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Global Pulse
Rapid Impact and Vulnerability Analysis Fund Project

A Visual Analytics Approach to Understanding Poverty Assessment through Disaster Impacts in Latin America and Africa

Progress Report
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List of Acronyms

ACH	Action Against Hunger (International NGO)
AECI	International Cooperation Agency of Spain
ANACAFE	National Coffee Association of Guatemala (National NGO, Guatemala)
ARDs	Acute Respiratory Diseases
ASIES	Asociación de Investigación y Estudios Sociales (National NGO, Guatemala)
BANGUAT	Bank of Guatemala
CERF	Central Emergency Response Fund (United Nations)
CGIAR	Consultative Group on International Agricultural Research
CIA	Central Intelligency Agency (United States)
CONE	National Emergency Committee (Guatemala)
CONRED	National Coordinating Agency for Disaster Reduction (Guatemala)
CPI	Consumer Price Index
CRED	Centre for Research on the Epidemiology of Disasters, Belgium
DESA	United Nations Department of Economic and Social Affairs
DFID	Department for International Development (United Kingdom)
ECLAC	Economic Commission for Latin America and the Caribbean (United Nations)
FAO	Food and Agriculture Organization (United Nations)
GATE	Generic Architecture for Text Engineering
GDP	Gross Domestic Product
GEC	Global Economic Crisis
GFDRR	World Bank's Global Facility for Disaster Reduction and Recovery
GFRP	Global Food Crisis Response Program (World Bank)
GIS	Geographical Information System
GIVAS	Global Impact and Vulnerability Alert System
GoG	Government of Guatemala
GTQ	Quetzal currency (Guatemala)
HDI	Human Development Index
IADB	Inter American Development Bank
ICO	International Coffee Organization
IGSS	Guatemalan Social Security Institute
IFPRI	International Food Policy Research Institute
IFRC	International Federation of the Red Cross and Red Crescent Societies
INCAP	Nutrition Institute of Central America and Panama
IGN	National Geographic Institute (Guatemala)
INE	National Institute of Statistics (Guatemala)
INSIVUMEH	National Institute of Seismology, Vulcanology, Meteorology, and Hydrology (Guatemala)
IOM	International Organization for Migration, United Nations
IO&FC	International Oil and Food Crisis
ISDR	International Strategy for Disaster Reduction, United Nations
JICA	Japanese International Cooperation Agency
MAGA	Ministry of Agriculture, Cattle and Food (Guatemala)
MARN	Ministry of Environment and Natural Resources of Guatemala
MIF-IADB	Multilateral Investment Fund (Inter American Development Bank)

MINEDUC	Ministry of Education (Guatemala)
MFEWS	Mesoamerican Famine Early Warning System
MSPAS	Ministry of Public Health and Social Assistance (Guatemala)
NER	Named Entity Recognition
NGO	Non-Government Organization
OCHA	Office for the Coordination of Humanitarian Affairs (United Nations)
OWL	Web Ontology Language
OFDA	Office of Foreign Disaster Assistance, United States
REDHUM	Humanitarian Network
RIT	Rochester Institute of Technology
RIVAF	Rapid Impact and Vulnerability Analysis Fund
SEGEPLAN	Presidential Secretariat for Planning and Programming (Guatemala)
SESAN	Secretariat for Food Security and Nutrition (Guatemala)
UN	United Nations
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
UNOOSA	Office for Outer Space Affairs, United Nations
URL	Rafael Landivar University, Guatemala
US-AID	Agency for International Development, United States
USDA	United States Department of Agriculture
VBFB	Vital Basic Food Basket (Guatemala)
VAG	Visual Analytic Globe
WB	World Bank
WFP	World Food Programme (United Nations)

Summary

This progress report presents an update regarding the activities conducted by UNOOSA and partners agencies in the project entitled: *A Visual Analytics Approach to Understanding Poverty Assessment through Disaster Impacts in Latin America and Africa*. The report comments on activities conducted thus far, results from ongoing analysis, challenges faced, and the next steps.

The report presents a description of the visual analytics tool developed to conduct the analysis of data collected for this project and the analysis regarding the Guatemalan case study. The report also includes one annex which lists the different types of data and information which have been gathered to carry out the analysis focusing on Guatemala.

Preliminary findings indicate that assessing the impact of the Global Economic Crisis (GEC) in countries like Guatemala requires a more in-depth analysis of pre-existing conditions, of the impacts of International Oil and Food Crisis which preceded the GEC, and regarding local conditions including those faced by the government at the time of the GEC. The project focused on the analysis of impacts of disasters to track the effects of the GEC, but the impacts related to disasters reveal the vulnerabilities which have been generated over the years or decades, and the effects of the GEC on vulnerability is often blurred by other factors including the effects of the preceding International Oil and Food Crisis, previous disasters, the pre-existing conditions regarding poverty and livelihoods. While visual analytic tools such as the Visual Analytic Globe were developed to assist researchers involved in this project in the analysis of the GEC and its effects on Guatemala and Burkina Faso, such tools did not provide an advantage in comparison to the more traditional research methods when tracking the effects of the GEC.

In the coming month the final segment of the analysis using remote sensing and geo-spatial techniques will be completed, as well as an external activity in Guatemala, where feedback is being sought from representatives of national government agencies with respect to the finding included in this report.

Table of Contents

I. Introduction

In 2009, the Secretary General of the United Nations launched the Global Pulse Initiative (formerly known as GIVAS) to respond to the complex challenge: *how to fill the current gap between the onset of global crises and the availability of actionable information to protect populations against the immediate and longer-term consequences of such crises.*

Taking into consideration the impacts of the Global Economic Crisis (GEC) on livelihoods in developing countries, and the effects of such impacts in increasing poverty and vulnerability, the UN-SPIDER Programme of the Office for Outer Space Affairs proposed to RIVAF and launched the project entitled: *A Visual Analytics Approach to Understanding Poverty Assessment through Disaster Impacts in Latin America and Africa*[1]. The broad objectives of this project are:

1. To understand the particular effects that the GEC has had specifically on the well known relationships between livelihoods, poverty, and vulnerability to natural disasters, and
2. To understand how the quantifiable impacts of natural disasters such as loss of life and property are potential indicators of GEC impacts on the poor and vulnerable.

The project is based on the hypothesis that the GEC has created a set of unique, previously unexamined circumstances that have negatively affected livelihoods, creating increased poverty conditions and subsequent increased vulnerability to natural disasters. To test this hypothesis three interrelated specific questions are being addressed:

- How specifically have livelihoods been affected by the GEC?
- How have impacts of the GEC on livelihood exacerbated vulnerability to natural hazards?
- How do impacts from natural disasters reveal vulnerabilities present before an event and forecast vulnerability after an event?

The conceptual framework proposed to understand the impacts of global economic crisis on the poor and/or vulnerable is fourfold. First, it is assumed that poverty and vulnerability are disasters in the making. Second, disasters and by extension poverty, are inherently geographical in nature in terms of multi-scale interactions and relationships among numerous variables such as economic and social conditions and natural and built environments. Third, the complex and abstract nature of geographical relationships between poverty, vulnerability and disasters requires discrete visual representations and computational processing that can support analytical reasoning and decision making to inform policy response, a scientific perspective know as Visual Analytics . Finally, the framework draws upon the Department for International Development's (DFID) Sustainable Livelihoods Framework, which is a well established framework for examining the relationships between livelihoods, poverty and vulnerability. Four interrelated components are used to conduct the analysis:

1. Deriving explicit quantitative information from existing indicator sources such as national, regional and global employment trends.
2. Extracting from a variety of sources including open source media implicit qualitative information such as places and organizations.
3. Satellite imagery particularly to extract features associated with agriculture and cattle which are related to the livelihoods or rural communities in the two pilot countries.
4. Using space and time as an indexing principal for combining these components in order to develop insight into the relationships among livelihoods, poverty, vulnerability and disasters using multiple forms of evidence.

[1] The original name of the project only included Africa, but Guatemala was added as of Sept. 2010 to the project, and therefore Latin America has been included in the name.

This report presents a summary of the activities which have been conducted up to date and results of the analysis of the impacts of the GEC which have been conducted thus far in the particular case of Guatemala.

Project overview and current status

The project envisions the following tasks:

- The selection and adaptation of specific frameworks focusing on livelihoods, poverty, vulnerability, and disasters to conduct the analysis particular effects that the GEC has had on these issues.
- Data and information gathering.
- Development of visual analytic tools to conduct the analysis.
- Conduction of the analysis using visual analytics approaches and tools.

Taking into consideration the objectives of the project, the proposed use of visual analytics to conduct the analysis, and the many variables that are typically used to characterize poverty, vulnerability and the impacts of natural disasters; initial efforts have been conducted to establish a framework to catalogue, systematize, and analyze the data and the information which will be collected throughout the project. The framework is based on DFID's Sustainable Livelihoods Framework, on models used to characterize poverty and vulnerability, and on typical parameters used to express the impacts of disasters.

The project included the development of the Visual Analytic Globe (VAG) by researchers at the Rochester Institute of Technology (RIT) and is being used in this project to conduct a substantial portion of the analysis. Section 2 of this report presents a description of the VAG and initial comments on its usefulness within the scope of this project.

Section 3 presents the results obtained thus far from the analysis of the data, maps and information gathered for both Guatemala and Burkina Faso. The section focuses on displaying the impacts of the GEC on livelihoods and vulnerability of communities exposed to disasters.

Section 4 presents a summary of the information challenges which have been faced when trying to assess the impacts of the GEC in the pilot countries. Such challenges stems from the fact that in the two pilot countries at times data is either not generated, or only generated in short periods of time, or generated as a consequence of an event that triggers the need for such information. As expected, the lack of data or gaps in data limit the precision of the assessment of the impacts of the GEC. To this end, the section also outlines suggestions on types of data which could be useful to track the impacts of the GEC at various levels, or suggestions on the need for sustaining permanent efforts to generate data to complete long-term records that may allow researchers to discern the impacts of the GEC from impacts related to other causes.

Section 5 presents a description of ongoing research activities which are conducted to complete the analysis of the GEC in the two pilot countries.

Activities conducted

Activities conducted under this project include:

March – July 2011	RIT researchers developing the Visual Analytic Globe as a tool to assist in the analysis of data, maps, and documents gathered on the two pilot countries. Gathering of data, maps, and documents from the pilot countries through searches in the Internet and through official requests for information.
May – October 2011	Analysis of data, maps, and information gathered from the two countries. Elaboration of this report.

July 2011	Team meeting to review advances related to the development of the visual analytic globe and analysis of current strengths and to identify remaining technical needs. Elaboration and Executive Report for Global Pulse workshop. Participation in Global Pulse workshop

Next steps

At the time of elaboration of this report, data and information have been processed by RIT for subsequent use and analysis using the Visual Analytic Globe. Researchers have also reviewed documentation and identified additional research issues to be conducted using spatial analysis and remote sensing applications. The analysis of data, maps, and documents focusing on Guatemala has been conducted and the report of this analysis is presented in this report.

A final report will be drafted at the end of November containing the main results of the analysis, as well as an review regarding the usefulness of visual analytics and the VAG in the assessment of the impacts of the GEC. A presentation of the outcomes of the project would then be carried out in New York for further discussions on such outcomes.

II. The Visual Analytic Globe

Taking into consideration the approach of the project to look for relationships among livelihoods, poverty, vulnerability, and disasters using visual analytic tools, this section provides a general overview of the Visual Analytic Globe, which has been developed by researchers at the Rochester Institute of Technology in Rochester, New York, United States, for this project.

Visual Analytics Theoretical Framework

Generally speaking, human reasoning is a cognitive process by which facts and information from the external world are processed to form judgments and arrive at conclusions. In many cases, human reasoning is a critical component of sense making and decision making. The sense making and decision making aspects of human reasoning are of particular relevance to the OOSA RIVAF project as the project is assessing the complex and abstract nature of the relationships among livelihood, poverty, and vulnerability to natural disasters. .

Visual Analytics is the science of analytical reasoning facilitated by interactive visual interfaces, computational methods, and knowledge construction, representation, and management strategies (Thomas and Cook, 2005, Pike et al., 2009). Visual Analytics makes a particular focus on assembling evidence, generating inferences and explanations from evidence, and comparing assessing those inferences and explanations (Pirolli and Card, 2005). Using visual analytics, the OOSA RIVAF project can exploit discrete visual representations and computational processing in order to support analytical reasoning to derive insight into OOSA RIVAF project questions.

The following general descriptions of each data input and visual analytic computational procedures tools and are provided to establish context for how the data inputs and tool(s) are utilized in the analysis of specific project questions.

Data Inputs

Open-source media

Open source media refers to data and information artifacts that are publically accessible via the internet. Open source media is often used as a surrogate in the analysis of situations where direct, "ground-truth" data is not available or is difficult to obtain, such as household-level poverty or disaster impact data (Mubareka et al., 2005). In particular, open source media such as news reports can be a potentially important data input. For the OOSA RIVAF project, Google News and Google News Archives are the primary open source media items that are being used. Google News is used for obtaining current documents about a subject of interest. Google News Archive information is used for potentially understanding and reasoning about how a situation evolved over time, like the GEC (Tomaszewski et al., 2011).

Open-source media

Open-source media refers to data sets, PDF documents, and maps which are generated by a variety of government, non-government, and international organizations and published in their respective web-pages.

Closed-source media

Closed-source media refers to data sets, PDF and MS Word documents, and maps provided to the project team by representatives from a variety of government and international organizations that are not open source media.

Geographic Information

Geographic Information refers to spatially-aware, digital data sets that provide essential geographic context in the form of maps rendered via Geographic Information Systems (GIS). The use of Geographic Information for disaster management is well established in developed and in many developing countries, including Guatemala and Burkina Faso. In terms of analytical reasoning, maps have a long tradition as a medium for visually supporting human analytical reasoning with geographic information by making spatial contexts visible and engaging human information processing capabilities associated with vision (MacEachren, 1995).

Space-based Information

Similar to geographic information, space-based information refers to digital datasets acquired via satellites. For example, satellite images show the exposition of vulnerable elements to natural hazards of different kinds.

Ontology

Ontology, in the context of the OOSA RIVAF project, refer to a formal representation of knowledge encoded in a digital, XML-based file format known as "OWL" or "Ontology Web Language" (Bechhofer et al., 2004). An ontology for the OOSA RIVAF project has been fitted to the visual analytic globe to facilitate the detection of complex links among livelihoods, vulnerability, poverty and disaster impacts.

Temporal Information

Temporal Information refers to processes, activities and events that exist in successive temporal parts and phases with discrete beginnings and ends, also known as occurrents (Grenon and Smith, 2004). Occurents, derived from sources such as ReliefWeb, the Centre for Research on the Epidemiology of Disasters (CRED) and other sources are digitally encoded in an XML-based file format. In terms of analytical reasoning, time, along with space is fundamental to understanding the evolution of particular situations such as the drop in remittances over time due to the GEC.

Tabular Data

Tabular data, in the context of the OOSA RIVAF project, refers to non-spatial data encoded in a matrix (i.e., rows and columns) format. For example, country-level census information on employment levels by year. In cases where tabular data does contain a geographical reference such as an ADMIN 1 or ADMIN 2 level indictor, this data is joined on to geographical information . For example, a spreadsheet containing housing material composition by province in Burkina Faso can be joined onto a reference spatial dataset of Burkina Faso provinces to make the data spatially explicit and visually renderable on a map.

The overall data and information processing procedure is visually summarized in Figure VA1.

