# Evaluation of the Atlas of Honduras (Atlas Mitch)

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## Executive Summary

In October 1998, the Seeds of Hope project contributed to the production of 2,000 copies of the "Mitch Atlas", containing fundamental maps on population, land use, roads, rivers, topography, and soils. The Atlas was freely distributed to institutions for post-Hurricane Mitch emergency response and reconstruction. Two years later, the Seeds of Hope project conducted an impact assessment of the Atlas in order to gauge the role of geographic information on decision-making. The results of this impact assessment are presented in this report. The methods used to assess the impact of the Atlas combined case study analysis and descriptive statistics. We interviewed 20 Atlas users and received 43 completed questionnaires. Based on user responses, the Atlas of Honduras made a significant contribution to disaster response, agricultural development, and natural resource management in Honduras. Overall, 97.7% of the respondents said they thought the Atlas was a useful tool, and 84.8% thought the Atlas was the best compilation of geographic information available in Honduras. Seventy four percent of the respondents found the Atlas easy to use, and 90.5% used the Atlas interface itself, rather than copying the data to be used with their own GIS software. This indicates that the interface itself was well designed. The Atlas was used for a range of applications, from basic mapping to more strategic planning, predominantly within the agricultural and natural resources management sectors. Nearly all those who participated in this evaluation indicated that the Atlas improved the quality and efficiency of decision-making. However, a number of Atlas users mentioned that the Atlas was one of a range of tools and information sources, so they were reluctant to assert that the Atlas had a direct impact on their decision-making. The Atlas was instrumental in raising awareness of the value of geographic information and need to share information. With the Atlas now 2 years old, 100% of the users sampled expressed an interest in having an updated version produced, and 92.7% said they would be willing to contribute to it. 88.1% of the sampled users said they expect to use geographic information frequently in the next five years, indicating that geographic information will have a prominent role in the future.

## Introduction

At the height of the Hurricane Mitch emergency, the International Center for Tropical Agriculture (CIAT) recognized the need for socio-economic and biophysical data to guide and prioritize relief and reconstruction activities. With partial funding from the Seeds of Hope project, and in collaboration with United States Geological Survey and Environmental Systems Research Institute, Inc. (the leading mapping software manufacturer), CIAT produced 2,000 copies of a "Mitch Atlas" on CD-ROM (henceforth referred to as the Atlas). The information used in the Atlas had been developed over previous years as part of CIAT's program to apply information technology to agricultural and natural resources problems in Honduras. Several international donors were involved in some aspect of the previous work. Having completed this earlier work, CIAT had most of the content for the "Mitch Atlas" already in hand. The Atlas contained fundamental maps on population, roads, rivers, topography, and vegetation from a number of government institutions (DGEC, SOPTRAVI, MEP, SECPLAN, FHIS, SETCO, SAG and COHDEFOR[1]). In addition, satellite images were included to help depict the damage caused by Hurricane Mitch. The Atlas was freely distributed to institutions for their emergency response (e.g., Doctors Without Borders, International Red Cross) and reconstruction planning efforts (e.g., Secretariat of Agriculture, Office of Scientific Investigation and Technology).

Two years later and with relative order returning to Honduras, questions have arisen such as: 'What impact did the Atlas of Honduras have? How was the digital information used?' The term "impact" is used to collectively indicate a complex set of multi-causal, multi-dimensional outcomes (King and Kraemer 1998). The Atlas of Honduras was expected to have not just a single impact, rather a range of impacts depending on the users, settings, and applications. This study was designed to document how the influx of digital information distributed on the Atlas of Honduras contributed to better decision-making and spurred on digital information use. Also, from a methodological standpoint, this study aimed to further the understanding of how to measure the impact of geographic information. In the past, geographic information products such as CDs typically have been evaluated by relatively simplistic quantitative measures such as 'number of CDs distributed'. However, better measures are needed to assess the overall significance of geographic information.

## Background

Since the late 1980's, there have been calls for more systematic application of social-science research methods for evaluating the use and impact of geographic information systems (Weller 1988; Niemann et. al. 1988). Onsrud and Pinto (1991) stressed the importance of developing effective frameworks for evaluating the utilization of GIS and validating frameworks for assessing the social consequences of utilization. Calkins and Obermeyer (1991) advanced this line of research by developing taxonomy for surveying the use and value of geographic information. Still, after a brief flurry of research discussion on measuring GIS use and impact, only a handful of studies exist in the literature (Nedovic-Budic 1994; Cambell 1994; Nedovic-Budic 1998). Montagu (2000) pointed out that GIS use studies require contextual analysis since a suite of institutional, political, and socio-economic factors can determine the use of geographic information, more so than technical factors. Most of the points of inquiry deal with principles of change, diffusion, innovation, and social impact assessment; typically these are the realm of sociologists and management scientists, rather than geographers and database developers.

With respect to measuring the impact of geographic information specifically on decision-making, the references in the literature are even scarcer than for measuring the use and impact of GIS in general. The United Nations, the countries signing the 1992 Rio Agenda 21, and also the World Bank in its 1998-1999 Annual Report "Knowledge for Development" recognized the importance of geographic information for social and economic development. Geographic information is seen as an essential input, catalyst, and product of change. However, few empirical studies have been conducted to document how geographic information has affected decision-making (Stevens and Thompson 1996; McConnell 1995). Yovits et. al. (1987) defined information in terms of the relationship between information and decision making. In their view, information should be considered by its value when it is actually used in decision-making. Cook and Adams (1999) stated that the value of information is roughly equivalent to the degree of uncertainty it removes.

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[1] Refer to Appendix A for definitions of acronyms.

Given the recognition of the need for systematic social-science research on geographic information use and on the impact of geographic information on decision-making, the development and distribution of the Atlas of Honduras presented an unusual and timely research opportunity. Also, from a project monitoring and evaluation standpoint, this study provided tangible evidence of the value and impact of the investment in the Atlas. Since GIS impact assessment studies are not common, recent studies assessing the impact of the Internet on development (Daly 1999; National Research Council 1998; King and Kraemer 1998; Lefebver and Lefebvre 1996) and the impact of information use in the medical community (Wood et. al. 1995) were consulted.

## Methodology

The use and impact of the Atlas of Honduras were evaluated with a questionnaire and interviews – an empirical component and a descriptive approach. This combined methodology has been recommended for information technology studies (Onsrud et. al. 1992). A first step in both techniques was to obtain a profile of the user. Use is dependent on the level of skill of the user, and thus affects the impact (Swamidass (1994) in (Lefebvre and Lefebvre 1996). Swamidass suggested that there are three types of users: highly skilled users, moderately skilled users, and users with some skills. Similarly, the sector of use has been found a relevant factor. Also, a study on IT by Statistics Canada (1995 in Lefebvre and Lefebvre 1996) demonstrated that the size of the organization in which the user works is also a factor; larger establishments were making greater use of IT applications. Therefore, the study took into account the level of skills of users, the sector in which the user is based, and the size of the organization.

### *Questionnaire*

A structured questionnaire (Appendix B) was used to evaluate the use of the Atlas and included sections on technical aspects to ascertain what improvements could be made to future information products. Fifty-two questions were multiple-choice and nine were open-ended. There were also 6 questions at the beginning to characterize the respondent. The questions were divided into the following categories: (1) Installation, (2) Training, (3) Tools, (4) Data, (5) Use, (6) Operational Impact, (7) Impact on Decision Making, and (8) Evaluation of Data Dissemination by the Honduran Government. The multiple-choice questions relied on either 'yes/no' responses or a ranking according to a Likert-type five-point scale. Before distributing the questionnaires, we conducted an in-house pilot test to improve the questions, modify, add or delete some items, and to obtain an accurate estimate of the time required to complete the questionnaire. Test-respondents found that 10-15 minutes were sufficient for filling out the questionnaire.

During the course of disseminating the Atlas, CIAT compiled a database of 296 people from 246 institutions and government agencies. Prior to giving out a copy the Atlas, CIAT had each Atlas recipient fill out a form. The Atlas recipients in this database were the focus of the evaluation. Given the short time frame for conducting this evaluation, those people without email addresses or fax numbers were not included in the survey. The majority of these people without email addresses or fax numbers were representatives of municipalities, 142 in total. Attempts were made to contact several of the municipal Atlas recipients, but none indicated they had used the Atlas.

One hundred and fifty four questionnaires were sent by email and fax, and people were asked to respond within 3 weeks. We included a cover letter summarizing the Atlas and the purpose of the evaluation. For several institutions, we had more than one person in the database and each received a copy of the questionnaire. This may have helped in removing bias that a single person may have held, but generally, we had one respondent per institution. Ultimately, a total of 135 questionnaires were successfully distributed (90 by email, 41 by fax, and 4 in person). We tried to contact an additional 19 people, but 16 of the email addresses and 3 of the fax numbers no longer functioned. After three weeks, only a few people had returned the questionnaire, so we followed up with phone calls and extended the period for receipt of questionnaires another 3 weeks. In the end, of these 135 successfully distributed questionnaires, 43 were filled out and returned to us (24 by email, 15 by fax, and 4 in person), yielding a 31.9% response rate.

A sub-sample of those users listed in the database was interviewed to evaluate the  impact  of the Atlas. Twenty individuals offered their perspective on the Atlas and on the use of geographic information in decision-making.   This sub-sample represented a range of users, although the majority of the people interviewed were technicians:

- Technicians (12)
- Managers (3)
- Administrators (1)
- Communications Specialists (2)
- Consultants (2)

It was understood that those familiar with the technical and data aspects of the Atlas may not be those who made strategic decisions about project activities and resource allocation, etc.  However, in general, the technicians were the people who could best comment on the Atlas and who also were available for interviews.   These interviews were conducted face-to-face over a six-week period.   The interviewees responded to open questions such as:

- For what specific purposes did/do you use the atlas?
- What difference has the Atlas made to your work?
- Can you estimate the economic impact of using the Atlas?
- What would you have done instead if you had not had the Atlas?

The last question strove to ascertain what the alternatives were in the absence of the Atlas.   This question was asked in order to assess the Atlas's contribution to ameliorating a poor data access environment.

# Questionnaire Results and Discussion

As we mentioned in the prior section, a number of questions were asked about technical aspects, but for the purpose of this report, the analysis focuses on the evaluation of the use and impact of the Atlas.  It also includes a summary of the profile of the questionnaire respondents.

*Profile of Respondents*

For this type of study, it is important to obtain the perspectives of a range of users.  Respondents to the questionnaire belonged to several organizational types.   As shown in Graph 1, 33% were from government offices, 17% from non-governmental organizations, 17% from research institutions, 17% from academia, 9% from technical cooperation agencies, and 7% from private entities.  The majority of these organizations were large, with greater than 50 employees, though smaller organizations, with 1-5 employees and 6-26 employees, were also represented in this survey (Graph 2).  Graph 3 summarizes the sector in which the respondents worked.  Seventy-five percent were from either the natural resources management or agricultural sectors; other sectors were included in the survey to a lesser degree.  CIAT tends to work with institutions in the agricultural and natural resources managements sectors.  Also, the interest in GIS and mapping in Honduras is considerably more prevalent in the natural resources management and agricultural sectors than in health, information management, or infrastructure/facilities management, so it is reasonable that more respondents worked in natural resources management and agriculture.  Also, The respondents occupied a variety of positions, from technicians, consultants, and students, illustrated in Graph 4.  Seventy percent of the respondents considered their knowledge of GIS fair, good, or very good, while 30% indicated that their knowledge of GIS was poor or very poor (Graph 5).  For many of the latter, the Atlas was their first exposure to GIS.

