Summary of Contacts)
- Attended a 2 day seminar on the M&E goals and objectives of the CSLP
- Made three major presentations on the objectives of our mission and the results of our previous experience.
    - Avis de Reunion (Annexes 4 & 5);
    - USAID Team Presentation: "Goals and Results to Date"(Annexe 3) and a
    - Mission Director Debriefing
- Prepared a number of preliminary documents on various aspects of Poverty Mapping
    - Le Système Nationale d'Information Sanitaire et Sociale (Annexe 6)
    - Note sur le système d'information scolaire (Annexe 7)
    - Organigramme for the Observatoire de la Pauvretés (Annexe 8)
    - Brève Note sur les Indicateurs de Pauvreté (Annexe 9)
    - Proposition pour la Création d'un Atlas de la Pauvreté/Vulnérabilité du Mali Problèmes et Issues (Annexe 10)

1.3 Problems and Issues

During consultancy a large number of issues were reviewed with the USAID Mission, the CSLP and the various Government, Regional, Private and NGO groups. These issues can be divided into the following groups:

1.3.1 Institutional

Based on our observations, the Government of Mali is still struggling to define the institutional framework for its Poverty Reduction Program. The CSLP has worked extremely hard to adhere to the guidelines set by the World Bank and other donors. During the recent workshop to assess the monitoring and evaluation methodology of the CSLP, misunderstandings among the attendees with respect to the monitoring and evaluation (M&E) objectives were notable. The most glaring problem appeared to be a disagreement on poverty indicators, poverty measurements and the difference between monitoring of poverty and performance.

The priorities defined by the CSLP M&E framework define the ways to monitor programmatic and budgetary performances but they do not consider the most basic information needs of a poverty assessment system that by definition must precede any effective M&E process. The CSLP's priorities cannot be met unless a process is defined that first assesses poverty at the village and commune level using appropriate indicators. This will provide the baseline for future poverty assessments and updates. On the basis of these and the priorities set by the villagers and the communes the Government can allocate funds and develop action plans against which to measure its impact on poverty and ultimately on its own performance. The Stone consultant team has proposed a sequence of activities within an action-based plan that can be used as guidelines for an efficient institutional framework for these activities.

1.3.2 Technical

Technical problems are numerous but relatively easy to resolve. While there is little information and data available in a usable framework there is even less technical capacity to support information systems and data accumulation, storage, analysis and distribution. Despite the wide use and acceptance of computers, their capacity is seldom applied to data gathering and analysis. Our observations indicate that this situation is changing and certain technical offices in ministries and NGOs are becoming aware of the need to increase their technical capacity. The results are still mixed as a young cadre of inadequately trained individuals tries to understand the hardware and software requirements that will allow them to create, access, distribute, use and manage information for an effective and sustainable development.

1.3.3 Capacity and Training

There exists a great deal of interest, enthusiasm and a generally acceptable level of knowledge in information systems in Mali. There is in fact a very limited pool of trained individuals in the field of information management. Most of those who have been trained have received only two or three months of training. Most training is general but specialized training in simple GIS procedures using outdated software is the norm for the dozen or so individuals who were interviewed. Most of those who are working in information systems management have learned while on the job. Three or four Malians can be said to be experts in the field. Thus training presents a challenge for the future of information systems and the use of and management of information.

1.3.4 Ownership of data

Numerous national, international and NGO organizations have demonstrated a conviction that the data they hold belong to them or are convinced that if they have paid for the data collection that those data are proprietary. This situation has resulted in a lot of data being "banked" by organizations either in Mali or outside.

1.3.5 Cooperation and Support of Partners

One of the greatest impediments to the development of an efficient information system to which all segments of Malian society can have access is the lack of cooperation of donors and other Malian development partners. The lack of cooperation can be observed in a number of ways including: a general lack of interest in collecting sound basic information and data due to claims of its high cost. Similarly some donor programs do not require data sharing and do not follow conventional data gathering methodologies. These problems include data coding, collection of the same data by various sources, collection of data of little use, sampling methodologies, non-inclusion of existing data and discarding of valuable historical (legacy) data and information. The consultant team observed a high level of interest and cooperation among donors involved in the CSLP Poverty Reduction Program. Donor Support for poverty mapping and the creation of national information system within a "poverty observatory" received unequivocal endorsement from three of the four donors interviewed. The donors suggested that the Malian authorities prepare documents describing the type of system that might be appropriate.

1.4 Recommendations

Based on discussions held with Malian officials and donors, the following recommendations are a few of the most significant:

- The creation of a national coordination structure to deal with information and statistics and adoption of a national policy on statistics.
- The creation of an oversight committee charged with the updating of databases from different sectors.
- The creation of a primary location database code.
- The creation of a "light" coordination structure for the CSLP.
- The creation of a coherent national system for data collection and analysis and a framework for planning.
- The implementation and monitoring of a consensually agreed upon code of operation in the sector of data and information analysis and treatment.
- The utilization of new technologies in the communications and information sectors.
- The creation of a committee with the responsibility to develop poverty indicators.
- The identification and evaluation of existing statistical data collection structures.
- The reinforcement of operational organizations and functioning mechanisms in the data and information gathering sector in support of national, regional and local structures.
- The establishment of a mechanism to define the periodicity of future data collection and statistics and their transmission at the national as well as at the local level.
- The creation of a national Poverty Observatory that serves as a coordination structure for a poverty information network.

2.0 DEVELOPING A POVERTY/VULNERABILITY MAPPING PROGRAM NEEDS ASSESSMENT

The follow provides a summary of our activities and findings related to the development of a poverty/vulnerability mapping program to assist the CSLP.