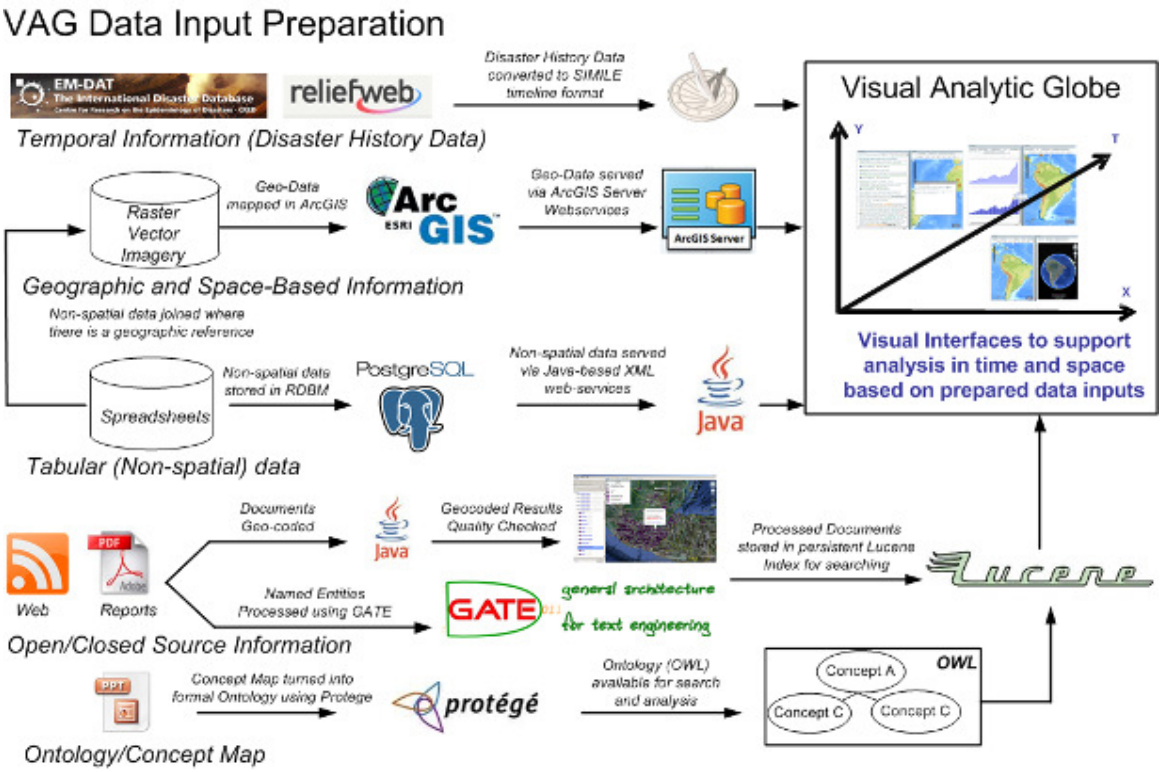

Figure VA1: Data input preparation

Computational Procedures and Tool Suite

Computational Procedure - Information Retrieval

The OOSA RIVAF researchers use the VAG to analyze open-source media and closed-source media to find potentially relevant information to inform analysis for addressing the project questions. Open source media searches are web-based searches while closed-source media searches are done against a repository of documents. Particular segments of text can be searched in all documents using standard key-word search functions. The *Lucene* software incorporated into the VAG is capable of searching individual key words or sets of key words.

Computational Procedure - Named Entity Recognition

Named Entity Recognition (NER) refers to people, dates and organizations identified in open-source media and closed-source media using natural language processing functions of the GATE program (Cunningham, 2002). NER is a useful procedure for identifying key terms in large document collections to help discern potentially relevant information and is a common technique used in text analysis (Pan and Mitra, 2007, Stasko et al., 2007). Figure VA2 presents an example of NER, where a document has been scanned to detect particular names or organizations. As it is seen in the bottom left segment of the figure, the term "UNICEF" (the United Nations Children's Fund) has been identified and highlighted with orange-colored text.

Computational Procedure - Geocoding

Geocoding refers to the identification and subsequent resolution to latitude and longitude coordinates of places or locations which are contained in open-source and closed-source media (Tomaszewski, 2008). The outputs of each geocoding process are used to create a map-based representation of a

document that highlights those places or locations which are mentioned explicitly in such a document. Figure VA2 presents an example of the geo-coding process related to a document targeting food insecurity in Guatemala. The green-filled circles in the map in the figure represent those geographical sites which have been explicitly mentioned in the document being reviewed.

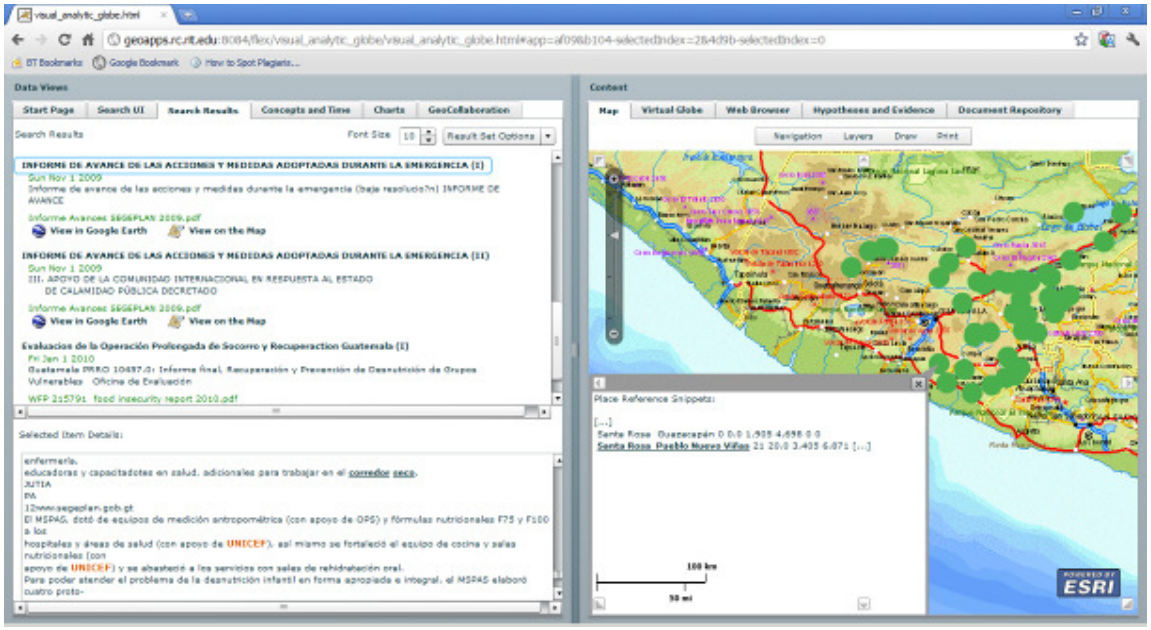

Figure VA2: Examples or name entity recognition and geo-coding.

Tool – Search Results Interface

Queries done to both open-source media and closed-source media are presented in a search result interface. The primary purpose of the search result search result interface is to provide quick overviews of the contents of documents foraged by web queries or derived from the document repository. Documents are ranked by their relevance to a given query using the information retrieval procedures previously mentioned. Visually, the search results interface allows users to obtain detail about any document by clicking on a document title and seeing the named entities that were identified in the raw text. A color coding scheme is applied to support quick scans of the named entities.

Tool – Geographic Map Interface

The Geographic Map Interface is based on web-enabled ESRI mapping software. The Geographic Map Interface displays geographic information that has been made available to the project by government agencies and international organizations and supports standard digital map interaction functions such as pan, zoom, layer visibility toggling and annotation drawing. Figure VA3 presents the map interface using the web-enabled ESRI mapping software.

Tool – Time Interface

The Time Interface is used to visually represent events using the SIMILE timeline interface (SIMILE project, n.d.). The time view supports the representation of single events (i.e an event with a specific date/time) and durations (i.e events that span over a given time range with specific starting and end dates). The SIMILE timeline interface supports the addition of descriptive balloons for adding additional information to events. Users can review potentially relevant historical information in the time view by panning the time view at either the year scale or month scale. Users can then click on a single event or duration icon to review event information.

Tool – Virtual Globe Interface

The Virtual Globe Interface is used to provide a 3D, globe-based representation of space-based information. In particular, the project uses Google Earth as it is a well-established, easy-to-use virtual globe tool that has had widespread use in a variety of applications including disaster management (Nourbakhsh et al., 2006).

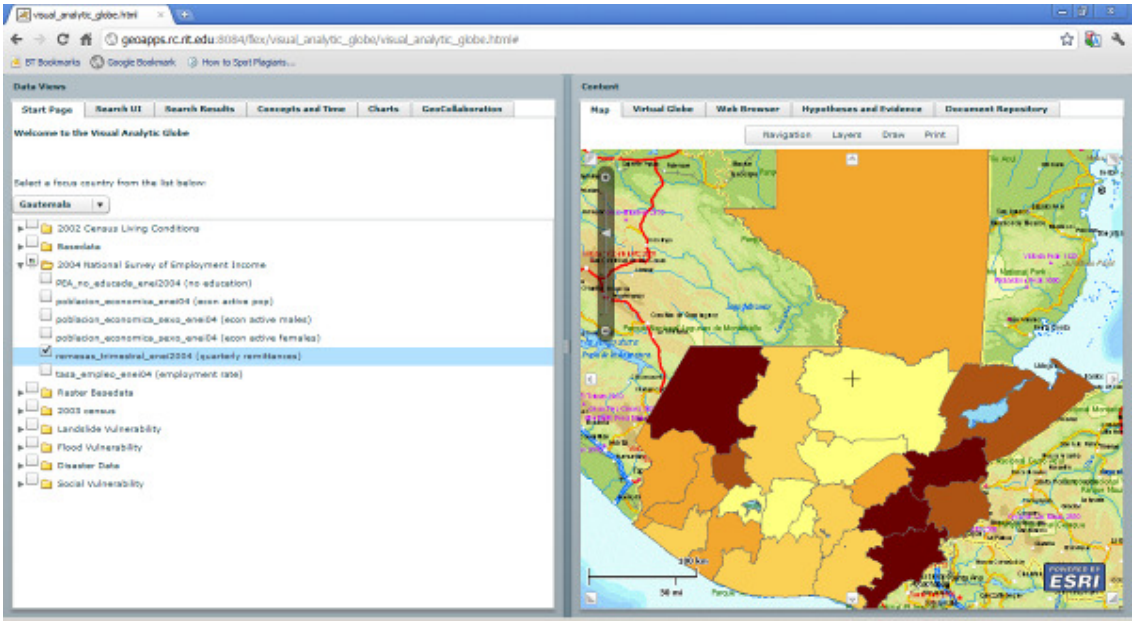

Figure VA3: The geographic map interface. The map makes reference to the percentages of households receiving remittances from abroad. Data was extracted from the National Survey on Employment Conditions conducted by the National Statistics Institute of Guatemala in 2004.

Tool - Quantitative Data Interface

The quantitative data interface is used to represent tabular data graphic formats such as pie charts and bar graphs.

Combined tools

Several of the tools are designed to work in conjunction with each other to provide linked representations of data inputs, a standard information visualization technique (Keim et al., 2004, Schneiderman, 1997).

Linked tools - Virtual Globe and Geographic Map Interfaces

The virtual globe is linked with 2D maps contained within the geographic map interface. By using this approach, the analysts can (a) seamlessly use GE for exploration with a standard 2D cartographic display that may be better suited to their work, such as incorporating organizational map symbols or other relevant styling, (b) maintain geographic orientation, for example having the 2D display indicate where in map space a user is when in the 3D view of GE, and (c) and manipulate perspectives where the flexible scaling between GE and the ESRI-based map software allows either to easily serve as the overview or detail due to ease of scale manipulation and/or the map data used in the ESRI-based map software.

The Computational Procedures and Tool Suite of the VAG are summarized visually in Figure VA4.

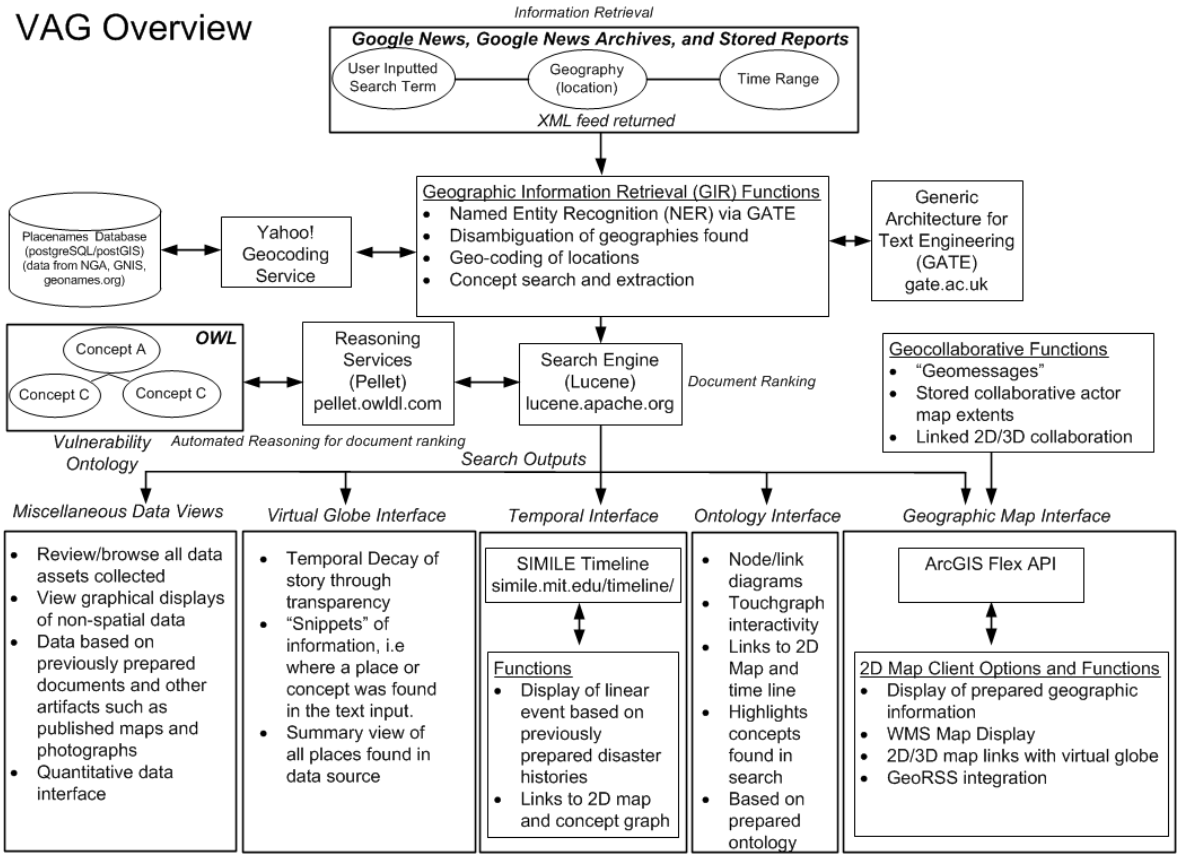

Figure VA4 – Overview of the Visual Analytic Globe Computational Procedures and Tool Suite

How is the Visual Analytic Globe used in this project?