Questionnaire respondents tended to work at the national and international levels considerably more so than the local, municipal or departmental levels (Graph 6).  Use of the Atlas was greater in the capital city of Tegucigalpa where government agencies, non-governmental organizations, universities and the private sector are concentrated.  As with the case of economic sector, there is more interest and awareness in GIS in Honduras by national level institutions.  Also, the distribution of the Atlas questionnaire may have

been a factor. Although CIAT distributed 142 Atlases to municipal representatives, these representatives were not included in the evaluation since we had neither email addresses nor fax numbers for them. Even so, if we had been able to include the municipal representatives in the survey, it is our understanding that few had installed the Atlas onto computers and used it. In a number of cases, the municipal representatives received a copy of the Atlas in error since the offices in which they worked lacked computers (and electricity).

<div align="right">*Atlas Use*</div>

The Atlas of Honduras created equitable access to data. "Without equitable access to GIS data and the technology, small users, local governments, non profit community agencies, and non-mainstream groups are significantly disadvantaged in their capacity to engage in the decision-making process." (Harris et al. 1995). Even though the majority of the questionnaire respondents were from government offices working at the national level, many others from a range of institutions received copies of the Atlas. If any failed to receive a copy of the Atlas, it was an issue of distribution and not intent.

The majority of questionnaire respondents indicated that they used the Atlas on a monthly basis (Graph 7). As a sort of check on the perceived frequency of usage, we also inquired in a different part of the questionnaire as to the level of their use of geographic information in general: 34.9% said they used geographic information frequently, 27.9% said some, and 37.2% said seldom. It appears that many people used the Atlas for discreet projects, and that these projects did not require sustained daily geographic information input. Yet, most of the sample users acknowledged that they expect to use geographic information more in the next five years: 88.1% said frequently, 9.5% some, and only 2.4% said seldom. So, it appears that geographic information will play a more prominent role in the future.

We mentioned earlier that 70% of the questionnaire respondents rated their knowledge of GIS as fair, good, or very good; yet, even though many were familiar with GIS, in particular ArcView, the most commonly used GIS software in Honduras, 90.5% of the sampled users indicated that they used the Atlas interface itself. It would have been possible for them to copy the Atlas data and then use ArcView. However, it appears that people were sufficiently satisfied with the tools, organization, and interface of the Atlas. Only 9.5% said they copied the data.

Respondents were asked which spatial data types they found most useful. Only half of the respondents answered. They identified biophysical and administrative data as most useful (Graph 8). Biophysical data includes soils, watershed boundaries, topography, climate, rivers, and roads. Administrative data includes departmental and municipal boundaries. Other data sets were deemed useful as well, but to a lesser degree. Noting the importance of administrative boundaries, it is worth mentioning that Honduras lacks an official, digital administrative boundary map. GIS users depend on base maps in order to standardize mapping in the country; however, the national mapping agency (IGN) only recently started using GIS. Until an official map is released, unofficial versions such as the one provided on the Atlas, will continue to circulate, and this creates disorder and inconsistency in the GIS community.

<div align="right">*Operational Impact*</div>

Responses to the questionnaire indicate that the Atlas had a substantial impact on institutional uses of geographic information. Overall, 97.7% of the respondents said they thought the Atlas was a useful tool, and 84.8% did not think a better compilation of geographic information existed in Honduras (Graph 9). A majority of users said the Atlas had a positive economic impact on their organization and saved them time. In general, the Atlas improved the presentation and communication of information. Users learned more about natural resources management. They increased their interest in GIS while recognizing a need for more training in how to use the software. Over 75% of the respondents reported that they intended to use GIS more in the future, but less than 25 percent said the Atlas stimulated them to hire a GIS expert, so it seems that people intend to develop their GIS skills. Over 50% of the respondents said the Atlas stimulated them to make contacts with other organizations. Almost half said the Atlas stimulated them to create geographic databases of their own. On an institutional level, the Atlas appeared to have a multiplier effect. It generated greater interest in GIS and natural resources management. Respondents indicated that the geographic information in the Atlas led to efficiencies in communication and presentation of information, and in time and money saved.

In general, most of the respondents considered that digital geographic information is very useful in decision-making. Only 2.5% of the users found the utility of geographic information as only moderate. With respect to the utility of the Atlas specifically, we found that the majority (73%) of the users thought the Atlas helped improve decision-making, and nearly all (94%) of the users said that it saved them considerable time. Also, 70% of the users said the Atlas improved the efficiency as well as the quality of their decisions. 81.1% of the respondents said the Atlas increased their confidence in their analyses. This last impact is significant, since one of the greatest values of information is that it removes uncertainty (Cook and Adams 1999). The impact of the Atlas on decision-making is summarized in Graph 10.

### *State of Data Dissemination by Government*

Survey respondents were asked to rate the state of data dissemination in Honduras by government agencies. This section of questions was included to characterize the data environment into which the Atlas was disseminated. Generally, the respondents' evaluation of data dissemination by government agencies was negative, but not excessively so. Graph 11 summarizes the frequencies scores of the responses: 38.5% rated the availability of spatial data as poor, 29.7% rated the quality of spatial data as poor, 34.3% rated the level of access to spatial data in terms of cost as poor, and 50% rated the level of service provided by government agencies as poor. A comparable amount of respondents rated data availability, data quality, data affordability, and government service as only fair. Overall, respondents were most critical of the level of service provided by government agencies. It appears that data users are most frustrated by the amount of time that it takes to obtain information from government agencies. This problem becomes even more noteworthy if potential data users need information quickly to respond to natural disasters. This highlights one of main objectives of the Atlas of Honduras – to make data easily accessible.

## Interview Results and Discussion

The most significant obstacle faced in this part of the study was the lack or low level of interest of people to be interviewed. Even amongst those who agreed to be interviewed, there were problems in scheduling and carrying out the interviews. In several cases, appointments were canceled or the interviewees were not available at the time they designated. However, with persistence, we were able to conduct 20 interviews and these provided useful insights on the utility of the Atlas. Interviewees were not necessarily decision makers. Below is a list of the most important points that the majority of the interviewees indicated. Also, following these points are examples of how the Atlas was used. Given the range of institutions and types of applications, it is evident that the Atlas had a wide reaching impact.

- All the interviewees considered the Atlas a useful tool in the decision making process. A number of interviewees indicated that they used the Atlas to develop a product, and the product did not necessarily include decision-making, but they recognized, in general, the utility of the Atlas for decision-making.
- Many of the interviewees mentioned that the Atlas was one of a range of tools they applied to their work, so they refrained from saying that the Atlas was a decisive factor in their decisions. They emphasized that the Atlas was an integral part of their analyses, yet its impact on decision-making was indirect.
- A great percentage of the interviewees said the Atlas presented an excellent organization of information, though there were several cases (SINIA, CARE, BIENSA, RESAL) that indicated that there were some discrepancies in the titles of the information with the displayed information. The people who made this comment appeared to be those who used the Atlas most heavily and thus were most familiar with the technical strengths and weaknesses of the tool. We recognize that improvements could be made to the Atlas from a technical standpoint.
- Unanimously, the interviewees agreed that the Atlas saved them considerable time. This was perhaps the most significant impact of the Atlas. Many indicated that this savings in time could be translated into an economic savings as well. However, the interviewees had difficulty in quantifying an economic impact. CONADES indicated that the Atlas was instrumental in improving a proposal of theirs for funding, and, if funded, this could have a significant economic impact for them.

- The interviewees agreed that the Atlas is a user-friendly tool, even for those who have no training in GIS.
- All the persons interviewed expressed their interest and willingness to provide technical support and information in the event that an updated version of the Atlas could be produced. In order to provide information, formal requests for information to the institutions would be necessary. Generally, the interviewees were speaking as individuals rather than for their institutions, but we hope that the production of the Atlas has created a more open environment for information sharing and that the institutions themselves would freely exchange their data.
- Institutions now are more conscious of the value of information and need to share information, and there is more communication between the institutions.

# Specific uses of the Atlas

Panamerican School of Agriculture, Zamorano, Department of Natural Resources had two students from Ecuador who used the Atlas for their theses. One of the theses was an evaluation of landslides in Ojuca.

National Autonomous University of Honduras, UNAH/Graduate School, Agricultural Information Network (Red de Informacion Agricola) has relied on the Atlas for reference material for researchers in agriculture, geography, and vulnerability analysis, as well as work in municipal development. The Agricultural Information Network is an information center in the library, and UNAH is extending this Network to a number of libraries (UNAH-San Pedro, UNAH-La Ceiba, IICA, Zamoranao). Network personnel will train people how to use the Atlas when they visit the library looking for information. UNAH also is incorporating the Atlas into their Masters in Community Forestry program. The Atlas will be used as a tool within the curriculum for the Master's degree.

Honduras Coffee Institute (IHCAFE) carried out a study on agroecological zoning of coffee at the national level using digital map information on administrative boundaries, geology, soils and climate. IHCAFE identified coffee cropping areas based on growing periods, climate and present coffee growing regions. Project officials are refining the methodology for producing a finished product in the near future.

SINIA used information in the Atlas on soils and soil potential for land use planning at the national level. The first phase of this work is to select the themes that will be used for the project and to develop methodology. SINIA will compare the Atlas data with existing information. They will incorporate the Atlas information into their geographic information systems (GIS).

National Commission on Sustainable Development, CONADES used the Atlas for a project proposal called 'National strategy implementation of sustainable development with sustainability indicators (Implementacion de la estrategia Nacional de desarrollo sostenible con criterios e indicadores de sostenibilidad). They wrote a proposal to the European Community, but it was returned with the recommendation that they improve their information. Using the Atlas, they revised their proposal and have now sent it back to the European community. They also used the Atlas to elaborate background profiles for project presentations.

CARE project workers made a socio-economic evaluation of agricultural producers at the national level to focus on the areas for intervention. From this evaluation they were able to identify the Choluteca, the southern part of Francisco Morazon and the south of El Paraiso as areas for potential CARE interventions. They also elaborated "Profiles of Poverty and Subsistence Security."

BIENSA conducted an Environmental Impact Study (EIS) of the Central Highway using information in the Atlas to determine potential impact to soils, forest areas and the environment along the highway route.

GEOCON used the Atlas to aid in the design of a cadastral and socio-demographic geographic information system for San Pedro Sula and Puerto Cortes. Municipal and departmental boundary data and other socioeconomic data were used.

SANAA used the Atlas to create a presentation for a meeting in Estocolmo, Sweden. The presentation showed the damage caused to nation-wide infrastructure (bridges, highways, etc) by Hurricane Mitch.

Information was also used on political divisions, demography, poverty, actual land use, recommended land use, national parks, areas and types of forests.