2.1 Background

In 2002 Stone Environmental Inc. and its Malian associates approached USAID with an unsolicited proposal to conduct Poverty Mapping in Mali that would provide the Malian people with improved information on the location, level and type of poverty on a village basis. This proposal proved to have an important parallel with the USAID Mali *Information and Communication Special Objective*. The objective aims to assure that: Malians have greater access to, and make better use of information." See Figure 1.

Figure 1: From the Information and Communication Special Objective as defined by USAID Mali

"Development interventions are effective and sustainable only if there is sufficient information available to decision-makers and beneficiaries, and sufficient capacity to use that information. In Mali, however, these conditions do not yet exist. Specifically, information in Mali is sparse and difficult to access and manage. This situation exists because telecommunication systems are underdeveloped, mass media are just beginning to spread throughout the country, literacy rates are low, access to official data is limited, and national libraries are essentially non-existent."
Such scarcity of information makes it difficult for the business community to make informed decisions on how to manage their affairs. Health and education planners have inadequate information upon which to base resource allocation decisions.

Scientists and researchers do not have readily available information from the international scientific community to acquire and apply research results to enhance the development process. Students do not have an adequate and reliable source of the types of information a university or national library would provide. Constituents have very little information with which to monitor and assess the performance of their elected representatives. Government officials find it difficult to glean information from constituents—especially those in rural areas—on their views and concerns. Hence, information is fundamental to the development of all aspects of society, namely economic, political and social"

Strictly speaking the objectives of the Stone proposal was to go beyond the USAID objective in an effort to develop data and information specific to the Governments needs for Poverty Assessment and Poverty Reduction in Mali; nevertheless, the proposal supports USAID's Special Objective to provide Malians with greater access to information and so permit its use and dissemination. Finally this proposal and its successors (See Annexe 10) define a framework for joining numerous data sets and information sources and cross inseminating these in a synergy of knowledge of Mali, its people and its resources.

2.2 Poverty Data and its Collection - Choosing the Indicators

The collection of poverty data and its cartographic expression and use to identify the poorest populations of Mali is equivalent to the creation and application of the map Dr. John Snow made of the Broad Street Pump cholera epidemic in 1854. Dr. Snow mapped all the cases of cholera during the epidemic and found that over 97% of the cases were located near the local public pump which he then found to have been shared by all of the deceased and also to have been infected with cholera.

Dr. Snow's observations and deductions provided him with the solution to the problem: removing the handle to the pump. As a result no more cases occurred in this part of London. The deductive reasoning followed by Dr. Snow, in this first and most famous epidemiological study provided him with a prescriptive solution to the problem and a means to arrest the progress of an epidemic which had the problem gone unresolved, might well have caused many more deaths.

This is the first documented case of socio-economic data being merged cartographically with resource information. The map derived from this work defined the critical indicators and clearly provided evidence of the utility of spatial data analysis for problem solving. It should also be noted that Dr. Snow used a participatory process in that the families, friends and acquaintances of the deceased were interviewed to define the indicators and the limits of the study.

Another important early study directly related to the work done by Stone Environmental for USAID Mali on behalf of the CSLP was the work of Charles Booth who in 1889 mapped Poverty in London England by using social conditions as indicators and mapping for every individual by street and tenement. True-to-scale maps showing the individual buildings on the streets of our cities are a fairly recent innovation, and thematic maps displaying selected characteristics of city life are relatively rare. Considering this, the colored maps created by Charles Booth to depict the social condition of every London Street in 1889 were a startling

innovation. Those maps, like the innovative village multi-indicator Atlas proposed by Stone Environmental and its Malian associates, would clearly show the advantage that such an Atlas would have over other "poverty mapping" efforts. This point has been demonstrated by Stone's work in Niger in 2001 and 2002.

Most discussion to date has defined poverty mapping in western terms and using western symbols for poverty. The poverty maps created to the present also typically present data and information aggregated to the political units that paint too broad a brush and miss the differences made obvious by Charles Booth in his study of London. Geographical mapping on the basis of the criteria and variables as proposed for the Atlas of Poverty/Vulnerability for Mali will provide a view of the country that permits one to understand why one village is very poor while the village next to it is inexplicably well off. This approach also and more importantly allows one to question and so seek the answers to why such differences exist.

Sonia Rocha (1998) of IPEA, Brazil supports such contentions. She implies that most poverty mapping efforts are contextually not relevant. She defines poverty on the basis of needs and not technological change? What are the main features of this "condition de vie" approach? The outstanding features are – "under-nutrition, low schooling, and lack of access to public services or unemployment and marginality." She adds that: "This overall information on the poverty syndrome is the key element for conceiving a framework in which poverty analysis and anti-poverty policies are to evolve. Specifically it means adopting concepts and measurement instruments (indicators) that seem the most appropriate to a specific context in terms of social reality and data gathering capabilities."

We believe that an additional and equally important set of factors should be included in the "condition de vie" analysis. These factors relate to the environmental status of populations. Environmental factors or indicators affecting poverty in Mali include: annual rainfall, availability of land, soil quality, the number of stakeholders using the land and the degradation processes and trends affecting a particular area, town or village. We also believe that poverty has a dynamic profile, a profile that must be redrawn periodically and whose lines must be reassessed with the impact of events that bring on social, economic and environmental change such as that affecting the West African region due to recent events in Cotês d'Ivoire.

It is with this background in mind that the following report is written. We believe that mapping the elements of poverty and food security provides Malian decision makers with a completely new view of the problem they are trying to solve. Providing a geospatial dimension to poverty helps to find solutions to problems that seem to defy solutions. Dr. John Snow resolved a very complex, if localized, medical problem by using this technique. Charles Booth spatialized poverty in London and influenced the understanding of 19th Century London and defined the process for attacking poverty through the spatial dimension.