1. How specifically have livelihoods been affected by the Global Economic Crisis?

According to the DFID framework, "A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base." Chambers and Conway (1992) cited in (Department For International Development (DFID), 1999b)

In particular, the analysis being conducted by the OOSA RIVAF project is looking for evidence related to impacts on assets or capitals related to livelihoods as outlined in the DFID framework. To this end, efforts have been conducted to gather data spanning from the national to the household/individual-level data to derive insights into the aforementioned capitals to understand how household behaviour has potentially changed due to GEC.

The complexity of the relationships among capitals and the insights into impacts on the capitals themselves can be reasoned about and subsequently understood using surrogate data. Table VA1 outlines livelihood capitals, data inputs and specific examples of them and Visual Analytics computational tools and procedures that will be used to reason about impacts on the capitals in order to understand fluctuations within them to discern how livelihoods been effected by the Global Economic Crisis.

Table VA1: Livelihood Capitals, Data Inputs and Computational Tools

Livelihood Capital	Data Input and examples	Computational Procedure/Tool
Human	*Open and Closed Source Information* – reports by government agencies, NGOs and international organizations including development banks (World Bank, Inter- American Development Bank (IADB), and African Development Bank (ADB)); and the Regional Economic Commissions for Africa, Latin America and the Caribbean (ECA and ECLAC).	*Information Retrieval and NER* – extracting people and organizations involved in country contexts based on news reports to understand what agencies/organizations are doing, policy implementation by organizations to understand macro to micro-level connections.
Natural	*Geographic and space-based information* – natural resources (landuse/landcover), census information on landuse	*Virtual Globe and Geographic Map Interfaces* – viewing landcover/landuse change over time using visible imagery, choropleth maps of landuse
Financial	*Open and Closed Source Information* - Official reports from government agencies and national statistic institutions, industry reports. *Tabular Data* – financial records, disaster financial impact (property loss, economic loss), official poverty statistics *Geographic and space-based information* – census information on commodity production by locations, remittances received from abroad	*Quantitative Data Interface* – graphical representation of financial and economic information to see potential trends/fluctuations overtime. *Virtual Globe and Geographic Map Interfaces* – choropleth mapping of census variables.
Social	*Open Source Information* – News reports discussing migration of individuals and social asset impacts on families due to livelihood impacts *Geographic information* – census information on gender, age and number of occupants in households and heads of households *Social Network Data* – insights from expatriates into how places they are familiar with have been impacted.	*NER* – extracting people involved in country contexts such as political figures, social networks *Geomessages* – highlighting locations of interest in terms of effects on social networks at the individual level.
Physical	*Open Source Information* – News reports discussing recovery from disaster impacts, aid request reports *Tabular Data* –disaster impacts on built environment *Geographic and space-based information* – census information on commodity production by locations, building materials of houses, risk to natural hazards (i.e, proximity to flood areas, earthquake zones) *Temporal Information* – disaster histories	*Virtual Globe and Geographic Map Interfaces* – choropleth mapping of census variables, examination of disaster impacts by location *Time Interface* – understanding of disaster events overtime to see how previous events can inform present events. *NER* – extracting financial amounts discussed in articles to assess physical impacts

2. How have impacts on livelihood exacerbated vulnerability to natural hazards?

As per the Livelihoods/Vulnerability/Poverty/Disaster theoretical framework, vulnerability has been modelled in this project in terms of (a) the susceptibility of livelihoods to external forces that act upon them with varying time scales (trends (long term), shock (sudden/onset), and seasonal (cyclical/recurring)) and (b) the capacity of people in communities to cope with the impacts provoked by those external forces. The project will try to assess the impact of the GEC on both the susceptibility and coping capacities of communities.

The OOSA RIVAF project is attempting to discern the effects of the GEC (an external impact) specifically from other external global trends and shocks such as the sharp increase in the international prices of food and fuel as a way to derive answers to question 2, focusing on external impacts to capitals related to livelihoods. In addition, it takes into consideration the fact that there are

international effects such as the GEC, and national aspects such as government policies or a weak national economy that may increase vulnerability.

Figure VA5 expands on the vulnerability conceptual diagram to show how vulnerability components potentially relate to livelihood asset capitals.

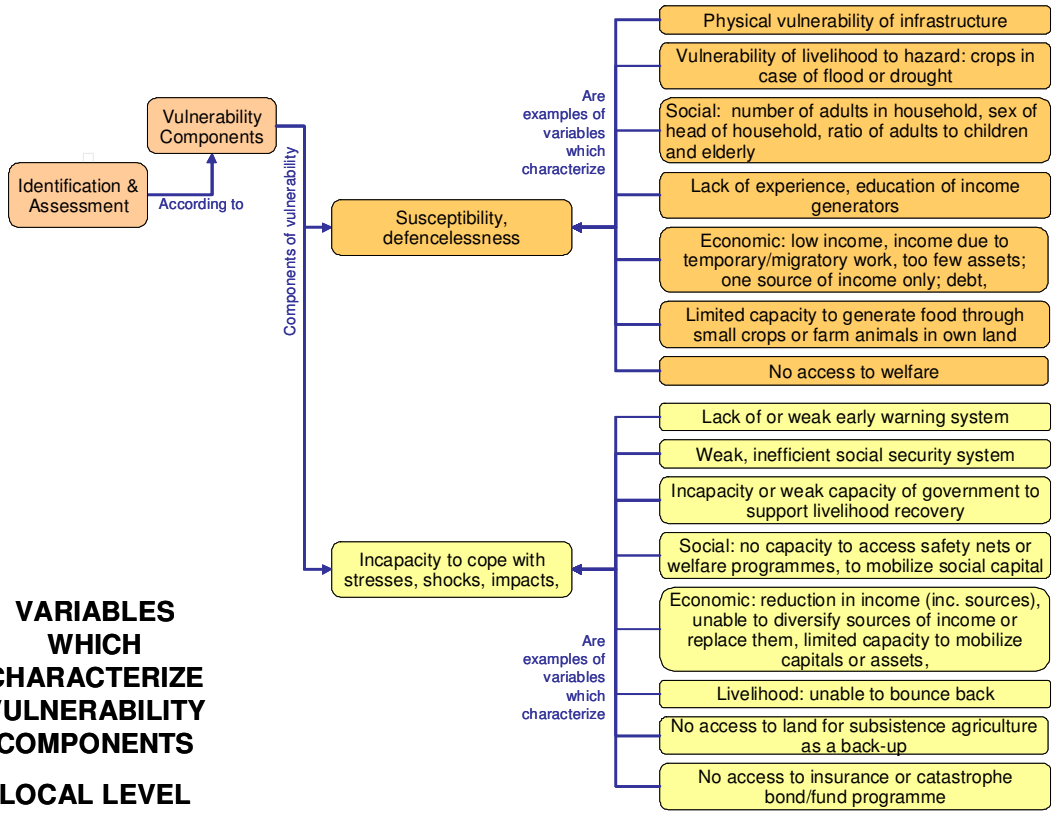

Figure VA5 – Overview of vulnerability components.

The VAG is not designed to visually represent vulnerability directly. Rather, the VAG, is used to compile evidence to in turn, draw conclusion about vulnerability based on assessments of capital impacts as per question 1. However, visual representations using MS Power Point and other representation software will be used to represent vulnerability.

3. How do impacts from natural disasters reveal vulnerabilities present before an event?

The project focuses on assessing the impacts of the GEC on livelihood capitals, and thereby trying to extract both the susceptibility of such capitals, and the coping capacity of communities taking into consideration three mechanisms which are present whenever a disaster strikes:

- Local coping capacities using local capitals;
- Humanitarian assistance provided by the government in case of disasters;
- International assistance provided by international organizations and donors (foreign governments).

Many of the Visual Analytic computational tools and data inputs outlined in Table VA2 can be repurposed to support reasoning to derive answers to question 3, as informed by outcomes of question 2 activities. Table 3 is a non-exhaustive list that outlines (a) how Visual Analytic computational tools and data inputs can be utilized to reason about local-level, internal dimensions of vulnerability, as

discussed in the Livelihoods/Vulnerability/Poverty/Disaster theoretical framework and shown in italics to (b) reveal vulnerability before a disaster and (c) forecast vulnerability after an event.

Table VA2: Pre/Post Disaster Vulnerability, Internal Vulnerability dimensions and Visual Analytic computational tools and data inputs

<table>
<tr><td colspan="2">Revealing Vulnerability Before Disaster</td><td colspan="2">Forecast vulnerability after an event</td></tr>
<tr><td colspan="2">Lack of or weak early warning systems</td><td colspan="2">Livelihood unable to “bounce back” after disaster</td></tr>
<tr><td><u>Data Input and examples</u></td><td><u>Computational Procedure/Tool</u></td><td><u>Data Input and examples</u></td><td><u>Computational Procedure/Tool</u></td></tr>
<tr><td>Open and Closed Source Information – News reports discussing problems during disaster response.</td><td>Information Retrieval, NER and Geo-coding – extracting people, locations and organizations involved in early warning efforts</td><td>Open and Closed Source Information – News reports discussing recovery from disaster impacts; official reports from government agencies and national statistic institutions, industry reports.

Tabular Data – financial records, disaster financial impact (property loss, economic loss, casualties - loss of head of households).

Geographic and space-based information – long term land-use degradation from disaster impacts.</td><td>Information Retrieval, Geo-coding and NER – extracting people and organizations involved in recovery, extracting numerical information to reveal issues identified for long-term recovery (financial resources needs for aid/recovery, potential for forced migration to various locations).

Virtual Globe and Geographic Map Interfaces – Disaster impacts on land-use such as areas effected by floods, drought, etc.</td></tr>
<tr><td colspan="2">Weak, inefficient social security system(s) (i.e. lack of welfare and insurance, lack of/weak governance)</td><td colspan="2">Physical vulnerability of infrastructure</td></tr>
<tr><td><u>Data Input and examples</u></td><td><u>Computational Procedure/Tool</u></td><td><u>Data Input and examples</u></td><td><u>Computational Procedure/Tool</u></td></tr>
<tr><td>Open and Closed Source Information – News reports discussing problems during disaster response such as lack of, delay or inability in government response.</td><td>Information Retrieval, NER and Geo-coding – extracting people, locations and government organizations involved in response and how they operated (or not) during a response.</td><td>Open and Closed Source Information – News reports discussing post-disaster refugee/IDP situations.

Geographic and space-based information –disaster zone impacts.</td><td>Information Retrieval, Geo-coding and NER – extracting people and organizations involved in assisting refugees/IDP and identifying refugee/IDP locations.

Geographic and space-based information – Mapping of Disaster-zone impacts on built-environments to asses relationships between magnitude of disaster impacts and refugees/IDPs.</td></tr>
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III. Results of analysis

As stated in the introduction, this project will make use of visual analytics to assess the impacts of the GEC on livelihoods and poverty in Guatemala and Burkina Faso, and the effects of such impacts in increasing vulnerability using data and information presented in a variety of formats. The next segments of this section display the results of the analysis of datasets, documents, and maps which have been compiled for this project regarding Guatemala.

Guatemala

Guatemala is one of the seven countries of the Central American isthmus and is situated between Mexico, which borders the country to the west and to the North; and Belize, Honduras and El Salvador, which are located to the east of the country. Figure G1 presents a map of Guatemala and its 22 departments.

Figure G1: Map of Guatemala displaying its departments and neighbouring countries.

The population of the country has grown consistently in the last decades, and is estimated to be around 14.7 million inhabitants in 2011 (INE, 2011a). The human insecurity associated with the military conflict that took place from the sixties to the nineties associated with the cold war and the worsening of the economy in rural areas triggered initially migrations to urban areas and in particular to the capital city Guatemala, and later, within the last decade, to migrations to the United States, either legally or illegally. Guatemala city has a population above two and a half million people, and is the major economic, financial, and governmental centre of the country. Unfortunately, nearly half the population of the country can be considered as poor, and among the poor, 15% of the population can be considered as extremely poor.

Since its conquest by the Spanish at the beginning of the sixteen century, Guatemala's economy has been fuelled by agricultural exports. Coffee was introduced in the late eighteen hundreds and has played a major role in generating income, tax revenues, and has provided employment to a large fraction of the population, mainly in rural areas for nearly a century. Other agricultural products

which are exported from Guatemala include bananas, sugar, rubber, and specific types of vegetables and fruits. Crops for local consumption include corn and black beans as well as a variety of vegetables and fruits as well.

In the context of natural hazards, Guatemala lies at the intersection of 3 active tectonic places which frequently generate earthquakes and the permanent volcanic activity in some of its volcanoes. The country is also exposed to hydro-meteorological phenomena such as floods triggered by hurricanes and tropical storms and droughts.

Guatemala is a country that blends itself very well to the goals of this project as it is a vulnerable country, half of its population is below the poverty line, and is impacted by disasters frequently. In addition, the GEC had effects at the national level impacting the budget of the government via reductions in tax revenues, and affecting budgets of families in urban and rural areas through decreases in remittances. Large disasters taking place within the last decade have impacted both urban and rural communities as well as public infrastructure (roads, public buildings) which demonstrate the vulnerability of such communities and infrastructure to disasters such as floods.

Three international crisis in the years 2000-2002, 2006-2008 and 2008-2010 triggered effects at the national and local levels. The sharp drop in prices of coffee in the international stock market in 2000/2002 triggered a large increase in unemployment and led to tax revenue losses. The international oil and food crisis in 2006-2008 impacted local prices of essential products such as corn. The 2008 GEC let to reduction in remittances and to reductions in tax revenues and other sources of income related to tourism and other sectors of development. The 2000-02 and the 2008-10 crises were followed by droughts which lead to increased poverty and malnutrition, forcing the government on both occasions to declare a National State of Calamity to deal with the combined impacts of the economic crises and the droughts.

The high frequency of large disasters in the last decade and the three international crises and drought have forced the government to request international assistance to respond and to recover from such events. Organizations from the United Nations system as well as other international organizations and Non-Government Organizations have contributed to such efforts, and as a result of such interventions, these organizations and the government have generated a variety of reports that have allowed this UN-SPIDER – RIVAF project to gather relevant data and information for this project. In addition, improvements throughout the decade in terms of disaster management have also allowed Guatemala's National Coordinating Agency for Disaster Reduction (CONRED) to keep better track of impacts of disasters and to incorporate since 2001 the use of geographic information systems as a routine tool to present data in the format of maps, and to conduct analysis.

Data focusing on Guatemala has been gathered from a variety of government agencies including CONRED, the Presidential Secretariat for Planning and Programming (SEGEPLAN), the Bank of Guatemala (BANGUAT), the National Institute for Seismology, Vulcanology, Meteorology and Hydrology (INSIVUMEH), the Ministry of Environment and Natural Resources (MARN), the Ministry of Agriculture, Cattle and Food (MAGA), Ministry of Public Health and Social Welfare (MSPAS), Ministry of Education (MINEDUC), the National Institute of Statistics (INE), the National Geographic Institute (IGN), the National Coffee Association (ANACAFE), and the Secretariat for Food Security and Nutrition (SESAN). Documents have also been collected from international organizations such as Economic Commission for Latin America and the Caribbean (ECLAC), the Inter American Development Bank (IADB), the World Bank, the Food and Agriculture Organization (FAO), the International Organization of Migrations (IOM), the United Nations Development Programme (UNDP), the World Food Programme (WFP), and the Office for the Coordination of Humanitarian Assistance (OCHA); from international NGOs such as the Spanish Cooperation Agency (AECI), and Action Against Hunger (ACH).