Sula Valley Executive Commission used satellite images from the Atlas to visualize flooded areas of the Sula Valley. Field validation was conducted because there were areas that were classified as flooded by the satellite imagery, but were not flooded in reality. Also, information on rainfall and temperature were used as reference to verify weather station data produced by the Commission. The Atlas was also used as a source of general information for the study area of the Commission. Most of the decisions that have been taken were for defining where flooding occurred, allowing the commission to determine needs for constructing infrastructure to avoid flooding. However, these decisions were based not only on the information in the Atlas, but derived from information the Commission generated in previous studies.

Independent Consultant used the Atlas for contract work conducted for the Food Security Network (RESAL), World Food Program, FAO, FOPRIDEH, RDS and others.

RESAL used the Atlas to characterize communities according to socioeconomic, biophysical and agricultural data.

Honduran Agricultural Research Foundation incorporated the Atlas into the digital information offerings of their library. Library users searched the information to answer specific questions. More than 10 library users interested in information on soils, watersheds, climate, and administrative boundaries were shown the Atlas.

Honduran Agricultural Research Foundation compared soil analysis results obtained in the laboratory with results reported in the Atlas. They elaborated a technical manual for the crop Rambután. One objective of the project was to give recommendations on fertilization and soil management to Foundation clients. Another objective was to identify and map soils appropriate for the Rambutan crop in the Atlantic coastal zone of Honduras. The Atlas we allowed the Foundation to give better recommendations on fertilizer use and soil management to clients. There were able to identify soils appropriate for Rambutan production.

Honduran Agricultural Research Foundation used the Atlas to make a map of watersheds for locating a reforestation project in the Rio Tocoa and San Pedro watersheds.

Honduran Agricultural Research Foundation used the Atlas in conjunction with the Interamerican Institute for Cooperation in Agriculture (IICA) to make a presentation on the percentage of cultivated areas in Honduras, land use and recommended land use in a recent World Soil Conservation Meeting in Buenos Aires, Argentina.

Catholic Relief Services (CRS) used the Atlas to characterize the socioeconomic situation of the indigenous population of the "Montana de la Flora" in the north of Francisco Morazan. From the Atlas, CRS developed a profile of the socioeconomic situation of the population of the zone, and the soil and forest conditions of the zone. The information served as reference information to begin a project in the zone.

SIG/Esnacifor used the Atlas for thematic map elaboration of the study area of the JICATUYO project. The Atlas was used to make maps for the Forestry Development Project in Esnacifor. Project workers made diverse maps of soils, forest cover, and municipal and departmental boundaries for the "Jicatuyo y el PDF" project.

Rural Areas Administration Project (PAAR) used the Atlas to elaborate 17 municipal atlases in the Olancho department. The municipal atlases used information on administrative divisions, town codes, statistical information, soils, crops, communication lines, road network and rivers. Separately, the administrative division boundaries and codes of the Comayagua department were used in the cadastral digitizing project for rural properties. The objective of the project is to provide each one of the 17 municipal districts with specific information in digital format to be used in decision-making for

organizations and people that work in each district. The objective of the digitizing project is to clarify, together with the National Agrarian Institute, rural land tenure.

OPS/OMS mapped diseases, sources of contamination from water, trash collection, and river water quality.

Student(s) determined of land use potential using the Simmons Soil map; put together a presentation on the relationship between Hurricane Mitch and protected areas.

Population and Housing Census compared 2000 pre-census data with the 1988 census for a cartographic update.

CIDICCO obtained general information about study areas.

PASOLAC obtained general information about soils.

CIAT characterized Jalapa and Luquigue watersheds and related the characterization to soil profiles using ArcView.

ICADE used the information in the Atlas in their GIS project while they developed more precise information.

CEVS made use of the satellite images in the Atlas for a comparison with flood maps of their own.

COHDEFOR used the Atlas for background information for formulation of strategies for micro-watershed management.

SIG_DICTA used the Atlas for locating flooded areas and localizing damage caused by Hurricane Mitch.

IICA used the Atlas to characterize and identified watersheds of the country

CATIE developed analysis and presentation tools using the base information provided in the Atlas.

PROFOR/ESNACIFOR used the soil map of Honduras for determining micro-watersheds.

In response to the question 'What would you have done instead if you had not had the Atlas?' both questionnaire respondents and interviewees responded that they would have gone to the government institutions and requested the information. In other words, the Atlas users recognized that CIAT was not the producer of much of the data; the data already existed in hard copy format, or in some cases digital format. Still, the users recognized the significant value in having the data compiled and in digital format.

## Evaluation/Impact Methodological Issues

Several methodological issues were encountered in undertaking this e valuation/impact assessment. To begin with, the Atlas was distributed to a wide range of users with different needs and skills, so their expectations most likely were different. Yet, we relied upon and compared their relative perceptions. Furthermore, the Likert questionnaire instrument itself yields relative results. It is very difficult to analyze the difference between a 4 and 5 (e.g., a 'good' versus 'very good'). So, we adjusted for this problem by focusing the analysis on the direction of the response values (never or often, poor or excellent), rather than on the actual number given. In other words, when interpreting the questionnaire findings, emphasis was placed primarily on whether respondents agreed or disagreed with the statement/question, rather than placing undue significance on the intensity of the agreement or disagreement.

The small sample size (43) and missing answers precluded the utilization of more sophisticated statistical procedures. We had planned to do a cluster analysis or multiple correspondence analysis, but once missing answers were omitted, we were unable to perform either analysis. We were limited to a difference of means test and frequency analysis. Ideally, we would have been able to characterize

different groups of users and yielded more insights as to why users of the Atlas may have responded the way they did to the questionnaire. For instance, a small percentage of questionnaire respondents said they used the Atlas daily or weekly. It would be useful to know in which sector and type of institution they worked and what kind of position they held.

Some of the organizations using the Atlas, such as IHCAFE, are in the midst of projects. Others, such as CONADES, prepared a proposal, but have not received word on whether it was funded, so it not possible to fully assess the impact of the Atlas. This highlights the issue of the timing of an impact assessment. If assessment occurs too early in the implementation process, then the product being assessed, in this case the Atlas, yet may not have been applied in full to users' needs. If assessment occurs too late, it may vaguely recall the adoption of the product in a general way and underestimate the impact (Onsrud and Pinto 1991). Some mismatch is unavoidable between technology development and social science research. Researchers studying the effects of widespread deployment of a new technology must wait for widespread deployment to occur. By that time, however, the technology is no longer new (King and Kraemer 1998). For this reason, responses to the Atlas of Honduras questionnaire and interviews may only partially depict the value and impact of the product. This study evaluated a short-term impact, rather than the longer-term consequences of having geographic information on-hand and having institutions integrate the information into their regular activities. In the near future, CIAT is planning to provide the Atlas via the Internet, thereby extending the impact of the Atlas. Also, the USAID/USGS-sponsored Geographic Information Center in Honduras (Centro de Informacion Geografica at UNITEC) has asked if they can make more copies of the Atlas and continue to freely distribute it. So, the impact of the Atlas is likely to continue, and an impact assessment at this time will not capture expected, future benefits.

The Atlas was introduced at a time when the use of digital data in Honduras was new. Daly (1999) questions how one measures the impact of a technology when it is introduced into a setting in which exposure to technology, in general, is relatively minimal and, perhaps, naïve. The 'newness' of GIS did not appear to be a significant factor in this study. Atlas users readily grasped the benefits of the technology and applied the technology to their work. On the whole, the responses to the Atlas and GIS in general are very positive. Still, further analysis is needed focusing on the less supportive responses.

Though the questionnaire responses were very positive as to the impacts of the Atlas, many of the interviewees indicated that impacts were not necessarily direct. With information and information systems, it is widely acknowledged that the benefits are indirect and thus difficult to measure quantitatively. We found this was particularly the case with the 'economic benefit' question we asked. Interviewees were not able to quantify an economic impact, but they were confident that since the Atlas saved them considerable time, that the Atlas had an economic impact.

Impacts can occur at several levels: the individual, organizational, or sectoral. To some extent, it may be easier to assess the impact of the Atlas on individual users. Yet the cumulative impact on an organization is probably greater than the sum of the impacts on individual users (National Research Council 1998). Similarly, the impact on a sector may be greater than the sum of the impacts on the organizations in the sector. Many organizations in Honduras are in the process of changing structure and processes to take advantage of geographic information technology. That is not to say that the Atlas of Honduras is responsible, but the Atlas may have contributed to the awareness of the potential of GIS. It is a challenge to assess the extent to which the Atlas contributed at the organizational and sectoral levels. In some cases, institutions hired new personnel (9 institutions), entered into new inter-institutional agreements, and wrote project proposals with GIS as an integral component. Institutions and sectors are changing how they operate and interact. However, the Atlas, alone, cannot take credit; it contributed. Better methods are needed to measure the *extent* of geographic information utilization in an organization over time. In other words, to what extent is use of geographic information part of an organization's overall, long-term activities and goals and not just a quick fix for a single issue? Similarly, the *level of use* according to the organizational structure and the *forms* of decision-making utilizing GIS/GIS products should be tracked.

# Lessons Learned / Suggestions for a second versions of the Atlas

Both the questionnaire results and the interviewee comments demonstrate that there is great support and interest in the use of geographic information for disaster management and agriculture and resource management in Honduras. The creation of the Atlas clearly was an important development investment. Still, having systematically evaluated the impact of the Atlas, we are aware of several factors that could influence greater use of the Atlas or a similar product in the future. These areas include: (1) distribution of the Atlas, (2) institutionalization of the Atlas, (3) local attitudes towards obstacles, and (4) technical improvements to the Atlas.

*Distribution of the Atlas*

The Atlas may have been unevenly distributed towards people in the natural resources field, thereby excluding other potential users in areas such as economic development, urban planning, health who might have benefited from the Atlas. Also, the distribution of the Atlas was highly centralized in the capital of the country, potentially neglecting distribution to important regions such as San Pedro Sula. In some cases, the distribution of the Atlas may have been at a managerial level and not at the level of execution. In other words, the people provided with the Atlas were not necessarily the people who worked directly with geographical information. This could have resulted in copies of the Atlases being mislaid in some bureaucratic drawer. For example, we are aware that two copies of the Atlas had been given to the national mapping agency (IGN), and a CIAT staff member personally saw the Atlas in a filing cabinet at IGN. However, when we conducted this evaluation and inquired whether IGN had a copy of the Atlas, IGN's initial response was "No."

The Atlas was distributed by different organizations, not only by CIAT. CIAT was responsible for distributing only a fraction of the CDs produced. We have no record of what was done by the other Atlas collaborators. In other words, distribution was not coordinated and was done without interaction of those distributing the product. Several Atlas recipients mentioned that they did not receive a copy of the Atlas handbook, so this may have been an oversight as well. Other institutions distributing the Atlas may not have distributed copies of the handbook. To some extent, this may have limited users from using the CD to its full capacity. Those people whole did not receive a copy of the handbook felt it was difficult to obtain technical support.