Present methods for poverty or deprivation mapping used in the West are not contextual with Malian problems. For example the State of Illinois maps list among other factors, recreational and crime statistics. In the State of Guanajuato, Mexico, the mapping of poverty considered, among other issues, marginalization, income and the quality of the dwellings. The latter is very important in Mexico but much less so in rural Mali. In Dorset, England, < www.dorset-cc.gov.uk > housing, disability and employment are important factors used as indicators. It is interesting to note that in the case of the Dorset study poverty is measured using an index of deprivation with six indicators that are weighed based on an established calculation.

Poverty mapping and the capacity to understand the geography of poverty will provide Malians and their partners with new information and therefore, a new outlook on the origins and causes of the problem. Once the origins and cause are better known, ideas and innovative approaches derived from this knowledge will become more common. During the mapping process it will be necessary to improve the assessment of poverty. This may be done by adding or deleting indicators based on developing these with the rural poor. It may also be necessary to define indicators of poverty/ vulnerability/deprivation/food security by establishing a weighted system that more correctly reflects the level of poverty of the individuals and villages concerned. The development of tools to increase and communicate our knowledge with respect to poverty is the only way to find solutions to deprivation and poverty in Mali.

2.3 Poverty Indicators, Monitoring and Evaluation Methods, and Requirements of a National Information System

In the documents provided by the CSLP at is November 2002 Workshop on Monitoring and Evaluation Indicators, it was noted that the CSLP have clearly

defined their objectives, priorities and budgets. Among the CSLP objectives is the alleviation of poverty among the poorest, rural populations, the least educated, the malnourished and the medically disadvantaged. These are valid if somewhat general objectives. Their non-specific nature is based on the lack of availability of detailed data on poverty at the village level in Mali. The CSLP acknowledges that current poverty data are general and that household surveys recently made by the Enquete Malienne d'Evaluation de la Pauvreté (EMEP) provide a very limited or partial view or sample of poverty at the regional level. These limited samples would probably preclude an objective and prescriptive approach to identifying specific pockets of poverty by village or commune, defining their raison d'etre and finding solutions to the problems identified.

The current CSLP operational framework appears to lack an effective tool for identifying, measuring and monitoring poverty at the village level. Such a tool is needed to prepare a baseline for all the other related work including: monitoring and evaluation of poverty through time as well as for measuring the impact of government and partnership programs and investments and monitoring and evaluating the performance of poverty reduction efforts and policies.

After reviewing the CSLP report on available information on poverty indicators and to help in achieving the goals of this grant for the cartography of poverty/vulnerability in Mali, the consultant team has developed a partial schematic of indicators. These indicators are considered as being critical to the development of a poverty assessment. We have further defined these indicators within a hierarchical structure in two broad categories: social indicators of poverty and environmental/resource indicators of poverty.

It is clear that Mali requires a poverty assessment methodology based on the creation of a multi-indicator baseline, but also requires long-term monitoring of poverty by village and commune as well as effective impact and performance monitoring and evaluation tools. The most effective way of providing for this multiple objective is the creation of a national information system (Système National d'Information du Mali, SNIM). This system would support not only the objectives described above but also provide the means for assessment of the food security situation, monitor disaster assistance requirements and provides the basis for conflict prediction and environmental/degradation/desertification monitoring.

The following tables provide initial outlines for two important support systems for poverty reduction and the creation of a national information system. Table 1 provides a clarifying perspective on the three levels of indicator development and reporting required for effective poverty reduction. This table was developed to provide a guideline for effective M&E. This table was also created because of the confusion evident at the two-day workshop.

Because our initial focus is on creating a poverty baseline we developed Table 2: Baseline and Monitoring Framework for Poverty Assessment. This table provides an illustration of the framework hierarchy of the proposed indicators required to systematically evaluation poverty and prepares a national poverty/vulnerability information system.

Lastly, Table 3: Example Framework Matrix for Creating First Order Indicators offers an initial method to describe the technical method by example for characterizing village level in condition of poverty. We would expect in Phase II that the CSLP and the ministries involved would use their hand at sculpting the final approach to creating the Mali Baseline of Poverty/Vulnerability and creation of the Atlas.

TABLE 1: 3 LEVELS OF MONITORING & EVALUATION

Performance:
- Indicators
  - Government Policies
  - Governance/Elections
  - Development of local governing structures
  - Increased development and use of a justice system
  - Investments & Budgeting Procedures, etc.

Impact:
- Indicators
  - Income/Consumption
  - Unemployment
  - Taxes collected
  - New Infrastructure, etc.

Poverty:
- Indicators (see Table 2)
  - By Village
  - By Communes
  - By Urban Areas
  - By Area (Aires de Sante)

TABLE 2: BASELINE AND MONITORING FRAMEWORK FOR VILLAGE/URBAN POVERTY ASSESSMENT
Illustrative Schematic

SECTOR	INDICATORS		
	1st Order	2nd Order	3rd Order
SOCIAL			
Education	Access to Schools: Government, Community, & Madersas	Enrollments	Matriculation
Health	Access to Health/Medicine	Number/type of Practitioners	Cases of Primary Diseases
			Life Expectancy
			Birth Rate
			Infant Mortality
Economics	Access to Transport	Roads	Paved, Laterite & Paths
		Railroads	
		Air	
		Water	
	Means of Transport	Means – Private	Cars, Bicycles, Donkey, etc.
		Means – Public	Buses, Trains
	Access to Communications	Telephone	
		Radio	
		Internet	
	Access to Markets	Local, National, International	Cattle, Agricultural, Consumer
	Access to Tools	Urban	Service Tools
		Rural	Farm Tools
	Access to Jobs	Business Formation	
	Access to Goods		
	Access to Credit/Investment		
Institutions	Central		
	Regional		
	Communal		
	NGOs		
	Private		
	Donor		
ENVIRONMENTAL/ RESOURCES			
Resource	Access to Water	Fluvial	
		Precipitation	
		Groundwater	
	Access to Food		
	Access to Arable Land	Capacity- rain /soil	
		Capability - to produce	
		Amount of Land	
	Access to Energy	Wood/Charcoal	
		Bottled Gas	
Environment	Parks		
	Biodiversity		
	Carbon Sequestration		