Data has been gathered specifically on gross domestic product, consumer price index, cost of the basic basket, quality of life, population and housing census data (2002), general figures on exports and imports, remittances, poverty, weekly prices of products such as corn, diesel fuel; data on diseases by province, malnutrition, employment conditions, impacts related to disasters, food insecurity, etc. In the international context, data has been gathered on the international prices of products such as petroleum (OPEC and USEIA), corn, sugar, and coffee; which have relevance to Guatemala.

In the context of geographic information, shape layers have been gathered for the whole country on a variety of parameters (political-administrative boundaries, roads, rivers, lakes, geology, morphology, land-use, disaster impacts) and other data: geology, land-use, soil-types, climatic variables, distribution of remittances, quality of life and living conditions, vulnerability, etc. All this data is available in GIS formats already. Annex 1 lists data and information gathered for Guatemala.

General trends before the GEC

In order to understand more precisely the impact of the GEC on livelihoods, on poverty and on the capacity of communities and of the Government of Guatemala to cope with the impacts of disasters, it is important to put the GEC in the proper context. This context should reflect the general trends of the country before the GEC, the impacts of the IO&FC which preceded the GEC, and the GEC itself.

Demographic trends

According to INE (2011a), the estimated population of Guatemala in 2006 was 13,018,759 inhabitants. Table G1 presents data on population estimates carried out by INE for the country and its 22 departments using data from the censuses conducted in recent decades for the period 2003-2006. The last national population and housing census was conducted in 2002. The most populated department was and remains Guatemala, where the capital city is located. The next four most populated departments in that year were Huehuetenango, Alta Verapaz, San Marcos and Quiche. The population in these four departments accounted for 50% of the total population of the country. At the bottom row one can see how INE estimated the total population for these years. Five departments have been highlighted: Guatemala, where the capital city resides and is the one with the largest population, and Escuintla, Sololá, Chiquimula and Jutiapa, which are relevant to this project because these departments experienced disasters related to droughts and floods after the GEC. Figure G2 presents population in terms of a map.

Table G1: Estimation of Population by Department for the period 2003-2006. Source: INE (2011 a)

Departament	YEAR			
	2003	2004	2005	2006
Guatemala	2,702,257	2,762,328	2,821,400	2,879,664
El Progreso	142,200	143,680	145,302	147,072
Sacatepéquez	264,981	271,221	277,518	283,891
Chimaltenango	486,908	501,158	515,832	530,951
Escuintla	579,750	594,578	609,478	624,527
Santa Rosa	308,521	311,964	315,770	319,963
Sololá	339,499	350,685	362,150	373,935
Totonicapán	370,825	382,485	394,567	407,124
Quetzaltenango	661,222	675,385	690,057	705,300
Suchitepequez	429,743	439,210	449,063	459,317
Retalhuleu	255,378	260,729	266,286	272,071
San Marcos	849,220	868,257	887,947	908,245
Huehuetenango	921,655	947,325	973,555	1,000,474
Quiché	727,628	752,318	777,998	804,683
Baja Verapaz	227,535	231,822	236,419	241,322
Alta Verapaz	865,811	894,260	923,427	953,203
Petén	440,393	464,763	489,209	513,843
Izabal	338,728	347,213	355,935	364,910
Zacapa	203,745	205,351	207,149	209,089
Chiquimula	316,813	322,358	328,247	334,469
Jalapa	259,844	265,981	272,454	279,268
Jutiapa	394,360	397,382	400,847	405,439
REPUBLIC	12,087,014	12,390,451	12,700,611	13,018,759

Like Peru and Bolivia, Guatemala is a multi-ethnic country. In Guatemala there are 22 indigenous ethnic groups and another group that is denoted as "ladino". Many of the actual ethnic groups stem from the old Maya civilization. The ladinos, the largest group, stem from a historical mix of indigenous people and the conquerors from Spain mainly, and from other foreign countries.

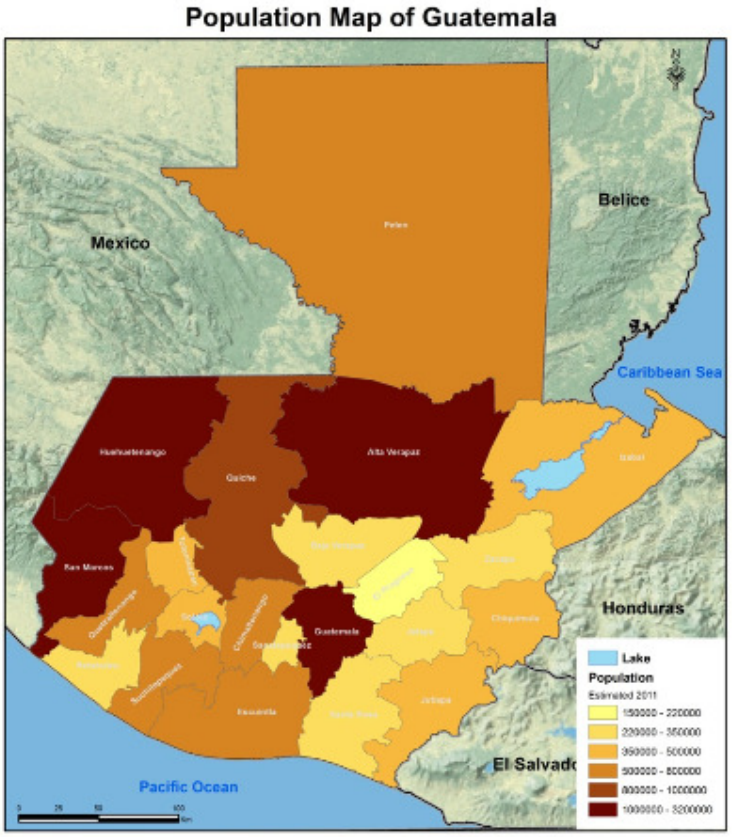


Figure G2: Map of Guatemala displaying the its population by department.

The main ethnic groups are the Ladinos which in the year 2002 had a population of 6,750,170 inhabitants and the Maya with 4,411,964 inhabitants. Many of these ethnic groups have their own tongue, although Spanish is the official language within the country.

Table G2 presents data concerning these main ethnic groups in Guatemala as presented by INE (2011b) corresponding to the year 2002. As it can be seen from this table, in several departments of the republic such as Chimaltenango, Solola, Totonicapan, Quetzaltenango, Huehuetenango, Quiché, Baja Verapaz and Alta Verapaz the majority of the population belongs to the Maya ethnic group.

Figure G3 presents a map displaying ethnic groups and their proportions in different departments of the country using pie-charts. The diameter of the pie charts is related to the total population of each department. As it can be seen, the major ethnic groups are those of Maya descent and the ladinos.

Table G2: Population by Ethnic Group. Source: INE (2011 b)

Departament	Main Ethnic Group			
	Maya	Garifuna	Xinka	Ladino
Guatemala	294,757	704	1,322	2,229,846
El Progreso	766	8	35	138,640
Sacatepéquez	100,992	16	18	146,018
Chimaltenango	350,757	23	52	94,779
Escuintla	33,746	99	148	503,750
Santa Rosa	3,427	45	3,592	294,168
Sololá	295,899	8	12	11,507
Totonicapán	333,438	4	9	5,640
Quetzaltenango	323,848	604	95	297,995
Suchitepequez	189,558	110	391	209,949
Retalhuleu	49,607	24	539	190,749
San Marcos	228,444	147	207	564,193
Huehuetenango	531,970	40	69	300,011
Quiché	579,067	8	48	76,044
Baja Verapaz	125,694	20	38	89,646
Alta Verapaz	718,223	26	22	57,692
Petén	109,068	67	92	257,238
Izabal	68,504	2,958	84	242,292
Zacapa	948	35	155	198,915
Chiquimula	45,558	20	76	255,921
Jalapa	26,279	57	33	206,850
Jutiapa	1,414	17	9,177	378,327
REPUBLIC	**4,411,964**	**5,040**	**16,214**	**6,750,170**

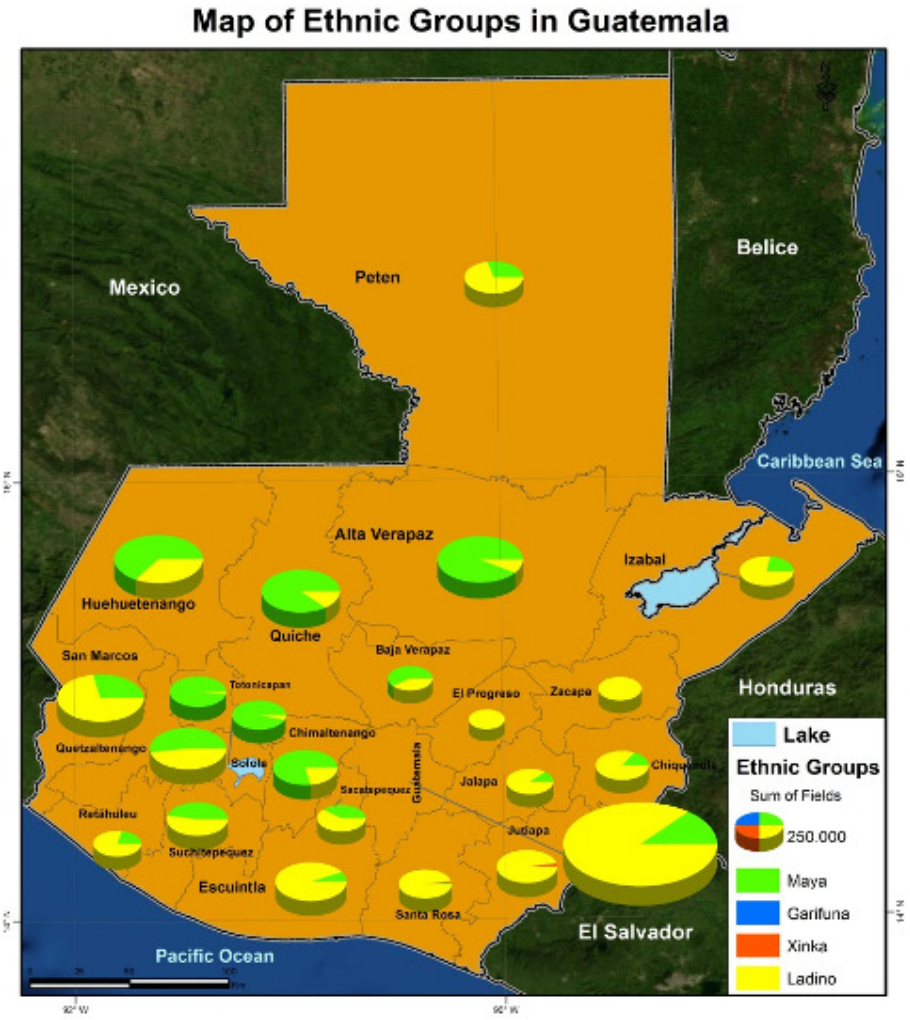


Figure G3: Map representing the proportion of ethnic groups in all department of Guatemala.

The Economy

For centuries Guatemala's economy was fuelled by agriculture. Taking advantage of its moderate climate, the country benefitted from the production of traditional export products such as coffee, bananas, cotton, cardamom, and rubber; and products for local consumption such as corn or maize, black beans, vegetables; and livestock as well. Other drivers of the local economy included commerce, transport, communications, construction of infrastructure, and services.

The vulnerability associated with the dependency of the economy on the export crops, including the economy at the community level, was demonstrated quite dramatically in the years 2000 -2003, when the prices of coffee in the international stock markets fell by more than 50% due to the emergence of Viet Nam as a powerful coffee producer. In Guatemala the impacts of this coffee crisis were severe, with considerable losses in terms of jobs (between 77,000 and more than 300,000 depending on the source of the information); and also impacted the national, and local economies. Other factors impacting the local economy in 2001 and 2002 were a weakening of the global economy and a situation of drought that forced the government to decree a National State of Calamity in 2001.

In recent decades the economy has been fuelled thanks to developments in other sectors including the insertion of sugar cane as a crop to generate sugar for export replacing cotton; the manufacture of clothing for export through special arrangements (maquilas), industrial production, and the production and exportation of non-traditional products including different varieties of fruits and vegetables and

crude oil. With the rise in communications technologies and information technologies, new types of services are now contributing to local economic conditions. In addition, mining activities are gradually evolving in various regions of the country.

Table G3 presents those production factors which make up the annual GPD as presented by INE (2011c) for the period 2001-2006. As it can be seen, manufacturing industries were the major contributors to the GDP in 2006, followed by private services, agriculture and related activities (cattle, hunting and fishing), and then commercial activities (wholesale and retail). In general terms the GDP grew in a consistent fashion, and at a higher pace in the year 2006.

Table G3: Gross Domestic Product according to the origin of the production - 2001 - 2006 (millions of Guatemalan quetzales constant at 2001 prices). Source: INE (2011 c)

Economic Activity	Year					
	2001	2002	2003	2004	2005	2006
Gross Domestic Product	**146,977.8**	**152,661.2**	**156,631.6**	**161,966.3**	**167,361.3**	**176,259.8**
Manufactuing Industries	28,913.1	29,242.8	29,974.7	31,441.5	32,260.3	33,472.4
Private services	22,801.8	23,604.8	24,341.9	24,904.5	25,477.5	26,868.5
Agriculture, livestock, hunting and fishing	20,498.5	21,596.2	22,138.3	23,057.2	23,547.6	23,842.4
Commerce (wholesale and retail)	18,936.7	19,323.2	19,610.7	20,214.2	20,858.5	21,681.7
Transport, storage and communications	7,827.1	8,438.6	9,284.1	10,716.2	11,932.4	14,146.1
Housing rentals	15,044.9	15,572.2	16,303.7	17,006.9	17,413.6	17,875.6
Public administration and defense	10,861.5	11,098.0	10,850.7	10,479.1	10,725.6	11,294.0
Financial intermediation, insurance and auxiliary activities	3,781.9	4,197.3	4,624.8	5,064.0	5,825.9	6,763.7
Construction	5,797.6	6,692.7	6,446.0	5,870.9	6,133.7	6,936.9
Provision of electricity and water catchment	3,794.6	3,988.6	4,185.9	4,337.0	4,453.7	4,586.5
Exploitation of mines and quarries	1,042.1	1,209.0	1,135.9	1,000.3	967.9	1,138.1
(-) Financial intermediation services measured indirectly	3,429.6	3,727.2	3,960.9	4,429.3	5,069.5	5,917.8
(+) Net taxes on subventions to products	11,107.6	11,425.0	11,695.8	12,303.8	12,834.1	13,571.7

Data regarding the rate of change of GDP for the period 1997 – 2006 is presented in figure G4 (BANGUAT: 2006, 2010). As it can be seen, the rate of change of the GDP had experienced a sharp drop in the years 2000, 2001 and 2003 as a consequence of the coffee crisis which impacted the country severely and also as a consequence of the weakening of the global economy. Nevertheless, as it can be seen, by 2006 GDP growth had surpassed the high level that had taken place in 1998.