*Institutionalization of Atlas*

It is important to monitor the "institutionalization" of the Atlas. We tried to quantify how many CDs had been "institutionalized" by being copied onto a hard drive and included into the GIS of the institution: 74.4% of the sampled Atlas users installed the Atlas onto their hard disk, and 25.6% did not. Several of the interviewees mentioned that they installed the Atlas on their computers at home. We also asked whether the colleagues of the Atlas users knew that the Atlas had been installed on the office computers: 80.5% said "Yes" and 19.5% said "No". Generally, these results would lead one to believe that the Atlas had been 'institutionalized'. However, these numbers do not reflect the "non-respondents" of the questionnaire. We suspect that many of the non-respondents received a copy of the Atlas, but then did not use it. Or, they may have looked at it briefly, but then did not install it onto their computers. The question now is figuring out why not. The institutionalization of the Atlas is perhaps as important as evaluating the impact of the Atlas, particularly because there is a high staff turnover rate in Honduras. In a number of cases, the Atlas may have stayed with individuals, not institutions. A few Atlas users mentioned that they trained other people, but as staff members leave an institution, even if they leave the CD behind, new staff members do not then make use of it. Ideally the Atlas would be listed in a data inventory by an institution and new people could know of its existence.

The atlas itself was not viewed as such an important thing that the institutions went out of their way to institutionalize it. Maybe CIAT should have produced an appealing poster to remind people that Atlas existed, and the poster would have been put up on the walls in the offices of potential Atlas users. Institutionalization (and distribution) is best when an institution has someone who really understands the utility of the Atlas and sees it as part of his/her job to encourage more people to use it. FIHA has the Atlas in their library, and the librarian is in charge of distributing the Atlas to people within the institution. It seems librarians should receive copies of CD, not just GIS technicians, since librarians have the mindset to share and pass on information. Technicians tend to be far more individualistic.

In some cases, the local attitude towards obstacles may have limited the use of the Atlas. We recognize that this is a broad generalization, but a person's mindset towards problems can influence their receptiveness and patience. We suspect that most people who received the Atlas liked it initially, but if they had any difficulties with it, they put it aside without seeking help. People need to have the cultural mindset to look for help, or the GIS product developers need to provide help so liberally that anyone who needs help has ample opportunities to receive it. 20.9% of the questionnaire respondents said installation instructions were not clear, 21.6% said the manual was not sufficient, and 76.7% said a training session would have been useful. However, 66.7% acknowledged that dd not use the tutorial provided on the CD, and, over two years, CIAT received only a handful of email messages or phone calls asking for guidance.

That being said, we agree that it would have been best if each recipient of the Atlas also participated in a training session. A number of Atlas users lacked sufficient explanation of the tools and how to manipulate the information. However, as with many projects, the output was the Atlas. The budget did not include follow-up time of a staff member, over a two-year period, to give presentations, training, and be on-hand to answer questions. For future data products, ideally someone would contact each product user several weeks or months after receiving the product to inquire how he or she is managing.

*Technical aspects*

Several suggestions were made with respect to technical aspects that could be improved or included in an updated version. The most common were:

- Include contact information (electronic addresses) to the institutions who produced the data and include metadata (information about the data)
- Update of the information [12.3% said the date of the data was insufficient]
- Provide technical support (in particular, a point of contact for questions, not just a manual).
- Provide larger scale data for local-scale users. [Generally, questionnaire respondents thought the scale of the data was adequate, however a small percentage (10.3%) indicated that the scale was not sufficient].
- Standardize the information. For example, several people pointed out that the base maps present on the Atlas had many differences with base maps of other institutions.

# Conclusion

The principal objective of this study was to evaluate the degree of usefulness of the digital geographical Atlas in the process of decision making in carrying out different projects dealing with development. In order to do so, the project was divided in to two parts: a) questionnaires and b) interviews. The questionnaires sought to obtain the statistical aspect, as well as to cover the technical aspects of the Atlas, while the interviews sought to provide the analysis with specific details of use of the Atlas. The Atlas had a very positive impact on decision-making largely due to the fact that Atlas users were able to obtain information pertinent to their work. In many cases, the information in the Atlas indirectly supported decision-making. Some of the users interviewed mentioned technical errors in the Atlas, but overall, the majority of users noted the utility of the Atlas and recognized the value of having a diverse set of information compiled onto a single compact disk. Technicians, analysts, and decision-makers alike perceived the Atlas as a useful tool. Tracking the precise pathway from information use to development impact needs to be carried out in future studies, if possible.

The dissemination of the Atlas could have been more carefully planned and carried out. Distribution of the Atlas may have been overly concentrated in the natural resources and agricultural sectors, though admittedly, these are the sectors in which CIAT focuses. Users were also concentrated in the capital city, potentially neglecting other areas that could have benefited from the information contained in the Atlas. It is possible that the Atlas could have had a greater effect had there been more publicity about what the Atlas contained, how to obtain a copy, and the possibilities for successful use. Also, regular training sessions, every few months for new users, would have further improved the use and impact of the Atlas.

The Atlas is one of a number of information sources for development applications. Honduras and Central America as a whole are dealing with a new era of digitized data, and now much more information is available, not just digital geographic data. Most institutions are facing the need for institutional change, and the availability of information is a significant part of that. Now that more information is available, new opportunities exist for bringing information to the cause of development. This is just a beginning.

Ironically, Hurricane Mitch may have done more to promote the use of geographic information for sustainable development more so than any government program or standard development project. Would the information contained in the Atlas have had the same level of dissemination and use without the natural disaster? Without Hurricane Mitch, perhaps much of the Atlas information would have been narrowly used and adopted only on a limited basis. While much of the Atlas use was directed to Mitch relief and response, about half of those interviewed in the survey cited uses unrelated to disaster management. Ideally, an updated version of the Atlas will be made, funding permitting, taking into account the suggestions from this evaluation and new data. Those government agencies with information technology and GIS capacity are capable of making a substantial improvement to this first version of the Atlas, and CIAT would welcome the opportunity to assist. Considerable political will and leadership will be required to continue bringing geographic information to bear on problems of hazard response, planning, and sustainable development in general, and hopefully, the uniting force of Hurricane Mitch for information sharing will endure.

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# APPENDIX A: DEFINITION OF ACRONYMS

**GIS: Geographic Information Systems**

**IT: Information Technology**

**Institutions (Data Providers)**
COHDEFOR: Honduran Corporation for the Forestry Development
DGEC: Direccion General de Estadisticas y Censo
FHIS: Fondo Hondureño de Inveresión Socila
MEP: Ministerio de Educacion Publica
MSP: Ministerio de Salud Pública
SAG: Secretaria de Agricultura
SECPLAN: Secretaria de Planificacion
SETCO, Secretaria Tecnica de Cooperacion Interanacional
SOPTRAVI: Secretaria de Obras Publicas Transporte y Vivienda

**Institutions (Atlas Users)**
BEINSA: Betancourt e Ingenieros S.A.
CARE: Comite Americano de Remesas al Exterior
CATIE: Centro Agronomico
CIDICCO: Centro Internacional de Informacion sobre cultivos de cobertura
COHDEFOR: Honduran Corporation for the Forestry Development
CONADES: National Commission on Sustainable Development,
CRS:Catholic Relief Services
FHIA: Honduran Foundation for Agriculture Ressearch
GEOCON: Geodesia consultores
ICADE: Instituto de capacitacion para el desarrollo Empresarial
IHCAFE Honduras Coffee Institute:
IICA: Interamerican Institute for the Agricultural Cooperation
OPS/OMS: Panamerican Health Organization/World wide Health Organization
PAAR:  Rural Areas Administration Project
PROFOR/ESNACIFOR: Forestry project of the National School of Forestry sciences
PASOLAC: Programa de Agricultura Sostenible de Laderas para Centro América
RESAL: Food Security Network
SAG: Secretariat of Agriculture
SANAA: Service National de Aqueducts and Alcantarillados
SIG_DICTA: Geographic Information System of the Direction of Science and Technology Agropecuaria.
SIG/Esnacifor: Geographic Information System of the National School of Forestry Sciences.
SINIA: National System of Environmental Information
CEVS: Sula Valley Executive Commission.
UNAH National Autonomous University of Honduras, UNAH/Graduate School
Zamorano: Panamerican School of Agriculture, Department of Natural Resources

# APPENDIX B: EVALUACION DEL ATLAS DE HONDURAS

**Instrucciones:** La respuesta de este cuestionario no le tomará mas de 15 minutos. Por favor envíe el cuestionario antes del **31 de octubre** a: mmendez@optinet.hn  Si no puede enviarlo por e-mail, puede enviarlo a: CIAT-Laderas Edificio Palmira 2do. Piso. Frente al Hotel Honduras Maya P.O. Box 1410, Tegucigalpa, Honduras o por fax a: (504) 239 1443.

**Nota:** Cuando nos referimos al Atlas nosotros nos referimos tanto a la interface como a los datos. Por lo tanto, si Ud. solo usa los datos eso se considera como haber utilizado el Atlas.

**PERFIL DE USUARIO**

1.  ¿ A cuál organización pertenece usted ? _____

2.  Seleccione el tipo de organización a la que pertenece:

    Gubernamental____ ONG ____ Investigación ____ Académica _____ Privada _____ Donante _____

    Otro (especifique) _____

3.  ¿ A qué nivel opera su organización ? Marque una o mas

    Local_____    Municipal_____    Departamental_____    Nacional_____    Internacional_____

4.  ¿Cuantas personas trabajan en su organización? _____

5.  Descríbase usted mismo:

| Marque con una "X" | Tipo de posición que usted maneja Si la posición que usted maneja no esta en las siguientes opciones, por favor especifíquela usted. | Marque una o mas con una "X" | ¿ En qué sector trabaja usted ? (¿ En qué sector usó el Atlas?) |
|---|---|---|---|
| | Técnico en SIG (Sector público) | | Agricultura |
| | Técnico SIG (Sector privado) | | Distribución de Semillas |
| | Técnico SIG (ONG) | | Manejo de Recursos Naturales |
| | Gerente (Sector público) | | Infraestructura/Planeación |
| | Gerente (Sector privado) | | Manejo de desastres |
| | Gerente (ONG) | | Ciencias del Suelo |
| | Facultad Universitaria | | Forestal |
| | Estudiante | | Geología |
| | Investigador | | Hidrología |
| | Consultor | | Antropología |
| | Donante/Asesor | | Economía |
| | Donante/Asistente Técnico | | Investigación en Salud |
| | Otro (especifique): | | Salud Pública |
| | | | Mapeo |
| | | | Industria |
| | | | Conservación de Recursos Naturales |
| | | | Manejo de Información |
| | | | Regulación Ambiental |
| | | | Otro (especifique): |

6.  ¿ Cuantas veces ha usado usted el Atlas ? )_____

    (a) Diario, (b)Semanal, (c) Quincenal, (d) Mensual

7. Por favor, proporcione un ejemplo lo mas concreto posible de como ha usado Ud. el Atlas y los datos digitales (identifique la aplicación y los datos utilizados).

8. ¿ Que hubiera hecho usted si no hubiera tenido el Atlas para resolver el problema mencionado en la pregunta anterior?