Table 3: Example Framework Matrix for Creating First Order Indicators

First Order	Database	Field Item	Technique
Access to Schools	Decentralization-Village	Total Primary Schools	1. Select all villages with schools 2. Buffer selected schools with selected distance, e.g., 5 km. 3. Reverse the selection and code as not having access to school
Access to Irrigation	Hydrology-IGM	Location of Rivers and streams. Topography. Soil types	1. Buffer all hydrography by appropriate distances, e.g. .5, .75, 1 km. 2. Select all villages in buffered area 3. Reverse selection & code as not having access to water with different value based on distance.
Access to Drinking Water	Decentralization-Village	Total Drinking Fountains and Wells	1.Select all villages with drinking water/wells 2. Buffer selected villages by selected distance, e.g., 5 km. 3. Reverse the selection and code as not having access to drinking water.

2.4 Data Availability and Sources, Age, Data Gaps and Needs

There are those who say that the forces that bring about poverty and its results cannot be measured and evaluated without local level data. Local level data means village level information collected painstakingly over time and at specified intervals using appropriate techniques and statistically relevant methods. If this is true, it is imperative that the quality and age of village level data be accepted and established as a pre-requisite for creating the baseline level of poverty within Mali. Of primary importance is the purpose this data will serve. The creation of a baseline level data set of poverty/ vulnerability is what needs to drive the program data requirements.

To that purpose, there exist many rich sources of data in Mali. These data have been gathered, compiled and put to use by various ministries and NGOs within Mali. The formats of these data are quite diverse. Many electronic databases are created in MS Excel. Some organizations are keeping their databases in Access.

Based on the initial assessment of the consultants, there is adequate information to develop a preliminary baseline of poverty/vulnerability. A program to ensure this data collection continues and spreads to other organizations will have to be a priority if an effective poverty assessment is to be implemented. An information system for support of Poverty Reduction will require a much higher degree of standardization and use of relational databases—RDBS. The need for using an RDBS is based on the following requirements:

- Protection/security
- Robustness
- Ease of access
- Standardization
- Redundancy minimization
- Integration with GIS Software

2.4.1 Data Sources

The consultant team found numerous databases and spreadsheets in visits to various ministries. The following is a summary of those findings.

2.4.1.1 DNSI

The Direction Nationale de la Statistique et de l'Informatique is responsible for compiling data from many ministries. In addition to this wealth of data, they are the organization charged with managing the census of population efforts.

2.4.1.2 Health

The Ministry of Health has many databases. These are located in various "Directions" including the Direction National de la Statistique, DNSI where a nascent GIS is in preparation that attempts to create an aggregate of all health data for Mali. Some of these data are at the village

level and many are at the "aires" level. The Ministry created these "aires" or areas were by the as their assessment and mensuration units a number of years ago. This aggregation level does not easily permit assessment at the commune level. The disease databases are also tracked at the "aires" level.

The DNSI is developing a new survey using WHO/OMS funding to assess the status of world health. Unfortunately these databases are not coherently organized though an attempt is being made to manage and create a more efficient data system. Disease statistics covering HIV/AIDS, tuberculosis, malaria and meningitis as well as other disease data need to be collected at the village level. (See Annexe 6 for additional details.)

2.4.1.3 Rural Development

The consultant team visited the Cellule de Planification et de Statistique in the Ministry of Rural Development and Environment. During interviews we found that this group had developed a number of databases of great value to a national poverty database. These data are provided in an electronic format and could be easily integrated into an easily disseminated dataset. In addition this Ministry has developed a database providing information donor and national investments by sector, by age and by commune. This information and the electronic database that should be created from it would be invaluable to the CSLP M&E process.

2.4.1.4 Agence Nationale pour l'Investissement dans les Collectivités Territoriales (ANICT) National Agency for Investments at the Commune Level

This agency is not an operational or line department but distributes funds on the basis of the demands of the Collectivites Rurals. The Director advised us that he is very interested in having updated maps of the investments by rural commune and by investment sector so that the government can assess the efficacy of its investment and have long-term planning, monitoring and evaluation tool upon which to base future investments. He also indicated that a poverty map such as the one described by Stone would permit his Agency, the Government and the Donors to evaluate the needs of each commune through such an assessment. The Agency has recently given a contract to a local company (BAGS) to map agency interventions and their sites. The Director also expressed an interest in seeing that the relationship between poverty, land management and employment is analyzed through the type of national information system that we had discussed.

2.4.1.5 Commerce

The consultant team visited the Ministry of Commerce to assess their data collection program. While very little data are available in a format useful to the development of a poverty mapping system, nevertheless the Director of this office was knowledgeable and felt that the Ministry could and should participate in a poverty assessment program but that his office would require capacity building and training. The Director was attempting to establish databases on business and private capital expenditures and income, salary of workers, number of industrial employees, and tax collections at the individual and business level. This office also attempts to maintain records of the mining companies that are active, as well as hotels and other businesses.

2.4.1.6 Hydrology

Perhaps the most complete sectoral database can be found at the Direction National de l'Hydraulique. The Direction has electronic databases on wells, aquifers, water quality and other parameters. The staff is small but appears to be well trained and could make a major input to a national database and observatory.