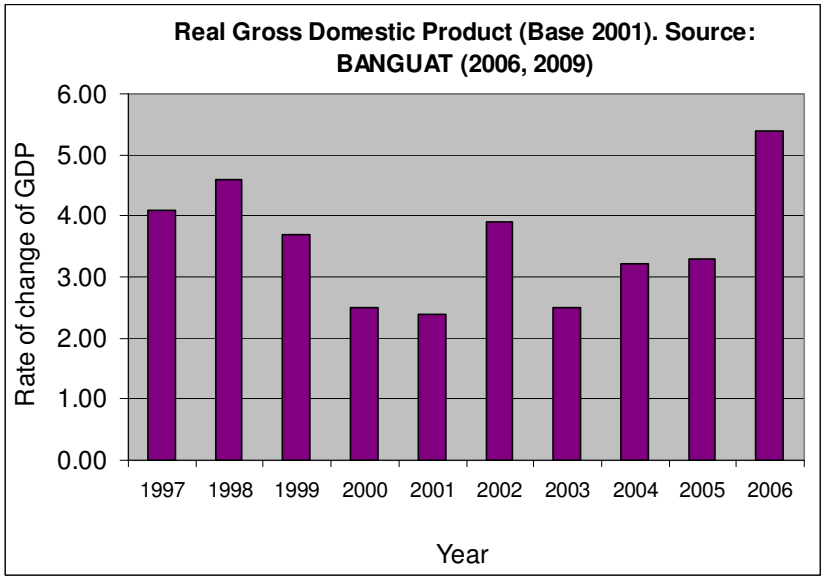


Figure G4: Evolution of the GDP between 1997 and 2006 (Source: BANGUAT 2011a).

Figure G5 presents the evolution of the monthly inflation rate as reported by BANGUAT (2011a) for the period from January 1996 until December 2006. As it can be seen, the inflation rate fluctuated

between 10% and 12% at the beginning of this period, and then gradually dropped between 1997 and 1999, with small and large fluctuations.

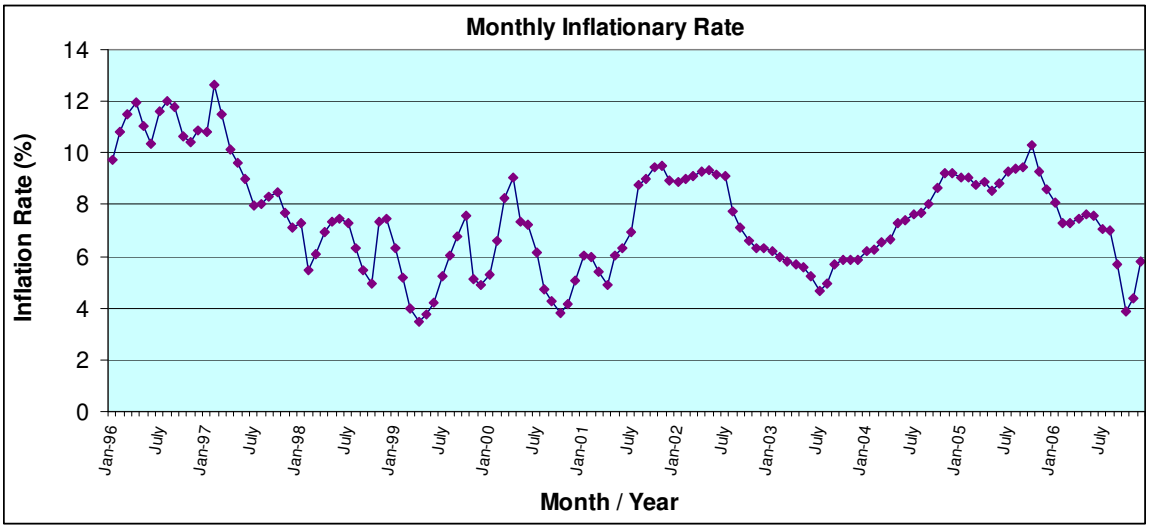


Figure G5: Evolution of the monthly Inflationary Rate between Jan. 1996 and Dec. 2006 (Source: INE 2011d).

Figure G6 presents data on the consumer price index for the period of January 2001 to December 2006, as reported by INE (2011d). The graph shows a consistent upward trend throughout this period.

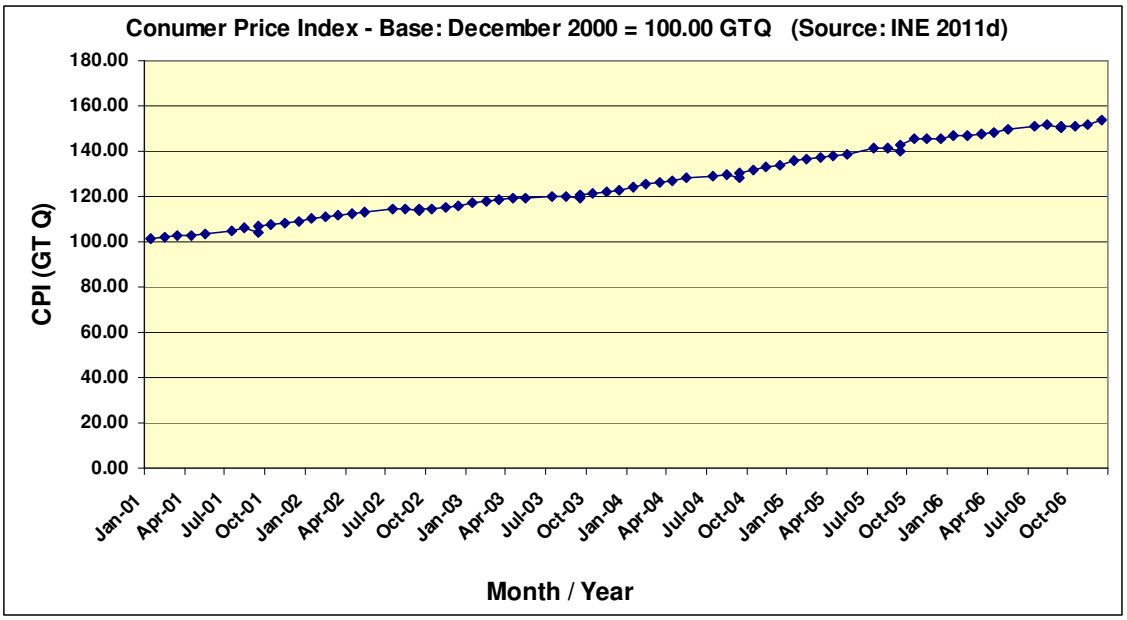


Figure G6: Evolution of the Consumer Price Index between Jan. 1996 and Dec. 2006 (Source: INE 2011d)

In addition, its important to comment the fact that disasters triggered by events associated with natural phenomena have also impacted the economy at the national and local levels. As reported by ECLAC in its report targeting the Pacaya volcano eruption and Tropical Storm Agatha in 2010 (ECLAC 2011), disasters in the last decades have dwindled the efforts of the Guatemalan Government in terms of sustainable development. Table G4 presents impacts of disasters in relation to GDP for the earthquake of 1975 and related to Hurricanes Stan and Mitch.

Table G4: Summary of impacts of disasters: ECLAC (2011)					
Year	**Event**	**Damages and Losses (percentage of GDP**	**Impact on GDP (Percentage)**	**Fatalities**	**Affected Population**
1976	Earthquake	17.9%	11.0%	23,000	3,400,00
1998	Hurricane Mitch	4.7%	1.5%	268	106,000
2005	Hurricane Stan	3.5%	0.1%	669	474,821
2010	Tropical Storm Agatha and Pacaya volcanic eruption		≥ 0.5% [a]	235[b]	559,923

a) ECLAC estimates that the impacts due to the storm and the eruption represent at least 0.5% of the GDP.

b) At the time of the report, ECLAC reported 235 fatalities and 42 persons missing.

Poverty

As many developing countries, Guatemala has been trying to combat poverty and corruption and to promote social development and economic growth while trying to maintain a monetary policy to keep the exchange rate between the Guatemalan Quetzal currency (GTQ) and the United States dollar (US$) in control, and inflation within adequate proportions. However, global economic turmoil, electoral processes, and disasters often trigger changes in policies and programmes that have an impact on resources targeted to alleviate poverty and improve social welfare. While in the previous decades governments favoured an export market economy, experts argue that gains from such an approach may have widened the gap between the rich an the poor, as measured through the Gini coefficient (World Bank, 2009).

Poverty has been a difficult challenge to address in Guatemala. The following root causes have been identified by experts from the United Nations Children's Fund (UNICEF, 2010): discrimination due to gender and ethnicity, lack of actions designed for rural development, low education levels, malnutrition and disasters.

As in the case of many other developing countries, the extreme poverty line is linked to the cost of food to sustain a person, while general poverty line is linked both to the cost of food to sustain a person and the cost associated with other goods and basis services. Table G5 presents data on both the general and the extreme poverty lines corresponding to the years 2000 and 2006 as reported by INE (2006). The table also presents the proportion the monetary value of extreme poverty with respect to the monetary value of general poverty.

Table G5: Monetary values related to the Poverty and Extreme Poverty lines for Guatemala: 1989 – 2006. Source: INE (2006)			
	Extreme Poverty	General Poverty	**Proportion EP/GP**
Year 2000	Q 1,911.00	Q 4,318.00	44.2%
Year 2006	Q 3,206.00	Q 6,574.00	48.7%

According to SEGEPLAN (2007, 2008a, 2010a) and INE (2006), general poverty was reduced from 56% to 51% between 2000 and 2006. Extreme poverty, unfortunately, dropped far less in that same period, from 15.7% to 15.2%. In addition, urban poverty rose from 27.1% to 30% while rural poverty dropped from 75% to 70.5% within the same period. Table G6 presents data on poverty, extreme poverty and the human development index according to SEGEPLAN (2008a) and according to the World Bank (2009). Two trends that have been identified by SEGEPLAN in its *Third Report regarding advancements in reaching the Millennium Development Goals* (2010a) in relation to the distribution of poverty are:

Table G6: Poverty, Extreme Poverty and the Human Development Index for Guatemala: 1989 – 2006			
Indicator	**1989**	**2000**	**2006**
General Poverty	62.8	56.2	51.0
Extreme Poverty	18.1	15.7	15.2
Human Development Index	0.583	0.634	0.702

1. A clear polarization in the territorial distribution of poverty, which reflects the great socio-economic inequalities, as poverty more concentrated in rural areas of Guatemala, and in particular

in departments where the majority of the population belongs to ethnic groups. Departments (provinces) such as Quiche, Alta Verapaz, Huehuetenango, Sololá, Totonicapán, Baja Verapaz, and San Marcos have a higher incidence of general poverty (above 70%). In addition, Alta Verapaz, Quiché and Huehuetenango are the provinces or departments with the highest levels of extreme poverty (above 30%).

2. The urbanization of poverty, as the migration to urban areas may not necessarily be considered as a solution to poverty, implying that such migration to urban areas may not necessarily lead to improvements in the quality of life of those migrating to such areas (World Bank, 2009). According to SEGEPLAN (2007), urban poverty increased from 18% to 28% in urban areas between 2000 and 2006, while rural poverty decreased from 81% to 72% in the same period. However, it is important to remark that despite this increase in urban poverty, 60% of those who are not poor or extreme poor live in urban areas, while 31% live in rural areas.

As it is to be expected, poverty is inversely correlated with the degree of education of the population (World Bank, 2009). Table G7 presents data on the percentage of poor and non-poor according to the level of education achieved (INE, 2011c).

Table G7: Level of Education and level of poverty. Source: INE (2006)

	Level of Education						
Class	**None**	**Incomplete Primary Education**	**Completed Primary Education**	**Incomplete Secondary Education**	**Completed Secondary Education**	**Incomplete Superior Education**	**Complete Superior Education**
Poor	71.6	55.2	39.0	22.5	8.5	1.1	0.4
Non Poor	28.4	44.8	61.0	77.5	91.5	98.9	99.6

Experts from SEGEPLAN (2008a) comment that a sharp reduction in the illiteracy rate in recent years may explain the decrease in poverty reflected in the statistics.

Using the 2002 census data and the 2000 Survey of Living Conditions, SEGEPLAN, INE, and Rafael Landivar University (URL) generated maps of general poverty and extreme poverty by municipal district for the entire country (ASIES, 2005). These maps are presented in Figure G7.

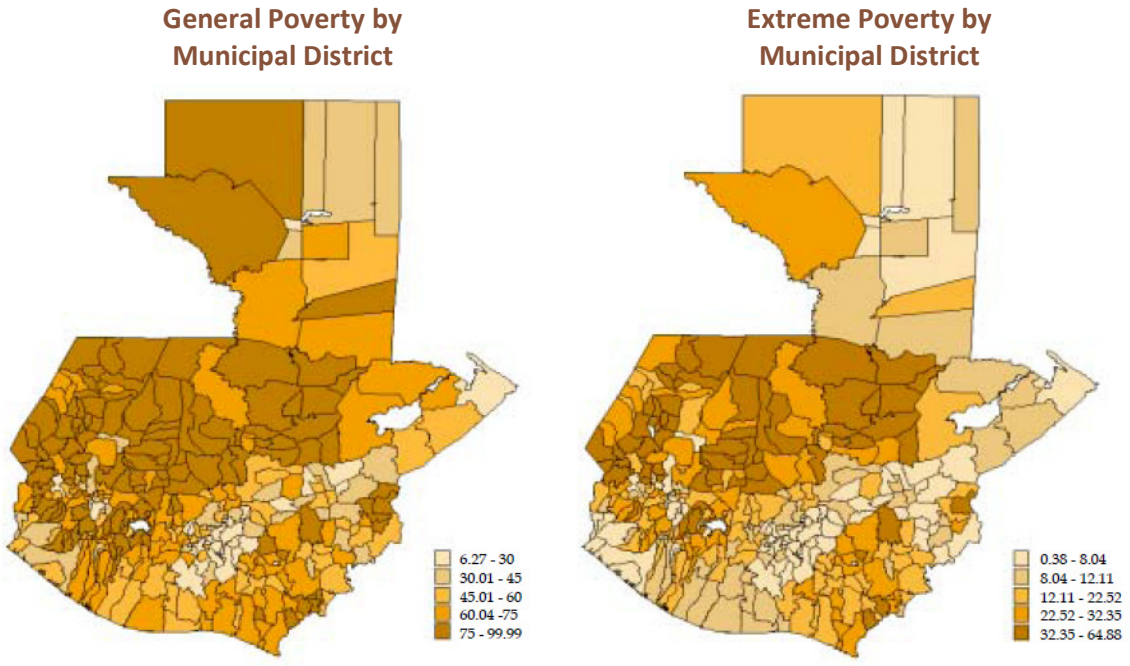


Figure G7: Geographical distribution of General Poverty and Extreme Poverty by Municipal District (Source: SEGEPLAN, INE and URL, 2002)

Despite these results, it is important to note that between 1994 and 2002 there were improvements in the reduction of poverty and extreme poverty in many municipal districts of the country. The Guatemalan Think Tank focusing on social and economic issues ASIES conducted a comparison of the levels of poverty and extreme poverty for these years and estimated increases or decreases in poverty and extreme poverty. The result of this analysis is presented in Figure G8. Municipal districts displaying improvements in general poverty and extreme poverty are highlighted in blue-colours, and those displaying negative results (increases in the level of poverty) are presented in orange and brown colours. As it can be seen, areas to the west, towards Mexico, and to the east, towards Honduras and Belize, seem to display improvements, while centrally located areas seem to display negative results.