**Para cada categoría, escriba su respuesta en la última columna en una escala de 1 (muy pobre) a 5 (muy bueno) o la opción si / no, según corresponda.**

| ACTIVIDAD | Calificación (1 a 5) | | Su Respuesta |
|---|---|---|---|
| **Instalación del CD** | Muy pobre | Muy bueno | |
| 9.  ¿ Fueron claras las instrucciones para la instalación? | 1    2    3    4    5 | | _____ |
| 10.  ¿ Quedó instalado correctamente? | 1    2    3    4    5 | | _____ |
| 11.  ¿ Instaló usted el atlas en el disco duro de una computadora de su institución? | Si / No | | _____ |
| 12. ¿ Saben sus demás compañeros de trabajo que el atlas está instalado en una computadora de la oficina y que pueden utilizarlo? | Si / No | | _____ |
| Comentarios: | | | |
| **Entrenamiento** | Muy pobre | Muy bueno | |
| 13.  ¿ Qué conocimiento de SIG  tenía Ud. antes de usar el Atlas? | 1    2    3    4    5 | | _____ |
| 14.  ¿ Qué conocimiento de cómputo tenía antes de usar el Atlas? | 1    2    3    4    5 | | _____ |
| 15.  ¿ Fue suficiente con el manual? | 1    2    3    4    5 | | _____ |
| 16.  ¿ Usó el tutorial del Atlas del CD? | Si  /  No | | _____ |
| 17.  ¿ Habría sido útil una sesión personal de entrenamiento sobre el Atlas? | Si  /  No | | _____ |
| 18.  ¿ Qué tipo de entrenamiento está interesado en recibir ahora?   SIG Básico  SIG avanzado  Análisis Espacial (métodos/estadísticas)  Manejo de Recursos Naturales  Otro (especifique) | Si  /  No  Si  /  No  Si  /  No  Si  /  No | | _____  _____  _____  _____ |

| Uso de la interfase SIG | | |
|---|---|---|
| | **Muy pobre      Muy bueno** | |
| 19.   ¿ Es el Atlas fácil de usar? ( ¿Es fácil navegar a través de él?) | 1     2     3     4     5 | _____ |
| 20.   ¿ Qué tan bien funcionan los menús en el uso del Atlas? | 1     2     3     4     5 | _____ |
| 21.   ¿ Usó usted la interfase o manejó los datos con ArcView? | Interface / Arcview | _____ |
| 22.   ¿ Qué aspectos pueden mejorarse?  Por favor, especifique | | |

| Herramientas | | |
|---|---|---|
| | **Muy pobre      Muy bueno** | |
| 23.   ¿ Las herramientas operaciones existentes cubren sus necesidades? | 1     2     3     4     5 | _____ |
| 24.   ¿ Cuáles herramientas operaciones usa usted? | | |
| Ver mapas | Si  /  No | _____ |
| Ver tablas | Si  /  No | _____ |
| Ver gráficas | Si  /  No | _____ |
| Imprimir | Si  /  No | _____ |
| 25.   ¿ Qué herramientas adicionales podrían ser útiles? Por favor, especifique | | |

| Datos | | |
|---|---|---|
| | **Muy pobre      Muy bueno** | |
| 26.   ¿ Considera Ud. que los datos del atlas son correctos? | 1     2     3     4     5 | _____ |
| 27.   Si no lo son, ¿Cuáles datos en particular no son correctos y por qué? | | |
| 28.   ¿ Fueron suficientes los metadatos (documentación de los datos)[1] ? | 1     2     3     4     5 | _____ |
| 29.   ¿ La escala de los datos satisfizo sus necesidades o requerimientos? | 1     2     3     4     5 | _____ |
| 30.   ¿ Entiende Ud. las consecuencias del uso de los datos a una escala inapropiada? | 1     2     3     4     5 | _____ |
| 31.   ¿ La fecha de los datos llena sus necesidades o requerimientos? ( ¿Los considera suficientemente actualizados? ) | 1     2     3     4     5 | _____ |
| 32.   ¿ Ha corregido o alterado algún dato? | Si / No | _____ |
| 33.   ¿ Que datos considera Ud. que son los mas utilizados? Por favor, especifique | | |
| 34.   ¿ Qué datos adicionales serían útiles también? Por favor, especifique | | |

---

[1] Los metadatos indexan los datos, los describen, dicen cual es su origen, cual es su contenido, su escala, etc. No son los datos en si mismos, pero ayudan al usuario a entender mejor la información que maneja.

| | Calificación ( 1 a 5) | Su Respuesta |
|---|---|---|
| 35. ¿ Existe una mejor fuente de datos digitales compilados para Honduras que el Atlas? | Si / No | _____ |
| 36. ¿ Hay otros datos digitales que sean mejores que los incluidos en el Atlas? | Si / No | _____ |
| 37. ¿ Qué otras fuentes hay de información digital? | | |
| *Si Ud. tiene mas comentarios sobre problemas que haya visto en los datos, por favor inclúyalos al final de este formulario. | | |

| **Uso** | **Calificación ( 1 a 5)** | **Su Respuesta** |
|---|---|---|
| 38. ¿ Desde cuando ha usado el Atlas ? | ¿Cuál mes y año? | _____ |
| 39. ¿ Actualmente, que tan frecuentemente usted utiliza la información geográfica ? | Nunca      Frecuentemente<br>1   2   3   4   5 | _____ |
| 40. ¿ De acuerdo a sus expectativas de los próximos cinco años, que tan frecuentemente piensa que su organización va usar o va a necesitar la información geográfica ? | 1   2   3   4   5 | _____ |
| 41. ¿ Cómo caracterizaría Ud. el uso que hace del Atlas ? Marque uno o mas<br><br>(a) Ver mapas,      (b) Comparación de información,<br>(c) Análisis de datos,      (d) Toma de decisiones<br>(e) Crear Mapas para reportes | a   b   c   d   e | _____ |

| **Impacto operacional** | **Muy poco      Mucho** | |
|---|---|---|
| 42. ¿ Incrementó el impacto del Huracán Mitch su interés en utilizar información geográfica? | 1   2   3   4   5 | _____ |
| 43. ¿ Considera Ud. que el Atlas es una herramienta útil ? | 1   2   3   4   5 | _____ |
| 44. ¿ Tener toda la información de Honduras en un solo CD le ha ayudado a ahorrar tiempo en su trabajo ? ¿ Como ? | 1   2   3   4   5 | _____ |
| 45. ¿ Ha implicado este tiempo ahorrado algún impacto económico en su Organización? | 1   2   3   4   5 | _____ |
| 46. ¿ Mejoró el Atlas la comunicación de información en su organización? | 1   2   3   4   5 | _____ |
| 47. ¿ Mejoró el uso del Atlas la presentación de la información en su organización? | 1   2   3   4   5 | _____ |
| 48. ¿ La información contenida en este CD le ha ayudado a generar nuevas ideas para mejorar su trabajo ? | 1   2   3   4   5 | _____ |
| 49. ¿ Lo estimuló el Atlas para usar más los datos digitales? | 1   2   3   4   5 | _____ |
| 50. ¿ Lo estimuló el Atlas para crear y desarrollar su propia base de datos digitales? | 1   2   3   4   5 | _____ |
| 51. ¿ Le motivó el Atlas para interrelacionarse con otras organizaciones? | Si / No | _____ |

| | | |
|---|---|---|
| 52   ¿ Que organizaciones? | | |
| 53.   ¿ Antes del Atlas, ha tenido Ud. dificultad en obtener datos de otras instituciones? | Si / No | _____ |
| 54.   ¿ Al usar el Atlas descubrió usted que necesitaba mayor entrenamiento en esta área ? | Si / No | _____ |
| 55.   ¿ Lo estimuló el Atlas a contratar personal capacitado para manejar el sistema de información de su organización ? | Si / No | _____ |

**Impacto en la toma de decisiones**

Muy poco          Mucho

| | | |
|---|---|---|
| 56.   ¿ La información digital contenida en el Atlas de alguna manera le ayudo a mejorar: | | |
| (a)   la calidad de la toma de decisiones | 1     2     3     4     5 | _____ |
| (b)   la eficiencia en la toma de decisiones (ahorro tiempo, dinero, personal) | 1     2     3     4     5 | _____ |
| (c)   mejoró en general el proceso de la toma de decisiones | 1     2     3     4     5 | _____ |
| 57.   ¿ Cual fue el impacto que tuvo el Atlas en el factor  tiempo dentro del proceso de la toma de decisiones ? (Seleccione una opción.) | | |
| (a)   utilizó mas tiempo | | |
| (b)   utilizó el mismo tiempo | a     b     c | _____ |
| (c)   utilizó menos tiempo | | |
| 58.   ¿ Considera Ud. que la confiabilidad en sus análisis se incrementó gracias al uso de la información geográfica ? | 1     2     3     4     5 | _____ |
| 59.   ¿ Ha oído la frase "infraestructura nacional de datos espaciales" (INDE)? | Si / No | _____ |
| 60.   En general, ¿Son útiles los datos digitales en la toma de decisiones? | 1     2     3     4     5 | _____ |
| 61.   ¿ El usar el Atlas le permitió aprender mas sobre el manejo de recursos naturales ? | 1     2     3     4     5 | _____ |
| 62.   ¿ Sería de algún valor producir la versión II del Atlas? | Si / No | _____ |
| 63.   ¿ Estaría Ud. interesado en participar en el desarrollo de la versión II del Atlas ?  Si si, ¿ Cómo lo haría ? | Si / No | _____ |

**Evaluando el servicio de diseminación del gobierno de Honduras**

Muy pobre     Muy bueno

| | | |
|---|---|---|
| 64.   ¿ En general, como evaluaría Ud. la accesibilidad de la información geográfica digital proveída por las agencias gubernamentale s en Honduras ? | 1     2     3     4     5 | _____ |
| 65.   ¿ Como evaluaría Ud. la calidad de la información geográfica digital proveída por las agencias gubernamentales en Honduras ? | 1     2     3     4     5 | _____ |
| 66.   ¿ Como evaluaría el nivel del servicio de entrega de la información por  parte de las instituciones gubernamentales de Honduras ? | 1     2     3     4     5 | _____ |
| 67.   ¿ Como evaluaría el nivel de acceso de la información geográfica digital, en términos del costo económico que ello representa, que las instituciones gubernamentales de Honduras proveen ? | 1     2     3     4     5 | _____ |
| 68.   ¿ En términos generales, como evaluaría Ud. su satisfacción en cuanto a la disponibilidad de la información geográfica digital proveída por las instituciones gubernamentales de Honduras ? | 1     2     3     4     5 | _____ |