2.4.1.7 Social Affaires

The National Director for Social Development advised us that they collect data on the destitute on a commune level. These figures do not however reflect the level of poverty of a commune or village. The law no longer applies its outreach in a just way and so many very poor individuals do not profit from the funding available to the very poor.

2.4.1.8 Transport

At the Ministry of Transport we discussed the availability of transportation related data for use in a Poverty Mapping project. The Director advised us that they were very interested in supporting poverty mapping. Efforts are being made by the Ministry to produce data on population movement, trade movement, imports and access to markets, The Transport Ministry has created a Transport Observatory that is developing statistics and data on existing transport systems. They are creating a map of all the transport systems in Mali and the different types of vehicles, ships, boats and barges, the amount of tonnage transported and among other items the number of vehicle accidents. The Observatory is preparing a simple GIS- based map of various transportation parameters. Indications are that the observatory is ready to make a major effort to develop an all inclusive

transportation GIS for which they are ready to seek training and assistance.

2.4.1.9 Education

The team visited the Cellule de Statistique at the Ministry of Education, unfortunately neither the Director nor his Deputy were able to see us in spite of the arrangements previously made. It is the understanding of the team that the database available at the Ministry is that which will be used in the CSLP Monitoring and Evaluation framework. (See Annexe 7 for additional details.)

2.4.1.10 IGM

The consultant team visited the Director of the IGM. In Mali as in other West African countries the IGM has the role of producing and distributing all official maps. According to the director, the IGM has prepared digital versions of the 135, 1:200,000 sheets that cover all of Mali. Various other digital files at different scales and of different types can be found here.

The IGM has prepared a digital version of the city of Bamako at a scale of 1:25,000 but it was created using a number of inexact products. Similarly, the IGM took the maps showing commune boundaries created for the Mission Decentralisaton by ARP and has re-digitized boundaries to produce a national commune map.

The production capacity of the IGM is limited to one map at a time on a very high-quality plotter. The prices charged for available maps are very high. If the IGM is to provide mapping services to Malian institutions it will need to farm out the production of its maps to a printing house instead of trying to produce maps on expensive in house printers.

The IGM has two or three well-trained individuals who are familiar with various GIS software and their applications. Policies which require that the IGM control the production and distribution of all maps produced in Mali could prove to be a problem if a National Information System and Geographic Database were to be set up in a National Observatory.

Some of the most detailed base map information has been digitized by IGM. This data is available for purchase for single purpose use. It is relatively expensive prospect. For this reason the data is not in wide use by other organizations. Based on the historic tradition of charging for maps, the rationale for charging for the digital data was consistent with their mission, but not in line with current thinking about widespread use of digital data. It was not determined whether their digital maps line up at each edge. The widespread dissemination of their data would greatly aid all government and other organizations.

2.4.2 Data Age

The majority of the databases found during our visits are sufficiently current to be used for building a baseline of poverty/vulnerability. Investment data on health care and school facilities built over the last 2 or 3 years are available at the village level. The data may be added to improve the existing databases. The baseline data development for village level data is presently derived from multiple sources; a consensus will have to be reached on a primary source.

It will be important to address the village and urban commune level information for each sector. All statistics on all schools should continue to be made annually by the Ministry of Education. The Ministry of Health should update all data on the availability of health care facilities by village annually. Investments in transport improvements, the opening of new markets will also need to be tracked on some regular basis.

2.4.3 Data Gaps

There does not appear to be any significant problem in developing an initial Malian baseline of poverty. The team found that the necessary data to create a poverty map such as the one prepared for the Government of Niger and the World Bank were available in a number of places in Bamako. Most of the data are available at the DNSI. The assessment of data quality was beyond the scope of this project. Based on discussions held with technicians at the organizations visited we believe that the data is of sufficient quality to develop a baseline of poverty. We also believe that there is sufficient village data to identify the investments being made that impact poverty. We are not as certain with respect to the availability of data to measure the performance or effectiveness of those investments on poverty.

The primary database for use in determining the baseline extent of poverty is the data created as part of the Decentralization Project and the most recent census data available from the DNSI. This database has over 29 village level characteristics that can readily be used (over 79 attributes covering 29 characteristics dates from 1987). When combined with developing village level condition using other databases such land use, hydrography and roads in association with village location, a robust assessment of village level poverty is possible. (See discussion in Figure 2.)

Current administrative boundary databases should be redrawn to insure that new communes correspond to the physical boundaries, as they exist. When the current boundaries at all levels are superimposed on Landsat satellite imagery, the boundaries do not match especially where they are meant to match rivers or lakes boundaries. The correction of this problem is not an expensive task, but requires that one ministry is charged with the task and the legal guidelines on how the task is to be accomplished. The Ministère du Plan and IGM are the ideal collaborators on this project.

The UNDP office in Bamako felt strongly that missing data and erroneous data needs to be collected or corrected to assure that the national poverty database is representative of the quality of life of the Malian population. One of the most serious data gaps is a census of cattle, including: ovines, bovines, camelines, caprines equines and asinines. Little or no information is available on crop production outside the conventional cereals. Little or no information exists on the status and trends in forestry, pasture, aquatic and biotopic degradation. Climate level information and climatic trends have been too generally mapped and need review and improvement. Finally not enough information is available on human diseases, their occurrence and sources.

2.4.4 Data Documentation

We did not find many government organizations that have documented the GIS data they use or have developed. Many departments have been using data that they acquired from other sources but without attribution. The data with the most complete documentation is that available from USGS and to a lesser degree that compiled by AGRHYMET. In addition the data from the census and those used by the decentralization project appear to be better organized than other data sets. As part of any future government or donor funded project, data to be used must have complete metadata support prepared according to the ISO metadata standard. This is one of four choices currently available in ArcGIS™ 8.x's ArcCatalog™.