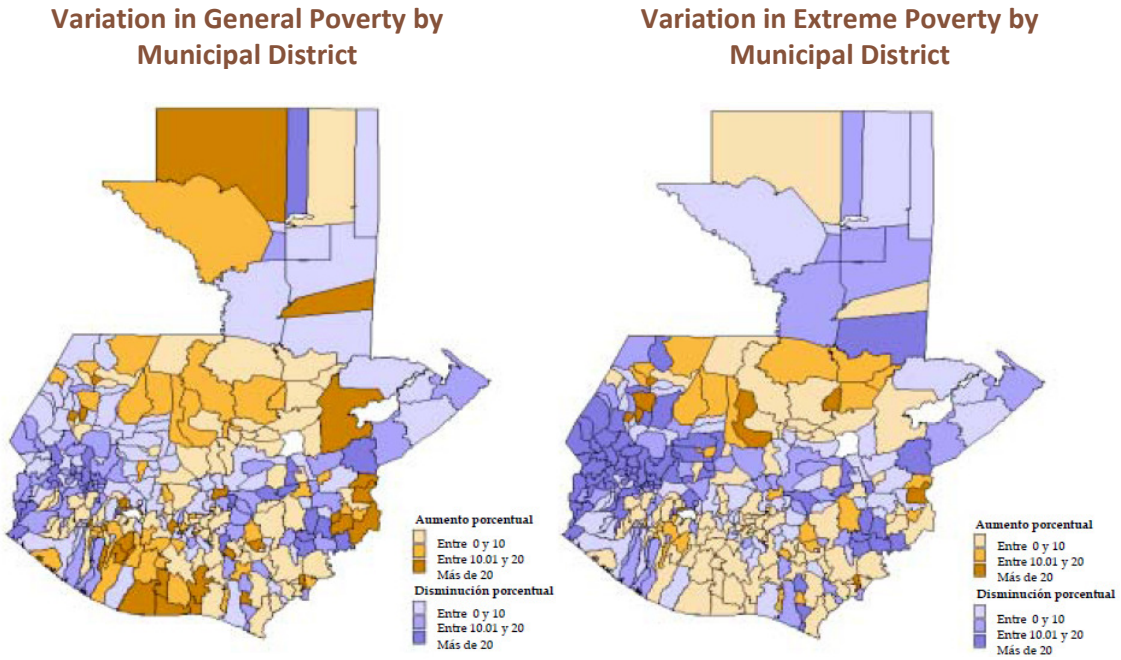


Figure G8: Geographical variations of General Poverty and Extreme Poverty by Municipal District between 1994 and 2002 (Source: SEGEPLAN, INE and URL, 2002)

The distribution of population classified by department as non-poor, below the poverty line but above the extreme poverty line, and below the extreme poverty line can be seen in table G8. As it can be seen from this table, the three departments with the least percentage of poor people are Guatemala, Sacatepequez, and Escuintla, which have been highlighted in this table with a green-colour background. Solola, Chiquimula, Jutiapa have also been highlighted as this project focused on these departments. Solola, one of the departments of the highlands, and whose population belongs to the Maya ethnic group, has a high percentage of its population living below the poverty line. In contrast, Jutiapa at the bottom of the table has a comparatively lower percentage of people living below the poverty and extreme poverty lines.

Another parameter which is used to represent poverty is the Human Development Index (HDI). According to SEGEPLAN, between 1994 and 2006, the HDI improved from 0.583 to 0.702. Several components of this index have also displayed improvements in the same period of time at the national level. The Health Index rose from 0.615 to 0.763; while the Education Index rose from 0.555 to 0.700; and the Income Index rose from 0.578 to 0.642. Table G9 presents these indices sorted by department (province) and highlights 5 provinces, several of which are relevant to this project. These provinces are:

Guatemala: where the capital city is located;

Escuintla: which is located south of the capital city and is highly developed relatively in terms of export agriculture, energy, port facilities, and commerce.

Sololá: located to the west of the capital city, in a mountainous region and representative of a department with a high degree of population belonging to ethnic groups.

Chiquimula: Located to the east of the capital city, in the Dry Corridor and heavily affected by drought and by the crises.

Jutiapa: Located to the south-east of the capital city, in the Dry Corridor and also affected by drought and by the crises.

Table G8: Total population (poor, extreme poor and non-poor) by Department for the year 2006. Source: INE (2011 c)

Departament	Total Population	Levels of Poverty				Non Poor
		Population belofe the General Poverty line	%	Population below the Extreme Poverty line	Population in Poverty, but not Extreme	
Guatemala	2,975,417	486,405	16.3	13,408	472,997	2,489,012
El Progreso	150,826	63,024	41.8	12,262	50,762	87,802
Sacatepéquez	278,064	101,565	36.5	13,194	88,371	176,499
Chimaltenango	519,667	314,389	60.5	100,444	213,945	205,278
Escuintla	610,731	252,783	41.4	32,887	219,896	357,948
Santa Rosa	332,724	192,733	57.9	33,993	158,740	139,991
Sololá	361,184	269,541	74.6	105,992	163,549	91,643
Totonicapán	395,324	284,059	71.9	79,225	204,834	111,265
Quetzaltenango	735,162	323,403	44.0	74,197	249,206	411,759
Suchitepéquez	464,304	254,018	54.7	63,061	190,957	210,286
Retalhuleu	273,328	137,771	50.4	25,969	111,802	135,557
San Marcos	905,116	592,421	65.5	180,519	411,902	312,695
Huehuetenango	986,224	703,293	71.3	217,289	486,004	282,931
Quiché	769,364	623,282	81.0	197,241	426,041	146,082
Baja Verapaz	245,787	173,071	70.4	52,030	121,041	72,716
Alta Verapaz	914,414	720,865	78.8	397,897	322,968	193,549
Petén	441,799	251,971	57.0	64,279	187,692	189,828
Izabal	364,924	188,713	51.7	66,700	122,013	176,211
Zacapa	215,050	115,998	53.9	40,541	75,457	99,052
Chiquimula	342,681	203,881	59.5	94,961	108,920	138,800
Jalapa	279,242	171,004	61.2	63,287	107,717	108,238
Jutiapa	426,497	201,701	47.3	47,228	154,473	224,796
Total	**12,987,829**	**6,625,891**	**51.0**	**1,976,604**	**4,649,287**	**6,361,938**

Source: Instituto Nacional de Estadística, INE. Encuesta Nacional de Condiciones de Vida, ENCOVI-2006.

The table displays the fact that the three departments with the largest improvements in the HDI in the period 1994 – 2006 are Alta Verapaz, Escuintla, and Chiquimula. It is interesting to note as well that the departments with the lowest improvements are those with the highest standards of living: Guatemala and Sacatepequez.

Table G9: Human Development Index and components per department

GUATEMALA (1994, 2002 y 2006): Human Development Index by Deparment according to components												
	HDI			Health Index			Education Index			Income Index		
	1994	2002	2006	1994	2002	2006	1994	2002	2006	1994	2002	2006
Country	**0.583**	**0.640**	**0.702**	**0.615**	**0.690**	**0.763**	**0.555**	**0.613**	**0.700**	**0.578**	**0.617**	**0.642**
Departament												
Guatemala	0.769	0.795	0.798	0.817	0.852	0.824	0.785	0.803	0.829	0.706	0.730	0.741
El Progreso	0.576	0.648	0.703	0.553	0.660	0.728	0.608	0.672	0.746	0.568	0.613	0.634
Sacatepéquez	0.645	0.708	0.732	0.668	0.759	0.762	0.680	0.729	0.781	0.586	0.635	0.653
Chimaltenango	0.531	0.618	0.679	0.522	0.644	0.733	0.542	0.624	0.717	0.529	0.585	0.587
Escuintla	0.518	0.605	0.677	0.402	0.570	0.696	0.606	0.654	0.709	0.546	0.590	0.627
Santa Rosa	0.557	0.604	0.677	0.590	0.624	0.733	0.565	0.625	0.698	0.516	0.564	0.601
Sololá	0.457	0.579	0.606	0.492	0.702	0.697	0.381	0.483	0.564	0.498	0.552	0.556
Totonicapán	0.465	0.540	0.614	0.469	0.574	0.644	0.418	0.497	0.644	0.508	0.550	0.555
Quetzaltenango	0.574	0.655	0.696	0.578	0.714	0.713	0.589	0.652	0.735	0.554	0.598	0.639
Suchitepéquez	0.506	0.587	0.657	0.478	0.600	0.722	0.508	0.580	0.642	0.532	0.581	0.605
Retalhuleu	0.559	0.632	0.697	0.576	0.690	0.759	0.569	0.631	0.714	0.533	0.574	0.617
San Marcos	0.509	0.583	0.663	0.531	0.630	0.720	0.496	0.571	0.682	0.500	0.548	0.587
Huehuetenango	0.508	0.560	0.644	0.658	0.686	0.765	0.400	0.471	0.588	0.467	0.523	0.578
Quiché	0.461	0.508	0.610	0.631	0.638	0.762	0.305	0.383	0.527	0.445	0.504	0.539
Baja Verapaz	0.524	0.576	0.651	0.666	0.699	0.769	0.425	0.495	0.616	0.480	0.535	0.568
Alta Verapaz	0.460	0.514	0.623	0.638	0.620	0.755	0.282	0.412	0.568	0.460	0.510	0.545
Petén	0.579	0.619	0.700	0.760	0.773	0.750	0.489	0.554	0.738	0.489	0.531	0.614
Izabal	0.557	0.611	0.699	0.568	0.647	0.779	0.548	0.591	0.690	0.554	0.596	0.628
Zacapa	0.576	0.638	0.702	0.575	0.683	0.777	0.580	0.620	0.702	0.574	0.611	0.628
Chiquimula	0.499	0.564	0.656	0.493	0.597	0.717	0.454	0.507	0.638	0.550	0.588	0.614
Jalapa	0.512	0.568	0.638	0.573	0.619	0.709	0.462	0.533	0.615	0.501	0.552	0.591
Jutiapa	0.535	0.593	0.679	0.550	0.624	0.720	0.541	0.600	0.690	0.513	0.556	0.627

Source: SEGEPLAN, elaborated with data from Banguat, Celade, INE, Survey of Living Conditions (ENS89, ENCOVI 2000 and ENCOVI 2006), MSPAS, MINEDUC, UNDP and World Bank.

Unfortunately, SEGEPLAN (2008a) also recognizes the difficulties that governments face when implementing policies when there is no data to monitor the evolution of relevant indicators. The national survey of living conditions which was used to assess both poverty and extreme poverty was conducted by the National Institute of Statistics of Guatemala only twice in recent years, in the years 2000 and 2006. Population and housing censuses are also conducted only once every decade. The last population and housing census was conducted in 2002. Thus it is not possible to track changes in poverty on a monthly or on an annual basis, or to track the impacts of the GEC within a short interval of time. Data on indicators related to health, the environment, and employment are also missing; thereby incapacitating the government and other organizations to monitor the impacts of policies. To this end, it is important for Global Pulse to find ways, with the support of other United Nations organizations and entities such as the United Nations Department of Economic and Social Affairs (DESA) and the United Nations Development Programme, to support developing countries such as Guatemala in improving their national statistics as a way to facilitate the monitoring of policies and programmes.

Similar comments regarding the lack of data generated on a more frequent basis are made by international organizations such as the World Bank and ECLAC particularly when determining the effects of global events or disasters of sudden onset.

Livelihoods, livelihood capitals and vulnerability

Livelihoods can be described as the way in which people live in any place. According to DFID's sustainable livelihoods framework (Chambers and Conway, 1992; Ashley and Carney, 1999): "*a livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base*." According to the Mesoamerican Famine Early Warning System (MFEWS, 2005), a livelihood is "*the sum of all of the ways of life of a household, through which such household live from year to year and cope with the impacts of shocks and stresses*."

As stated by experts from Tango International Inc.(2002), sustainable livelihoods allow households to have adequate and sustainable access to income and resources to meet basic needs (including adequate access to food, potable water, health facilities, educational opportunities, housing, and time for community participation and social integration). As such, livelihoods should allow households to achieve several types of securities including income security, food and nutritional security, health security, water security, shelter security, and social network security among others. DFID, CARE, IFRC and other international organizations have linked the notion of livelihoods to livelihood capitals, which are described as tangible or intangible assets that are used by households in their daily activities to reach those securities.

For example, natural capital is used to achieve food and nutritional security and water security. Human capital of course contributes to the generation of economic capital and is linked to health security. Economic capital allows households to achieve income security, health security, food and nutritional security, and shelter security. Physical capital is related to infrastructure and hence is linked to shelter security and to water security in those cases where infrastructure is used to deliver potable water to the households. Figure G9 displays the links between livelihood capitals and securities.

As expected, the vulnerability of a capital may lead to one or several insecurities. For example, in poor households where economic capital is gathered through manual labour in farms which produce products for exports, the income may be vulnerable to sudden drops in the international prices of such goods, leading the household to experience income insecurity, and other types of insecurities depending on the severity of the effect of the reduction in such international prices.

In 2005 MFEWS reported that agriculture was the main sector of development for the national economy of Guatemala and that nearly 52.5% of the total population of the country was engaged in agriculture. In addition, the report highlighted the distinction between *subsistence agriculture* (corn, beans, and other standard vegetables) which encompasses the majority of the rural population and is usually conducted in small plots of land and *export agriculture* (coffee, bananas, sugar cane, cardamom and other products for export) which is conducted in large plots of land, sometimes belonging to foreign companies.

In 2009 MFEWS (2009) presented an updated version of its assessment regarding livelihoods in Guatemala, redefining a way of life as the means that are used by households in a particular geographic region for subsistence, meaning their incomes and food, as well as the hazards to which such households are exposed and the coping mechanisms employed when subject of stresses or events associated with these hazards. The updated version was carried out with SESAN and FAO. This updated version proposed 20 different types of livelihoods. Figure G10 replicates a map from this

MFEWS 2009 report displaying the 20 different types of livelihoods present in Guatemala as characterized by MFEWS.