Comentarios adicionales/problemas/sugerencias

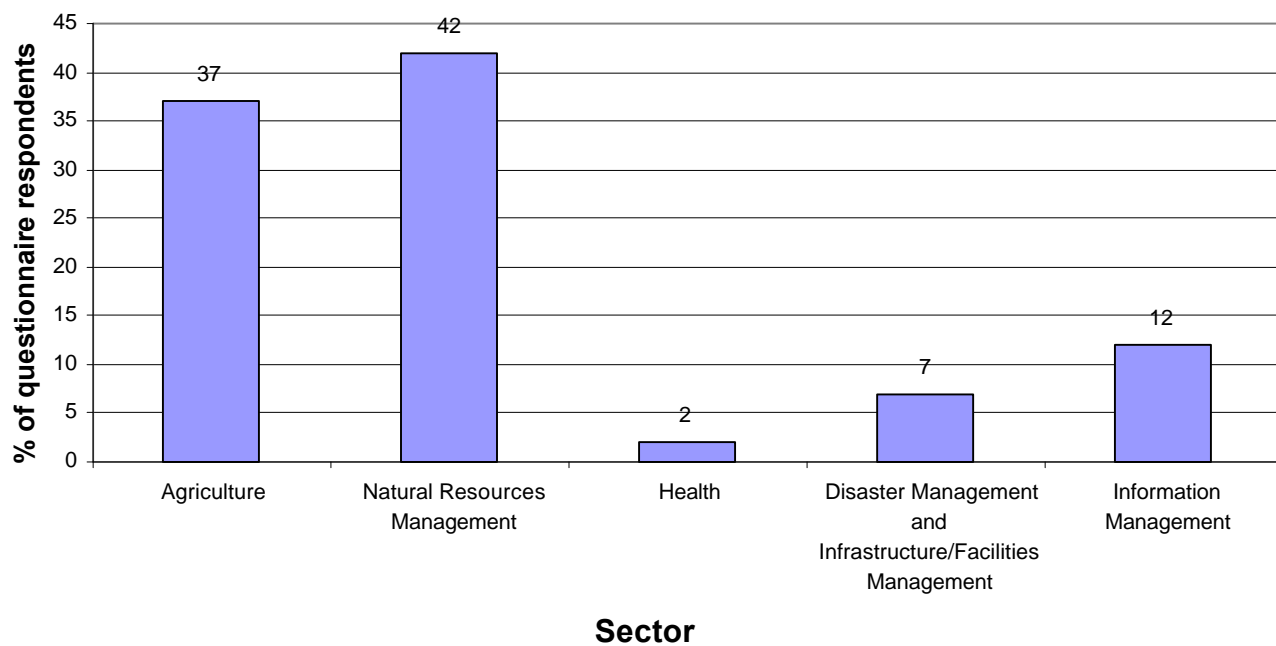# Types of organizations in which Atlas users work
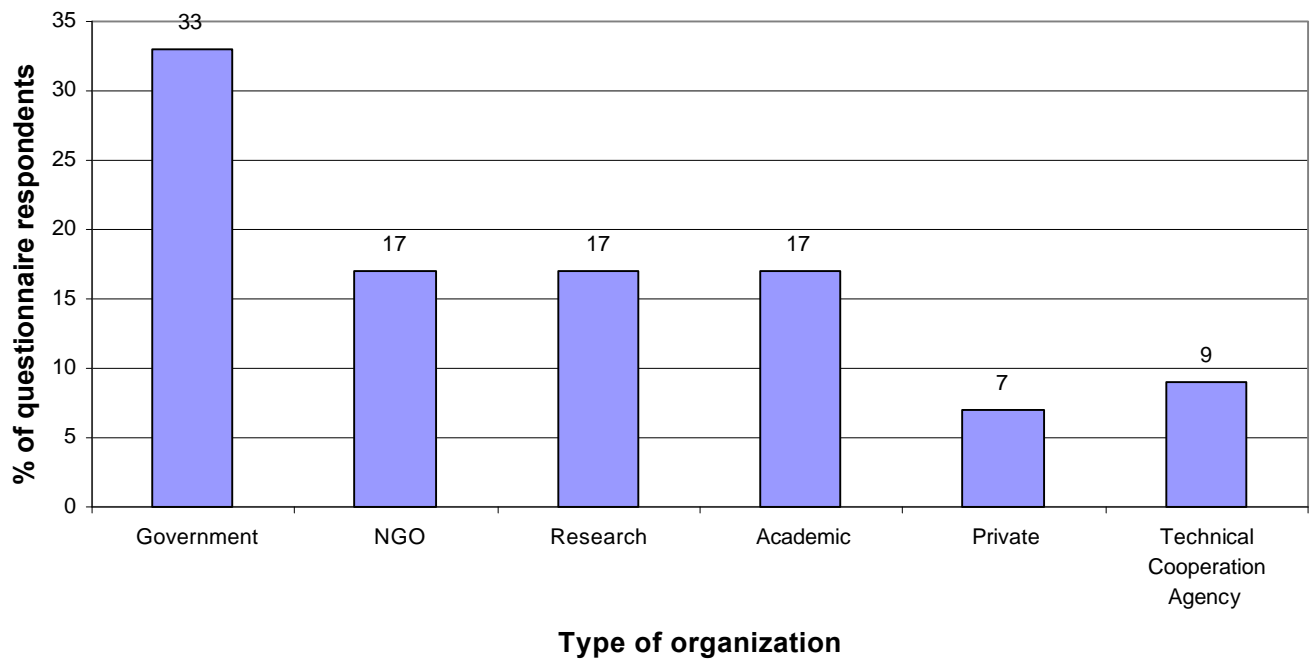


**Graph 1.** Percent questionnaire respondents by organization type.
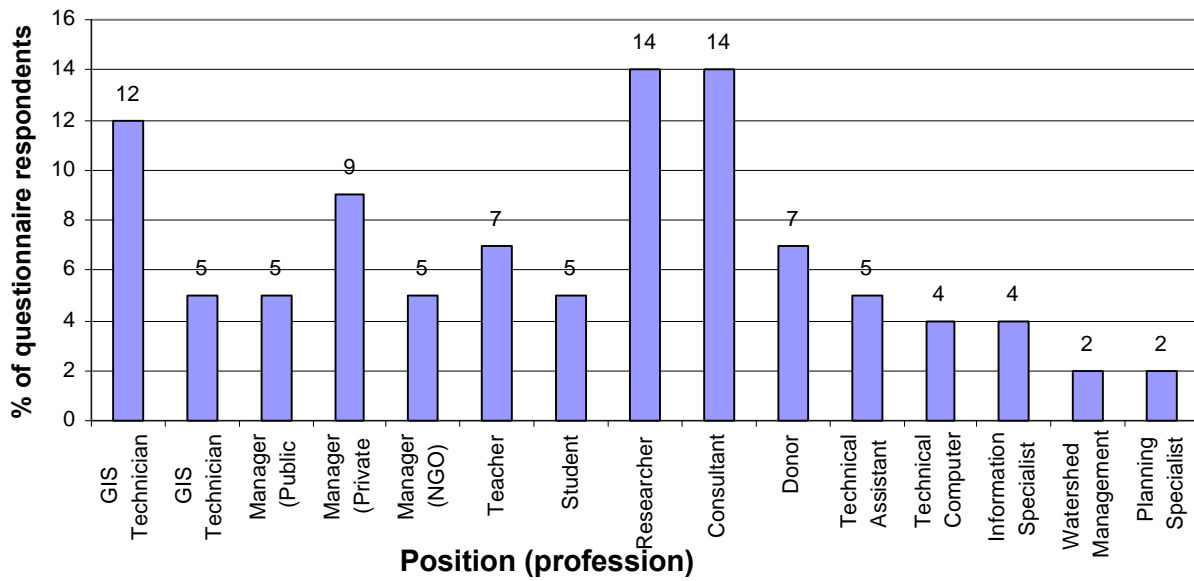
# Size of organizations in which Atlas users work
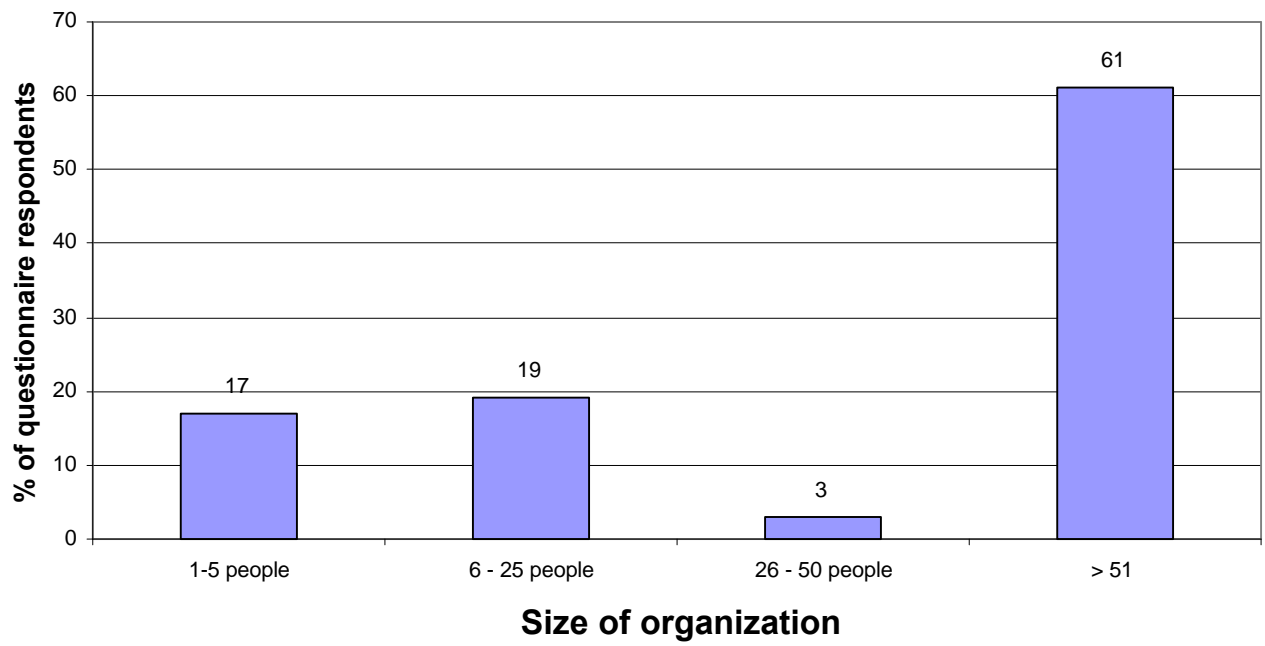


**Graph 2.** Percent questionnaire respondents by size of organization.
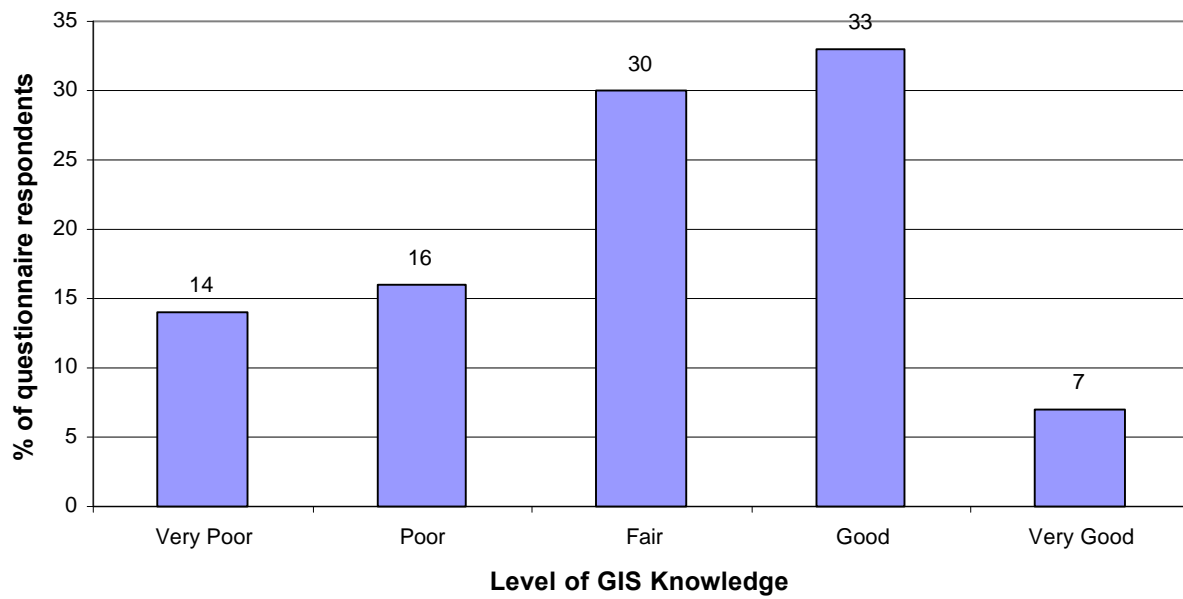
## Sector in which Atlas users work