Figure 2 provides an example of the issue that will need to be resolved prior to the development of the baseline poverty information.

2.4.5 Data Access / Dissemination

Based on our visits and interviews, there appears to an effective "personal-network" version of data access. With the advent of recordable CDs on generic personal computers, there is very little to keep technicians from sharing data with colleagues. Although this approach encourages data duplication the down side of this approach is the lack of knowledge as to the origin of the data. The consultant team was able to compile over 550 MB of data related to Mali. It was acquired from key GIS staff in Mali who were interested in sharing and from several research institutes Additional data were acquired by downloading from the USGS EROS Data Center's website. (www.eros.usgs.gov)

There was a high level of interest in a repository system from which users could easily get the "official" versions of data. This should be one of the high priorities in building the National Poverty Information System. Agreement on who is the official data sponsor should be an early task for the system. Putting the data on a universally accessible web server is also a high priority.

The consultants found that most current users of GIS data are not connected to a network for ease of sharing. The progress of technology has opened up the door to two possible future network approaches. The first is the introduction of low cost wireless networks and the second in the forthcoming high speed third generation (3G) GSM cellular telephone system. (See Annex This later technology would not only allow remote downloading of data but also allow for remote web-based mapping applications to run on such a connected device. Both these technologies could assist in the rapid development of the national system. Either approach would play a role in the future access of GIS data from a repository.

FIGURE 2: EXAMPLE OF DATA INCONSISTENCIES AND LACK OF DOCUMENTATION ISSUE

Three separate sources of village data were compiled during this project. The originator is most likely DNSI. None of the data indicates whether urban communes have been included.

The first set of village data was that available on the ARP's *Cartographie de la République du Mali* CD-ROM. It contains a runtime version of various information by village, commune, and region. It was produced with funding from UNICEF. The databases used in this product were originally developed to support the efforts of the "Mission de Décentralisation." The data on the CD-ROM is not directly accessible, so dissecting it or using it in other software programs is not easily possible. Based on information contained in the help files and in the "Avertissement" contained in the printed version produced several years earlier, These data originated from a database (mlcensus.dbf) that came from DNSI but the number of villages were reduced to correlate better with the countries 1:200000 scale maps as produced by IGM. The DNSI file contained 11,634 villages. The copy of the DNSI mlville.dbf obtained from the USAID office contained 11,632 villages and has population data for the years 1987,1991, 1996 and 2001. The data on the source dbf file is dated July 29,1998. The third source of village data came from ICRISAT. They have managed to read ARP's database and produce it in a GIS format useable in ESRI's ArcView software. The following table summarizes the data and highlights the differences in the three databases. There was no metadata file to explain the content or origin of the information.

Source	Villages	Population
DNSI (USAID)	11,632	10,982,394
ARP- CD-ROM	~10,000	8,348,211
ICRISAT	10,297	8,341,754

2.5 GIS Capacity

No formal survey was conducted of GIS capabilities. We did make a number of observations during our interviews. There are at least 21 organizations using GIS software. It was difficult to determine the skill level of some of these groups, but it is certain capacity and interest exist. We only encountered two or three GIS "super users" during our meetings. The remaining users have not had projects or data in which the full capacity of GIS could be used. It was clear that application-based training or educational programs focusing on real life projects would enhance the country's capacity and capability.

We also learned that there is a "user network" that has been meeting and they have developed a draft charter. The participating network organizations are:

- Direction Nationale de la Conservation de la Nature
- Cellule de Planification et de Statistique du MDRE
- Direction générale de la CMDT
- Office Malien du Bétail et de la Viande
- Direction Nationale de l'Hydraulique
- Direction Nationale de la Météo
- Secrétariat Technique Permanent du Cadre institutionnel de Gestion des Questions Environnementales (STP/GQE)
- Cellule de Planification et de Statistique du Ministère de la Santé
- Institut d'Economie Rurale
- Institut Géographique du Mali
- Office du Niger
- Office de la Haute Vallée du Niger
- Projet FEWS/NET
- Observatoire du Marché Agricole
- Projet Système d'alerte Précoce (SAP)
- Direction Nationale de la Statistique et de l'Informatique
- Cellule de Planification et de Statistique du Ministère de l'Education
- Direction Nationale de l'Appui au monde Rural
- Direction Nationale de l'Aménagement et de l'Equipement Rural
- Direction Générale de la Réglementation et du Contrôle
- Direction Nationale de la Géologie et des Mines
- Observatoire National des Transports

The sharing of data is highest concern of this group. Based on our observations, government organizations using GIS software are using it to display summaries of the information they collect for reports and presentations. The NGO's we interviewed are using GIS for large, long- term projects.

2.6 GIS Software Availability and Use

The GIS software in use in the country is diverse. ArcInfo™/ArcView™, AtlasGIS™, GeoMedia™, MapInfo™, are all in use. In addition, Autodesk's AutoCad™ is also used for mapping. The versions of this software vary from organization to organization

Database programming skills were even more limited. Most government organizations are still using MS Excel as a database. In our view, MS Excel should not be used

for the storing of data. Clearly this is an area for expanded training within the country.

As a result of using many different software packages, the data formats are often incompatible and data needs to be transformed to be used. This makes data sharing difficult or impossible.

We recommend that the "National Information System" adopt standard GIS software that maximizes flexibility and expansion and provides tools for the proper data management functions necessary to standardize the creation and maintenance of data. The only product on the market that meets open GIS standards and offers the needed functionality is ESRI's ArcGIS™ family of software. This software allows access to users of multiple skill levels and needs. In addition public access is the greatest with the ArcPublisher™ and ArcExplorer™ options.