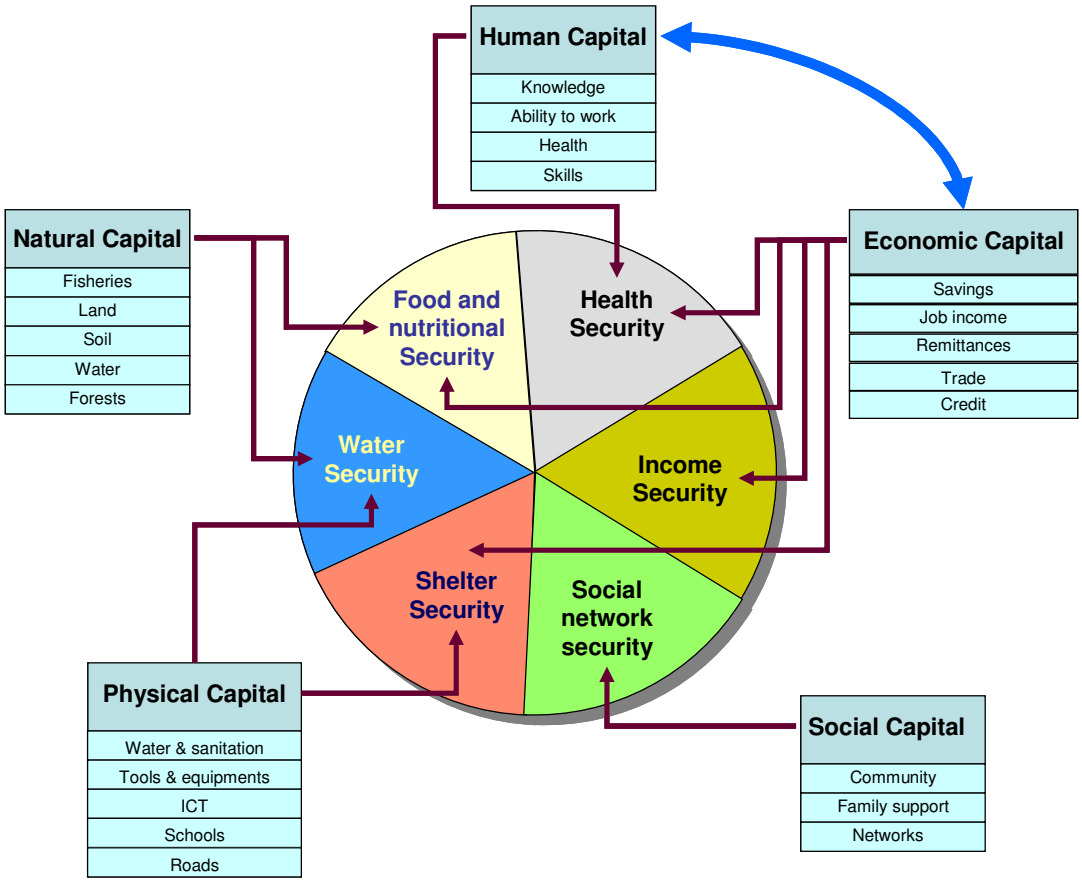


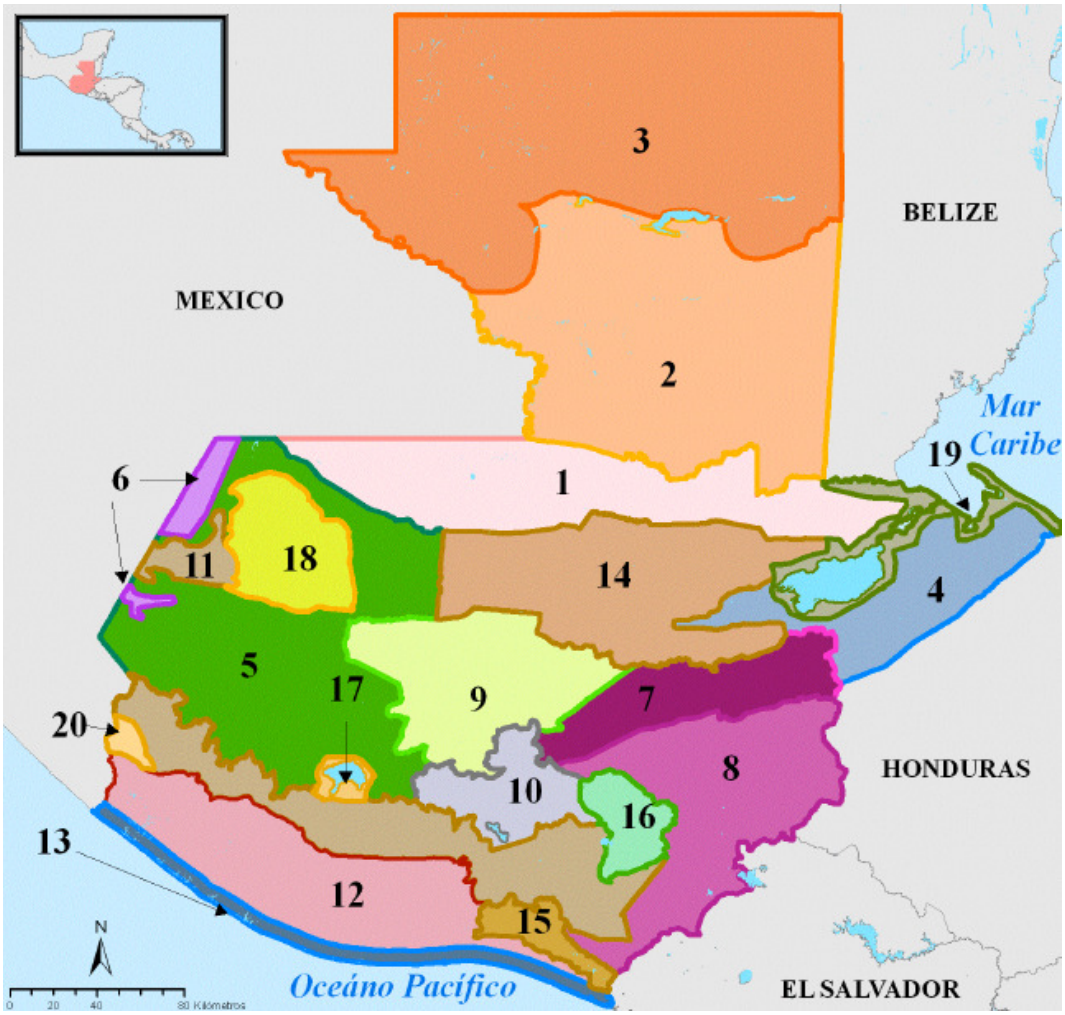
Figure G9: Livelihood capitals and their contribution to livelihood securities.

According to this updated version, nearly all livelihoods depend on the purchase of food to some degree, and in seven of these livelihoods considered as extremely poor, inhabitants buy all the beans they consume, and in three of these livelihoods extremely poor people buy all their corn. Self production in other livelihoods is carried out either in land rented or owned by the people. The report documents that in three specific livelihoods, extremely poor people depend to a small degree on humanitarian assistance to acquire corn and beans.

With respect to income, the report manifests that the extreme poor and the poor basically are hired as labourers in farms and only in two livelihoods do the extreme poor and the poor depend on unskilled manual labour for their income. Other sources of income include formal and informal commercial activities, skilled manual labour, formal employment, rental of land, and remittances. As it can be seen, this characterization by MFEWS highlights the fact that livelihoods do not follow political borders among departments (provinces), and are influenced by levels of income or poverty.

In terms of the five departments being addressed, it can be stated that according the 2009 version of livelihoods of MFEWS, the Escuintla Department comprises three types of livelihoods: Coffee production to the north on the foothills of Fuego and Pacaya volcanoes; agro-industry for exportation in the majority of the department (sugar cane, production of energy); and fishing and subsistence agriculture in the Pacific coastal strip. According to MFEWS, the majority of the Department of

Escuintla dedicates itself mostly to the production of sugar cane for exportation and for local consumption, natural rubber, basic grains and fruits.



Livelihoods of Guatemala (Source: MFEWS, FAO, and SESAN, 2009)

1. Northern Transversal Strip
2. Peten South
3. Peten North
4. Agro-industry for exportation and livestock
5. Subsistence agriculture
6. Agriculture and remittances
7. Agro-industry, wood industry, mining and coffee
8. Basic grains and border with El Salvador and Honduras
9. Basic grains and sale of manual labour
10. Agro-industry and textile-for-export labour
11. Coffee production
12. Agro-industry for exportation and basic grains
13. Fishing and subsistence agriculture
14. Cardamom and coffee production
15. Livestock
16. Vegetables and fruits of high altitude
17. Agro-touristic region of Lake Atitlan
18. Cuchumatanes mountain range
19. Artisanal fishing of the Atlantic
20. Agriculture, sale of manual labour, and commerce

Figure G10: Livelihoods in Guatemala in 2007/2009 according to a classification by MFEWS (Source: MFEWS, 2009).

Among the factors which have an impact on human capital, particularly when it comes to food security, are the **price of fuels** which have a direct impact of basic grains and **gastrointestinal diseases** due to the consumption of contaminated water drawn from artisanal wells; and **respiratory diseases** (malaria, dengue) due to its large amount of rainfall and humidity.

The poor and the extremely poor work in agricultural plantations mostly as unskilled labourers. Sugar cane and coffee are by far the main generators of jobs for peasants without skills, and there is substantial migration from many regions of the country during the sugar cane season and to a lesser degree during the coffee crop season.

The recent expansion of sugar cane production in this department has led to both benefits and problems. The expansion of the land dedicated to sugar cane production implies a larger demand for unskilled labour, particularly during the crop season, which benefits the extremely poor that base their income on such type of labour-related income. However, as poor people often rent land to produce half of the basic grains which they consume during the year, the expansion of sugar cane may increases the price to rent lands for agriculture.

Other sources of income include commercial activities, both formal and informal, and more recently in the construction business. The main insecurity associated with income is related to the dependency of people on labour dedicated to agro-exports products such as sugar cane, rubber, and coffee.

In the case of the Department of Solola there are mainly two types of livelihoods according to MFEWS: subsistence agriculture in the highlands, and the agro-touristic region of lake Atitlan. Solola is one of those departments in the country which has a large majority of Maya population. The subsistence agriculture segment covers nearly two thirds of the Department and focuses on basic grain agriculture for self-consumption. The high topographic relief presupposes a forestry use. However, the majority of the population which lives in poverty (52%) and extreme poverty (25%) has to make use of land for subsistence agriculture and, given its lack of education, seeks unskilled labour opportunities mostly in agriculture and less in construction. Some people from this Department migrate during sugar cane and during the coffee crop seasons for temporary work. Other sources of income include formal and informal commercial activities.

In the case of the extreme poor, 60% of the income depends on unskilled agricultural labour; 25% of the income is related to unskilled labour for other purposes rather than agriculture (construction for example); and other forms of formal and informal commercial activities may represent up to 15% of the income. In the case of the poor, 45% of the income depends on unskilled agricultural labour; 35% of the income is related to unskilled labour for other purposes; and commercial activities may represent up to 20% of the income. Those families with better economic status rely of a variety of sources of income excluding unskilled labour for agriculture. Remittances may account for 13% of the income in the middle class and 4% in the case of the high income group. These two groups rely more on formal and informal commerce and on formal, skilled labour.

Human capital in terms of food security, particularly for poor and extremely poor people, depends on the purchase of food for subsistence in addition to what they may be able to grow. It is estimated that the extremely poor must purchase between 80% and 97% of their basic grains for subsistence and that the poor purchase between 50% and 73% of basic grains for subsistence. The use of barter by the extreme poor is another way to gather food in exchange for the use of land. As expected, the extremely poor and the poor must rely on a modification of their access to income in case of increases in the cost of living.

The other livelihood in Sololá is the lake Atitlan agro-touristic region. This is a densely populated area and is among the largest touristic regions of the country along with Antigua and the archaeological park of Tikal. Ways of life are centred on agriculture, tourism, handicrafts, and commerce. The poor and the extreme poor work as unskilled labourers in the majority of cases. And while commercial activities may offer alternatives to income, it's those groups which may be considered as belonging to the middle and upper classes that can take advantage of such opportunities.

In terms of income, the MFEW report indicates that the extreme poor rely exclusively on unskilled agricultural labour for their income (100%), while the poor rely in such labour for 52% of their income; 10% of the income may be related to tourism, 20% related to the sell of agricultural production, 4% to remittances and 15% to other commercial activities. The middle income group has more options in terms of income, including a larger dependency on formal and informal commerce (51%), tourism (25%), formal skilled labour (16%), remittances (5%), and transportation (3%). The higher income groups rely substantially on tourism (40%), formal and informal commerce (45%), remittances (5%), and transportation (10%).

The extreme topographic relief of the area and its geological fragility are critical concerns in the case of landslides, particularly when the poor and the extreme poor remove forests for corn production, thereby removing all vegetation cover to the bare land.

In the case of Chiquimula and Jutiapa, MFEWS classifies Chiquimula and most of Jutiapa as areas dedicated to basic grains. Agriculture provides food for three to six months of the year, and the region is also seen as an exporter of black beans and other vegetables to other regions of the country. The basic grains produced are corn and beans. The region also is used for coffee production. Unfortunately, the poor quality of soils for agricultural purposes and its semi-arid regime may lead to food insecurity in those years when there is a drought.

The extreme poor and the poor work as unskilled labourers in agriculture, and migrate to nearby and far away areas during the crop seasons (coffee and sugar cane). Other sources of income include formal and informal commerce, temporary work during coffee crop season, and mining to a small degree. Remittances may represent up to 15% of the income of the poor and up to 10 % of those considered as middle class. As in other regions of the country, the extreme poor base their income on one or two sources: agricultural unskilled labour (90%) and the sell of agricultural production (8%). In the case of the poor, unskilled labour represents 55% of the income, the sell of agricultural production represents 25% of the income and remittances represent 15%. The middle and high income groups do not depend on agricultural labour, but rather on commercial activities (formal and informal) and skilled labour.

The percentage of population in extreme poverty is 30% and the percentage of population in poverty is 60%. The ch'orti' ethnic group may be considered as one in moderate degree of malnutrition due to the persistence of poverty and recent droughts. These conditions of drought have led to the adoption of sorghum as a crop in exchange for corn which is highly vulnerable to drought.

The majority of people in this region depend on the purchase of food for subsistence. The extreme poor purchase between 70% and 75% of basic grains for subsistence, while the poor purchase roughly 50% of basic grains. Given the high dependency of people in this area on agriculture, drought is a major concern. In particular because a segment of this region is part of the dry corridor which has been impacted by droughts in 2001 and 2009 again.

In 2008, SEGEPLAN (2008b) published its report on the "Vulnerability of Municipal Districts and the Quality of Life of its Inhabitants". Vulnerability was associated with Basic Unsatisfied Needs and incorporated a variety of parameters including:

Percentage of poverty	Quality of housing	School attendance
Percentage of extreme poverty	Overcrowding	Growth retardation
Index of marginalization	Access to potable water	Index of nutritional vulnerability
Employment	Access to sanitary service	

Using data from a MAGA, SEGEPLAN, INE, and the MINEDUC, experts from SEGEPLAN ranked all municipal districts into five classes of quality of life: *very low*, *low*, *medium*, *high*, and *very high*. In this context, SEGEPLAN defined quality of life as "*a degree of wellbeing, happiness, and*

satisfaction of the human being, empowering him or her to act, function, and to have a positive sensation regarding his or her life". Figure G11 represents the map of all municipal districts and their class of quality of life.