**Graph 3.** Percent questionnaire respondents by sector.

**Types of positions Atlas users held**
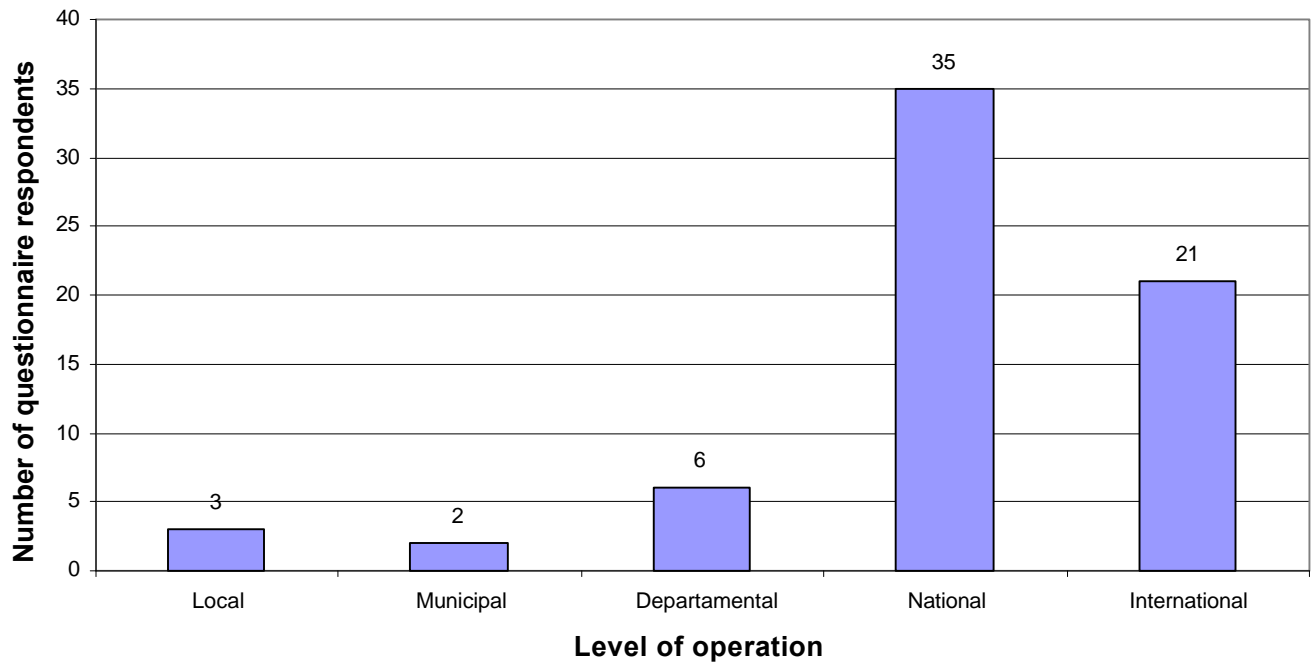


**Graph 4**.   Percent questionnaire respondents by position held (profession).

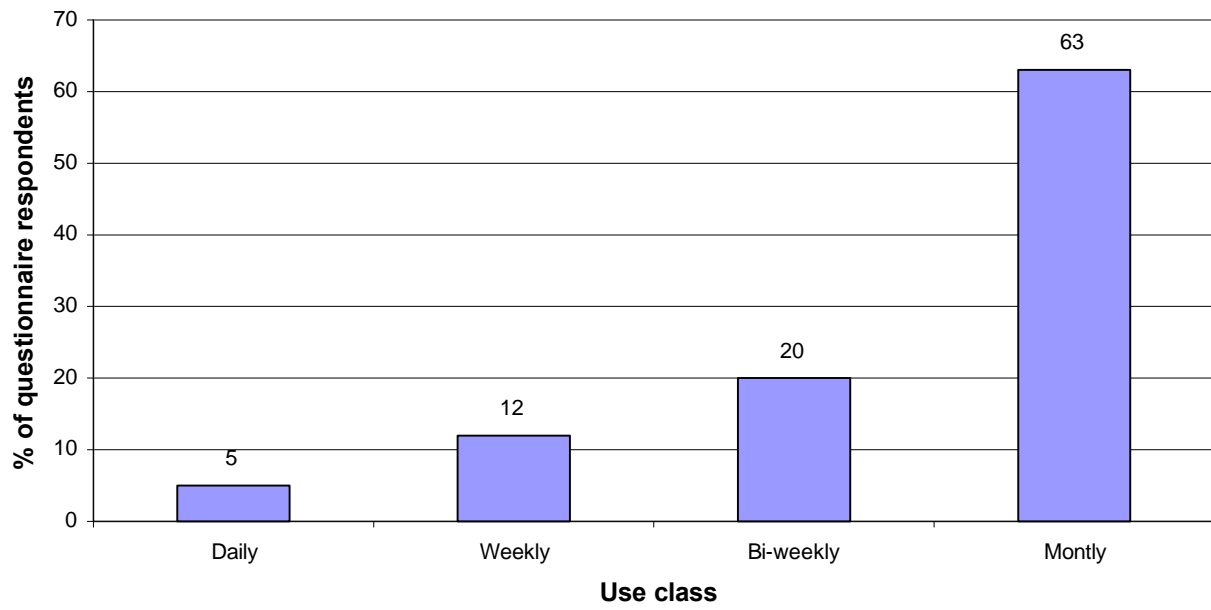## Atlas users' perceived level of GIS knowledge



**Graph 5.** Percent questionnaire respondents by level of GIS knowledge.

## Operational level of organizations in which Atlas users work
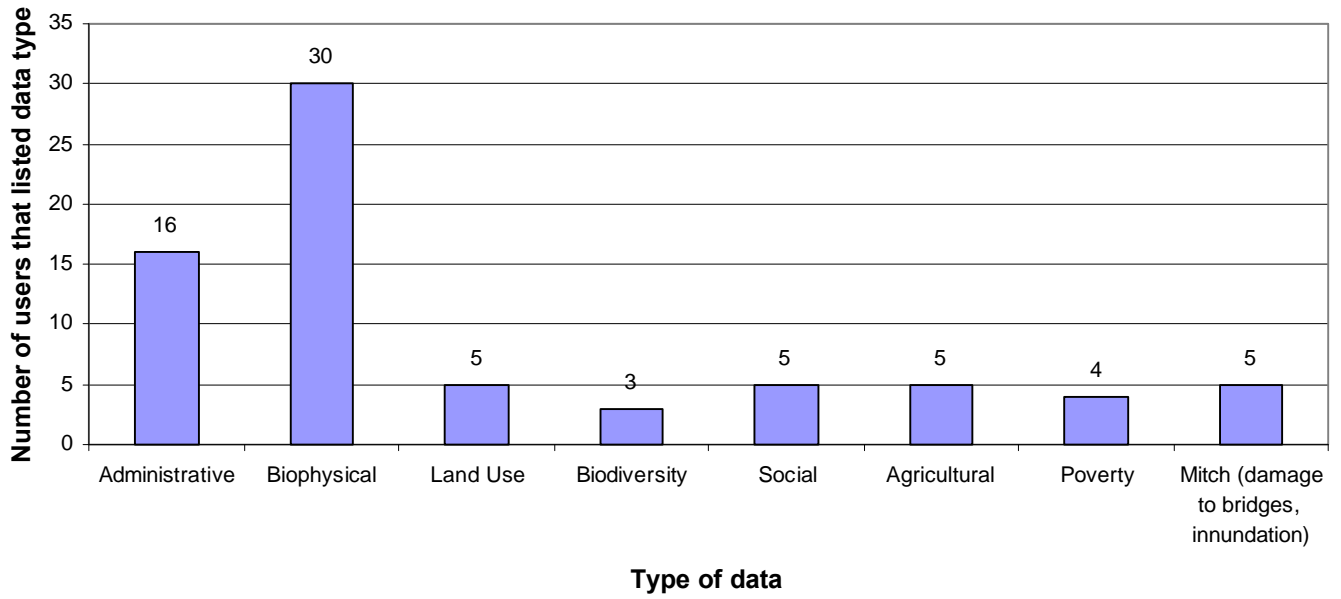


**Graph 6.** Percent questionnaire respondents by operational level of organization.
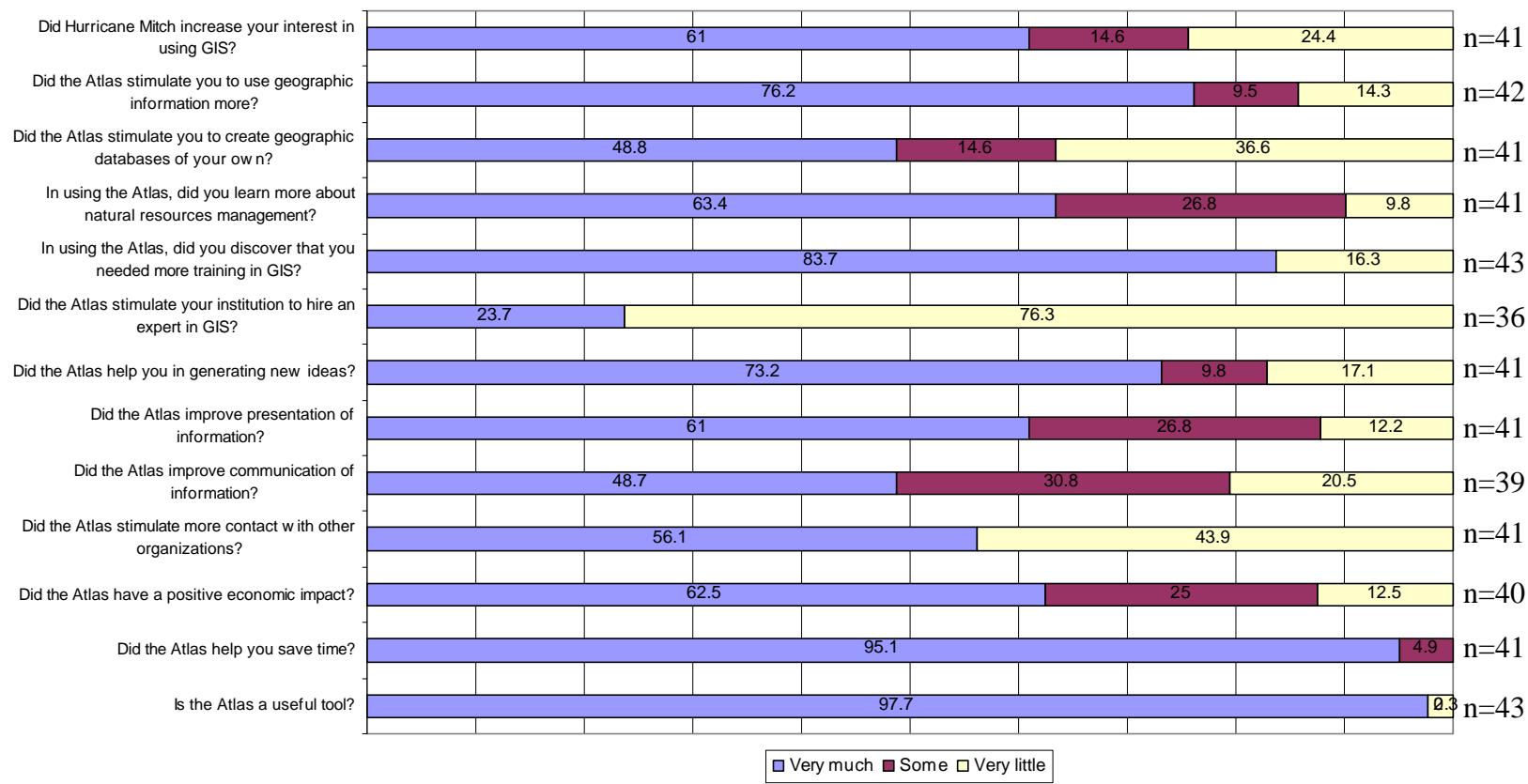
**Frequency of use of Atlas**