In the future there will be a reduced need for multiple copies of expensive GIS software as the technology moves into more web or publisher based applications that allow the user to query and analyze data and make maps without having to own a license or to manage the data. Such a development should enable Mali to develop future GIS systems at reduced cost.

2.7 Equipment: Availability, Condition, and Utility

A detailed inventory of equipment was beyond the scope of this study. We did observe that there is a variety of computer and peripheral equipment used in Malian GIS. IGM has the most sophisticated equipment. Most organizations are using PCs with small format inkjet printers.

For the effective creation of maps and their use in reports and documents it would be advantageous for Malian user organizations to acquire Adobe's Acrobat Writer® software so that the maps can be imbedded directly into reports and ease of reproduction. In addition, the potential for users to have the ability to publish interactive versions of their organizations work using ESRI's ArcPublisher™ software would help managers to better understand and to see different perspectives on the information.

3.0 DONOR SUPPORT

Donor support for poverty reduction actions in Mali must focus on actions that affect the poor in the short term if not immediately. The discussions held by consultant team with the donors in Bamako during the month of December 2002 demonstrated a total commitment to poverty reduction in Mali through an immediate and total support of the CSLP Poverty Reduction Plan and its associated M&E program.

The most evident aspect of donor support is the realistic and down to earth attitude of the donors interviewed by the consultant team. We were only able to visit and interview a small number of donors including: USAID, The UNDP, The World Bank and the European Community. These donors emphasized the following points.

- Poverty data must be as complete as possible
- Data gaps must be identified and the missing data collected
- The data collected must be accurate and standardized in order to provide a solid basis for poverty assessment and poverty monitoring and evaluation;
- The data must be made available and freely distributed to all users;
- The dissemination process must be simplified and tied to electronic processes including web availability and internet interoperability;
- All the donors emphasized capacity building and training.

The donors agreed that a timely collection of a poverty baseline was of primary importance and that a regular monitoring and evaluation of poverty must be a first step supporting impact evaluation and the monitoring and evaluation of performance.

The donors were in agreement that a national information system, including an independent network of data collection points (Ministries, NGOs etc.) should be an objective of national policy. At least two donors

supported a system that would operate within an autonomous "observatory" which should be created in support of the governments activities in poverty reduction and monitoring. They also indicated general support for the capacity building that such a system would require.

One of the objectives of the Consultants was to evaluate the possibility that one or more donors might consider supporting and funding a second phase study or project in support of the CSLP objectives. In particular the consultants were seeking to establish if the donors might support a poverty mapping effort.
Discussions with the donors clearly showed that at least two of the donors would support a second phase. As defined by the donors to whom we spoke the emphasis of this second phase should be on supporting the objectives of the CSLP. The objective as defined by the various parties is:

1. To create a systematic database in support of poverty monitoring and mapping, within an institutional structure. (Observatory)
2. To collect missing data and to fill the data gaps to support a more accurate poverty monitoring program.
3. To develop an effective poverty investment M&E.
4. To create national poverty maps at the village and commune level.

No outright commitments were made by any of the donors to support a second phase; however the United Nations and the EU representatives clearly indicated that they would consider funding proposals submitted by the CSLP that dealt with the topics noted above.

The director of the CSLP requested that the Consultant prepare a proposal for the next phase or phases. This proposal can be found in Annex 10.

The Representative of the EU advised the consultant that the proposal submitted to the CSLP would be well received and passed on to the Resident Representative.

The UNDP on the other hand showed a deep interest in supporting an improved poverty monitoring information system in the context of a national poverty observatory. However The UNDP indicated that such an observatory would be free to operate within a Malian institutional framework. The UNDP also supported the concept of a relationship between the observatory and the University of Bamako.

Although the Consultants were not able to convince the World Bank staff of the advantages of supporting a second phase of this project, we were made to understand that the Bank was supportive of the CSLP initiatives and would consider further discussions on this topic.

4.0 CONCLUSIONS AND CHALLENGES

During their three-week consultancy Stone Environmental and its Malian partners were to assess the need, for a national poverty/vulnerability map and the data required to support the system behind it.

The most important conclusions to be drawn from this three-week enquiry were:

1) The CSLP and three of the Donors interviewed requested that the consultants prepare a proposal outlining the major elements for a Phase II Project /Program. The consultants were advised that the proposal should consider the following elements:
   - The preparation of a data baseline for all of Mali and the creation of an Atlas of poverty/vulnerability.
   - The definition of monitoring and evaluation methods to assist the CSLP in assessing performance and progress.
   - The creation of a framework for institutionalizing Poverty mapping and the necessary M&E.
   - The definition of needs to support a sustainable system. (The preliminary proposal prepared by the consultant team can be found in Annex 10.)
2) The CSLP, which is the governing body in charge of the Poverty Reduction efforts of the Malian Government, was wholly supportive of the creation of a national poverty mapping system to support their M&E efforts.