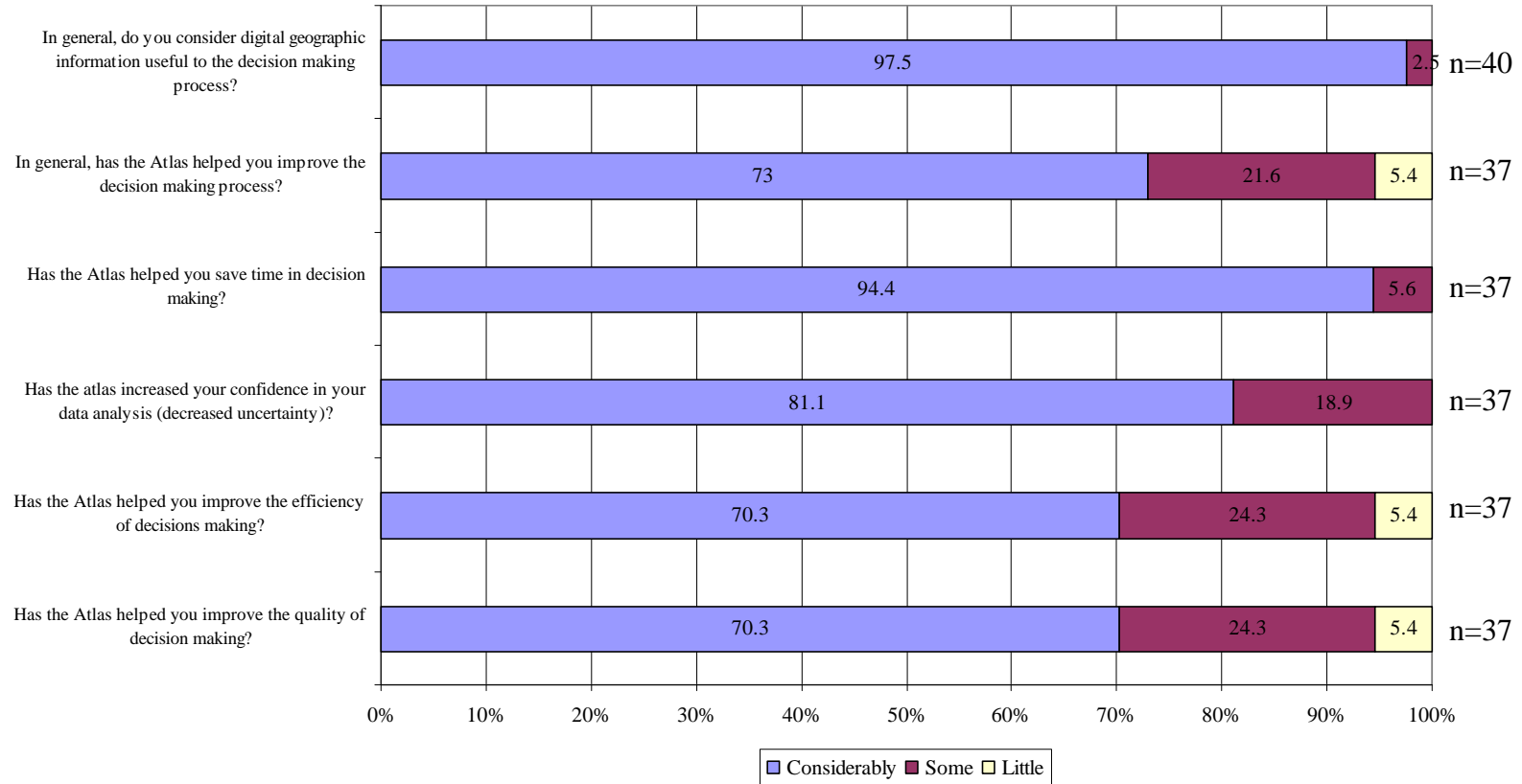**Graph 7**.  Percent questionnaire respondents by frequency of use of Atlas.

## Types of data most useful to Atlas users



**Graph 8.** Spatial data types identified as most useful

| | Very much | Some | Very little | |
|---|---|---|---|---|
| Did Hurricane Mitch increase your interest in using GIS? | 61 | 14.6 | 24.4 | n=41 |
| Did the Atlas stimulate you to use geographic information more? | 76.2 | 9.5 | 14.3 | n=42 |
| Did the Atlas stimulate you to create geographic databases of your own? | 48.8 | 14.6 | 36.6 | n=41 |
| In using the Atlas, did you learn more about natural resources management? | 63.4 | 26.8 | 9.8 | n=41 |
| In using the Atlas, did you discover that you needed more training in GIS? | 83.7 | | 16.3 | n=43 |
| Did the Atlas stimulate your institution to hire an expert in GIS? | 23.7 | | 76.3 | n=36 |
| Did the Atlas help you in generating new ideas? | 73.2 | 9.8 | 17.1 | n=41 |
| Did the Atlas improve presentation of information? | 61 | 26.8 | 12.2 | n=41 |
| Did the Atlas improve communication of information? | 48.7 | 30.8 | 20.5 | n=39 |
| Did the Atlas stimulate more contact with other organizations? | 56.1 | | 43.9 | n=41 |
| Did the Atlas have a positive economic impact? | 62.5 | 25 | 12.5 | n=40 |
| Did the Atlas help you save time? | 95.1 | 4.9 | | n=41 |
| Is the Atlas a useful tool? | 97.7 | 2.3 | | n=43 |

**Graph 9.** Perceived operational impact of the Atlas.

**Graph 10.** Perceived impact of the Atlas on decision-making.
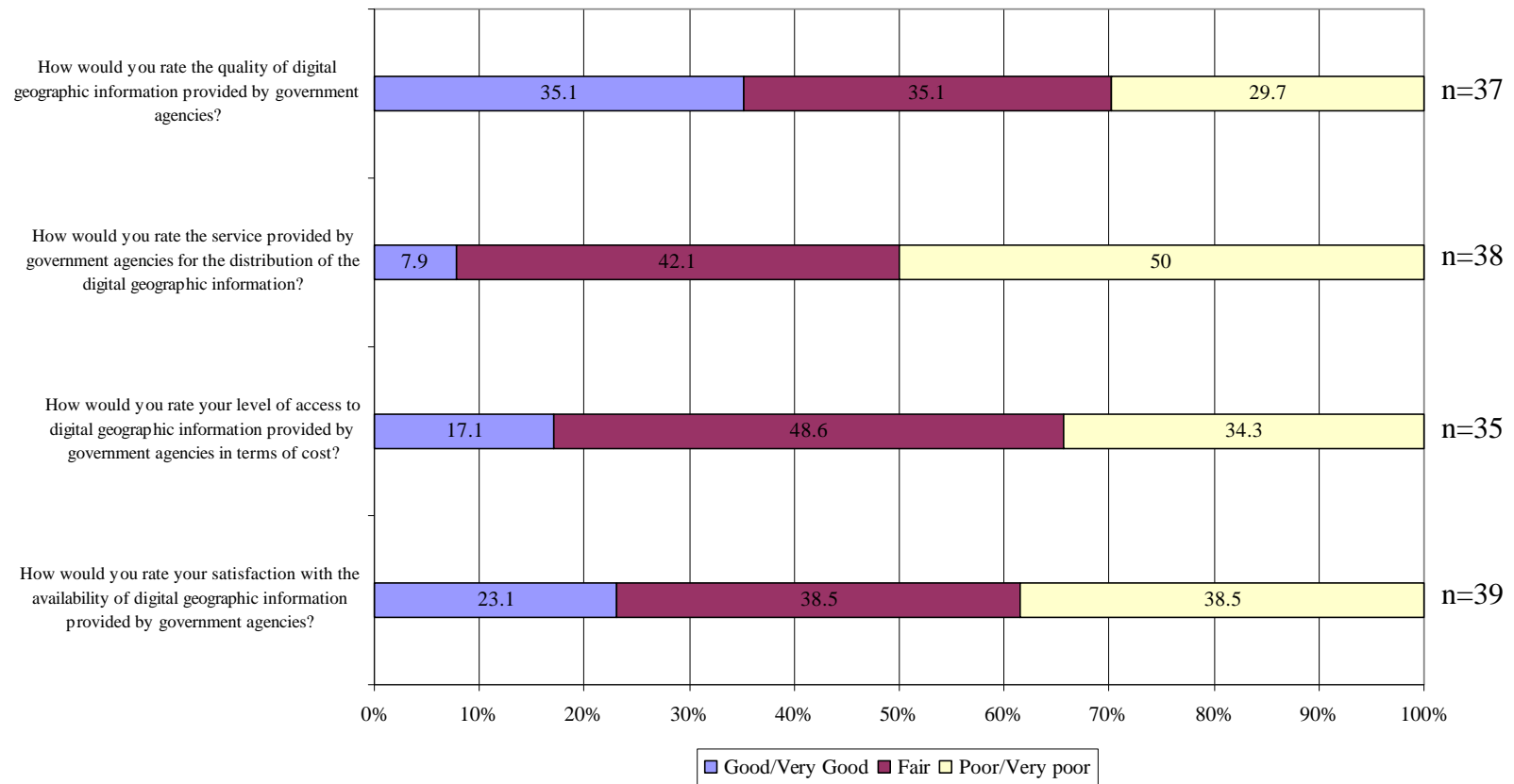
**Graph 11.** Perceived status of data dissemination services by Honduras government.