3) The CSLP believes that a national observatory should be created to support a system for collection of poverty and vulnerability data.
4) The CSLP has requested that Stone Environmental prepare a proposal to define the requirements of a national poverty and vulnerability mapping project/program.
5) The donors, to whom we spoke, unequivocally supported the creation of a national poverty mapping system and indicated they would support capacity building.
6) Malian agencies, NGOs and other international Agencies interviewed were in agreement that a national poverty system would be a significant help in reducing poverty and assist them in providing the necessary supporting data if capacity building and training could be assured.
7) There is a very visible interest in the creation and improvement of spatial databases in every organization visited by the consultants. This interest and enthusiasm goes beyond the technical level and extends to the higher echelon of management.
8) Technical proficiency is not high but the demonstrated interest and quick learning demonstrated during the visits to every office will assure that any effort to create a national system will be met with enthusiasm and hard work.
9) One negative observation made during the consultancy revolves around the question of data sharing and ownership and other issues that may have a political basis, such as where the Observatory will be housed, who will be in charge and who will get funding?
10) A second major problem that was evident is related to data transmission and the lack of electronic capacity now available in Mali. This lack has been partially palliated by USAID's effort to equip the University of Bamako with a server to permit the University to use the Internet and the web for research and distance learning.
11) University of Bamako will have the ability to conduct many of the functions required by the national information system, and could well be the focal point for the Poverty observatory and the national information system.
12) Based on the initial assessment of the consultants, there is adequate information to develop a preliminary baseline of poverty/vulnerability.
13) A program to ensure this data collection continues and spreads to other organizations will have to be a priority if an effective poverty assessment is to be implemented.
14) The majority of the databases found during our visits are sufficiently current to be used for building a baseline of poverty.
15) There is sufficient data to identify the investments being made to impact poverty.
16) There is not certainty that there is sufficient or available data to measure the performance of those investments on poverty.
17) One of the most serious data gaps is a census of cattle, including ovines, bovines, camelines, caprines equines and asinines.
18) There is little or no information is available on crop production outside the conventional cereals.
19) There is little or no information on the status and trends in forestry, pasture, aquatic and biotopic degradation.
20) Climate level information and climatic trends have been too generally mapped and need review, improvement, and integration.
21) There is not enough detailed information available on diseases, their occurrence and sources.
22) Most current users of GIS data are not connected to a network for ease of data sharing.
23) There was a high level of interest in a data and information repository system where users could easily get the "official" versions of data.
24) There will be a reduced need for multiple copies of GIS software as the technology advances to web or publisher based applications that allow the user to use, query and analyze data and make maps without having to own a license or to manage the data, therefore implementation of GIS for use in a national information system should be cautious in wide acquisition of software.

5.0 RECOMMENDATIONS

Poverty in Mali will not be reduced by the CSLP and its efforts at monitoring and evaluation. No products such as poverty maps or studies to outline the technical and institutional deficiencies and requirements of a national poverty monitoring system can reduce poverty in Mali. No amount of information or a networked system to measure and monitor poverty in an "Observatoire" can reduce poverty. These efforts can only provide the vehicle and draw the road map for reaching the poorest people and providing them with the most appropriate assistance so that they may choose their own way out of poverty.

Any poverty mapping effort will be flawed and must continuously be improved and updated. The Government of Mali has recognized this fact and is considering putting in place a number of institutional supports to improve data collection and dissemination as

well as to build capacity at the national and local level. Efforts are also underway to increase the participation of local populations in order to develop a more realistic set of poverty indicators, indicators that reflect the reality of the poor of Mali.

Based on the three-week analysis conducted by Consultant team the following recommendations are suggested:

1) Review the role of the national statistical service (DNSI) and the existing system in terms of its national and international obligations within the construct of the CSLP.
2) Assess how poverty is to be measured in all of its dimensions and complexity. What indicators? Urban vs. Rural poverty assessments, etc.
3) Respond to the needs of the user community in real time with respect to poverty monitoring in the context of economic, financial, social, political and environmental factors.
4) Find ways to improve data and data collection methodologies to permit regular updates of Poverty Data.
5) Identify methods to improve internalization (understanding) and use and updating of geographic data.
6) Identify methods to improve institutional capacity building to achieve a better understanding of poverty in Mali.
7) Define the objectives of an Institutional framework for a Poverty Observatory and its network.
8) Outline and define the roles of the different individuals and groups involved in the implementation of the Observatory.
9) Improve the census and assure its viability.
10) Assure effective and representative household surveys.
11) Evaluate and assess the cartography of socio-economic factors or indicators affecting poverty.
12) Define and identify the process of updating cartographic information and data in the context of creating a long-term system.
13) Create a national coordination structure to deal with information and statistics.
14) Create an oversight committee charged with the updating of databases from different sectors.
15) Create a single location database code.
16) Develop and adopt a national policy on statistics.
17) Create a "light" coordination structure for the CSLP within the Ministry of Economy and Finance.
18) Create a coherent system for data collection and analysis and a framework for planning.
19) Implement and monitor a consensually agreed upon code of operation in the sector of data and information analysis and treatment.
20) Support the utilization of new technologies in the communications and information sectors.
21) Create and support a committee with the responsibility to develop the methodologies and choices for poverty indicators.
22) Identify and evaluate existing statistical structures.
23) Reinforce operational organizations and

functioning mechanisms in support of national, regional and local structures.

24) Establish a mechanism to define the periodicity to be implemented in the process of future data collection and statistics and their transmission, both at the national as well as at the local level.
25) Establish application-based training or educational programs focusing on real life projects that would enhance the country's capacity and capability.
26) Require that future databases developed and used for any government or donor purpose must have complete metadata prepared according to the ISO metadata standard.
27) Monitor the progress of technology concerning two recent technology enhancements that could benefit data sharing: the introduction of low cost wireless networks and the forthcoming high-speed GSM cellular telephone system.
28) Review and redraw GIS administrative boundary databases should be to insure that new communes correspond to the physical boundaries, as they exist.
29) Establish a facility to support the widespread access to "official" databases for all ministries and organizations to access, stay current and use.
30) The Government of Mali should request that the donors support a second phase of this project. This effort should consist of supporting the three-phase proposal for a poverty/vulnerability information system development effort developed by the consultants. See Annexe 10.