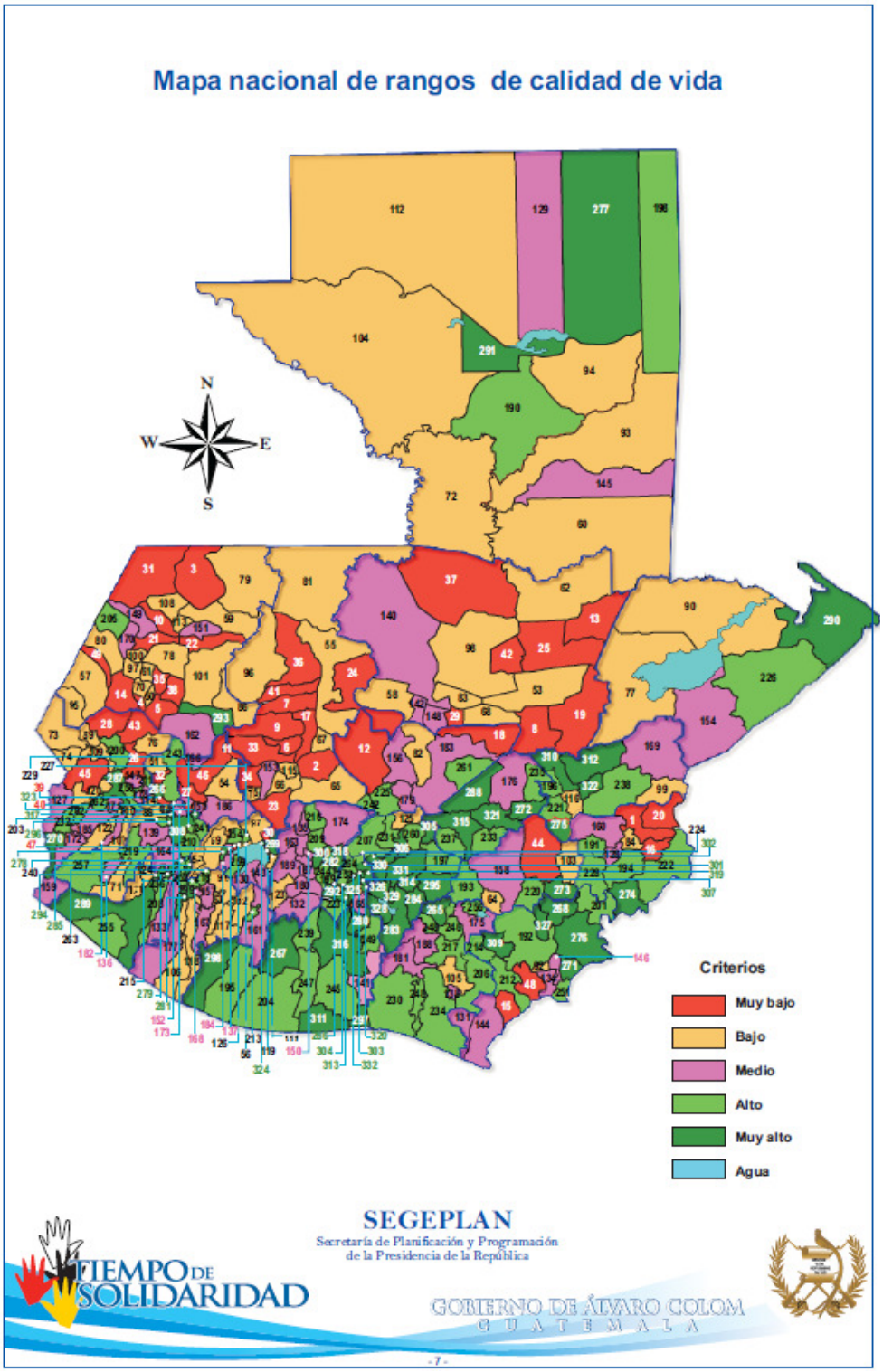


Figure G11: Levels of Quality of Life in Municipal Districts of Guatemala (Source: SEGEPLAN, 2008b). Very low quality of life is represented in red colour, medium quality in pink, and very high quality in dark green color.

Statistics on this map are presented in table G10. As it can be seen, nearly 50 of the 332 municipal districts of the country can be classified as low class and include roughly 12.9% of the population of the country. In the Department of Guatemala that hosts the capital city, 12 of the 17 municipal districts belong to the very high class, while four belong to the high class and only one, Chuarrancho, belongs to the low class.

Table G10: Classification of Quality of Life of Municipal Districts in Guatemala. Source: SEGEPLAN(2008b)

Class	Number of Districts	Percentage	Number of Inhabitants (2008)	Percentage of Inhabitants (2008)
Very Low	49	14.8	1,771,674	12.9
Low	77	23.2	2,884,068	21.1
Medium	63	19.0	2,308,148	16.9
High	75	22.6	2,254,378	16.5
Very High	68	20.5	4,482,004	32.7

The Department of Escuintla, located in the Pacific lowlands, is similar to Guatemala. 6 of its 13 municipal districts belong to the very high class, 6 belong to the high class, and only one belongs to the medium class.

In the Sololá Department located in the highlands, three municipal districts belong to the very high class (Lake Atitlan Agro-touristic region), three belong to the high class, four belong to the medium class, 7 to the low class, and two belong to the very low class.

In the Chiquimula Department which borders with Honduras, one municipal district belong to the very high class, four to the high class, two belong to the medium class, one belongs to the low class and three belong to the very low class.

In the Department of Jutiapa five municipal districts belong to the very high class, an equal number of districts belong to the high class, four belong to the medium class, one belongs to the low class and two belong to the very low class.

Alta Verapaz, Quiché and Huehuetenango are the departments which contain mostly very low and low class municipal districts.

Employment trends

Other aspects which play a role in affecting livelihoods are the employment trends. As a developing country with a large proportion of its population living in poverty in rural areas, many families have opted to migrate to the capital city, Guatemala city, and seek temporary employment initially in the informal economy. As expected, with a large birth rate, Guatemala faces a critical challenge of generating a large amount of jobs to cope with the massive numbers of young people entering the work force. It is likely that the coffee crisis of 2001 led to a loss of 246,000 jobs during the 2001/2002 crop season[2] (IOM, 2001) and to around a loss of 375,500 jobs during the 2002/2003 crop season. Such job losses may have triggered massive migrations of young people to the United States. To put these figures into perspective, the International Organization for Migrations (IOM) cites a figure of 750,000 jobs (permanent and temporary) for the 1999/2000 crop (IOM, 2001).

According to SEGEPLAN (2010a), the percentage of people employed has increased slightly between the years 2000 and 2006, from 57.4% to 57.7%. However, there was a large increase between the years 1989 and 2000, from 48.7% to 57.4%.

Taking into consideration the fact that a large segment of the population of the country belongs to different ethnic groups, table G10 presents data on employment trends according to gender and ethnicity. The drastic changes seen between 1999 and 2000 in the case of females is related to the

[2] Exact statistics are not available, and so estimates are conducted by different institutions leading to different results. For example, ECLAC estimates that 77,000 jobs may have been loss directly in 2001 (ECLAC, 2002).

opening of labour opportunities in the textile-for-export industry (maquilas), and in areas related to commerce and services.

Table G10: Variation in percentage of employment by gender and ethnicity: 1989 – 2006. Source: SEGEPLAN (2010a)

Description	1989	2000	2006
Indigenous Female	19.1	40.8	42.0
Indigenous Male	82.0	82.5	82.6
Not indigenous Female	26.3	38.2	40.7
Not indigenous Male	72.1	73.5	72.9

In the context of type of activity, figures from the census data indicate that employment in the agricultural sector continues to be dominant, despite the fact that it has been decreasing in recent decades. Table G11 presents data on the percentage of people employed by type of activity. As it can be seen, from 1989 to 2006, the percentage of people working in agriculture has been decreasing consistently.

However, when it comes to people in extreme poverty, agriculture remains the main source of employment. As experts from SEGEPLAN state, employment in the agricultural sector does not offer the best of working conditions, but most of the people in this group have few capacities and skills to migrate to other types of jobs. Table G12 presents data on the type of activities which people in extreme poverty are involved with.

Table G11: Percentage of the people employed by type of activity: 1989 – 2006. Source: SEGEPLAN (2010a)

Description	1989	2000	2006
Agriculture	49.9	38.8	33.2
Commerce	13.2	21.6	22.8
Industry	13.7	13.8	15.9
Construction	4.0	5.7	6.6

An important lesson to be learned in the context of international crisis is the impact of sharp drops in the international market prices of agricultural products exported by any country, including Guatemala. Agricultural products for exportation such as coffee and sugar cane are labour intensive in Guatemala, and hence such agricultural products generate hundreds of thousands of jobs within the country, either on a permanent or on a temporary basis (during harvesting).

Table G12: Percentage of the people living in extreme poverty employed by type of activity: 1989 – 2006. Source: SEGEPLAN (2010a)

Description	1989	2000	2006
Agriculture	75.0	74.0	69.2
Commerce	5.9	7.8	8.3
Industry	9.0	10.1	10.4
Construction	2.8	2.8	4.4

SEGEPLAN (2008a) states that poverty is concentrated mainly in the northern and north-western regions of the country, where ethnic groups of Mayan descent are predominant. Unfortunately, as it can be seen from the previous tables, there is very little data regarding employment, and hence it is not possible to track the changes in employment trends associated with the GEC which many manifest themselves in a short time. The data on job losses associated with the 2001 crisis was gathered through specific assessments conducted by local NGOs and by the Ministry of Employment and Welfare with the support of the International Migrations Organization at the time when there was a Flash Appeal to assist Guatemala as a result of the combination of the coffee crisis and the drought that impacted the country in 2000 and 2001.

Nutrition and Health

Nutrition and health play a crucial role in ensuring sustainable development of communities and of the country as a whole. However, for decades Guatemala has been facing problems associated with food insecurity and chronic malnutrition, often related to poverty (World Bank, 2009; WFP, 2010).

Public health is managed in Guatemala through efforts conducted by MSPAS and the Guatemalan Social Security Institute (IGSS). In the Second Presidential Report to the Congress of the Republic of Guatemala for the year 2005, the then President of the Republic commented (SEGEPLAN, 2005) that the country had been facing food insecurity, which is reflected in the low weight of infants at birth and in children, particularly in children belonging to indigenous ethnic groups. Among the factors

cited in this report that led to such conditions are the lack of productive infrastructure, road networks, and basis services in rural areas, which has direct impacts in inhibiting access to food. Other factors leading to malnutrition include the lack of access to potable water, as in 2005 only 4% of the 332 municipal districts operated waste treatment plants. The remaining districts simply discharge wastewater directly to rivers or lakes without any treatment. In addition, this reports states that the main mortality causes continue to be acute respiratory infections, diarrhoea, and malnutrition. The departments with most cases related to malnutrition are Totonicapan, Huehuetenango, Quiché, Alta Verapaz and San Marcos. Diseases provoked by vectors such as malaria and dengue affect coastal areas in the Pacific and Caribbean coast plains and in Peten. According to this report, 57% of all cases took place in the departments of Guatemala, Baja Verapaz, Escuintla, Zacapa, and Peten.

Unfortunately, this Presidential report also states that in terms of GDP, government spending targeting health decreased from the year 2000 to the year 2004 as well as the proportion of the national budget dedicated to health. However, the report states that private expenditures on health rose in the same period.

Table G13: Percentage of expenditures on health for the period 2000 – 2004. Source: SEGEPLAN (2005)

	2000	2001	2002	2003	2004
Total expenditure in health with respect to GDP	5.5	5.4	5.2	5.4	5.2
National budget of MSPAS with respect to the national budget	8.3	8.0	7.6	7.3	5.8
Public expenditure in relation to total expenditure in health	39.8	38.1	36.9	39.7	35.3
Private expenditure in relation to total expenditure in health	60.2	61.9	63.1	60.3	64.7

According to the Bulletin No. 22 of the National Epidemiological Centre of MSPAS (2007), in the year 2005 there were 406,797 cases of diarrhoea, 6,667 cases of dengue, 87,874 cases of malaria, 219,617 cases of pneumonia, and 1,505,640 cases of Acute Respiratory Diseases (ARD). Table G14 presents data on these diseases by department.

Diarrhoea, as reported by this National Epidemiological Centre of MSPAS (2008) has a higher incidence in infants and children up to 5 years of age. Mortality is also higher in the case of infants and children below the age of 5 and in the case of the elderly above 59 years of age, thereby implying higher vulnerability of population in these age groups. In addition, diarrhoea cases increase with the onset of the rainy season in June and then again in July and August, after the short period of no rainfall in July.

According to table G14, the highest number of diarrhoea cases during the year 2005 were reported in the Departments of Guatemala, Quiché, Huehuetenango and Escuintla. As expected, there is a correlation between cases of diarrhoea and the total population by department (0.82). Very little correlation exists between the cases of diarrhoea as reported in 2005 and the number of people living in extreme poverty (0.47) and between cases of diarrhoea and non-poor people (0.52). However, it is interesting to note the fact that there is a strong correlation between cases of diarrhoea and the number of people who are poor, but not extreme poor (0.90). In the case of Acute Respiratory Diseases (ARDs) there is again almost no correlation with population of different types living in the departments of the country.

Data on cases for three diseases (diarrhoea, dengue, and malaria) for the years 2000 and 2005 is presented in table G16. A comparison of the data on diarrhoea and malaria for these years leads to the conclusion that the same five departments heading the list of diarrhoea and malaria in 2000 continue to head the list in 2005. However, when it comes to dengue, there is no similar trend.

Another important trend to pick up from these tables is the fact that such diseases cannot really be linked to Maya ethnic groups, as Solola, Chimaltenango and Totonicapán report very few cases of diarrhoea, dengue and malaria. In the case of dengue and malaria it is understandable as these

departments are located in the highlands, which are not climates for mosquitoes which transmit malaria and dengue.

Table G14: Diseases Reported by the National Epidemiological Centre for the year 2005.

Department	Diarrhoea	Dengue	Malaria	Pneumonia	ARDs
Alta Verapaz	29,452	128	1,692	22757	113,100
Baja Verapaz	7,370	557	1,277	5713	37,480
Chimaltenango	12,917	31	23	10432	79,590
Chiquimula	12,758	224	4,535	7591	65,560
El Progreso	9,272	10	6	3379	41,270
Escuintla	35,166	751	7,317	18918	152,330
Guatemala	41,296	1,962	45	15246	58,420
Huehuetenango	36,984	361	10,567	14689	63,830
Izabal	9,775	110	6,836	5156	43,500
Jalapa	8,958	73	1,992	3841	33,520
Jutiapa	10,222	257	1,811	3365	75,490
Peten	21,633	621	25,542	7534	109,490
Quetzaltenango	26,554	249	538	15364	83,250
Quiché	40,815	113	13,910	15788	87,050
Retalhuleu	8,144	88	1,389	3293	42,140
Sacatepéquez	8,463	157	0	3415	32,870
San Marcos	32,932	149	2,282	24895	109,190
Santa Rosa	14,591	258	259	4756	57,980
Sololá	9,935	3	33	10490	53,190
Suchitepéquez	9,929	37	7,726	7792	47,560
Totonicapán	10,717	0	0	10682	66,650
Zacapa	8,914	528	61	4521	52,080

Source: National Epidemiological Centre, MSPAS, Bulletin 22, 2007

Recognizing the severity of chronic malnutrition across the country, the Nutrition Institute of Central America and Panama (INCAP) began to develop a complementary nutritional food called Vitacereal, which includes a variety of vitamins and minerals.

Table G15: Comparison of Diseases Reported by the National Epidemiological Centre of MSPAS, 2000 and 2005

	Diarrhoea		Dengue		Malaria	
Deparment	2000	2005	2000	2005	2000	2005
Alta Verapaz	38,383	29,452	24	128	4,557	1,692
Baja Verapaz	14,821	7,370	118	557	793	1,277
Chimaltenango	10,627	12,917	5	31	9	23
Chiquimula	14,490	12,758	409	224	297	4,535
El Progreso	5,220	9,272	323	10	120	6
Escuintla	80,777	35,166	3,492	751	9,345	7,317
Guatemala	47,984	41,296	641	1,962	81	45
Huehuetenango	35,745	36,984	854	361	7,615	10,567
Izabal	7,864	9,775	294	110	1,570	6,836
Jalapa	11,393	8,958	56	73	192	1,992
Jutiapa	16,628	10,222	193	257	824	1,811
Peten	16382	21,633	311	621	32,326	25,542
Quetzaltenango	14,272	26,554	206	249	3,816	538
Quiché	38,975	40,815	76	113	14,726	13,910
Retalhuleu	13,137	8,144	255	88	5,761	1,389
Sacatepéquez	12,533	8,463	0	157	0	0
San Marcos	27,474	32,932	113	149	5,264	2,282
Santa Rosa	20,588	14,591	1,054	258	5,635	259
Sololá	9,981	9,935	3	3	22	33
Suchitepéquez	7,601	9,929	193	37	13,520	7,726
Totonicapán	8,772	10,717	0	0	0	0
Zacapa	9,580	8,914	1,248	528	633	61

This product began to be implemented in 508 communities of 18 municipal districts in the Huehuetenango, Solola and Chimaltenango departments. Additional assistance was provided in terms of food by the World Food Programme and other international organizations and NGOs.

In addition, in 2005 the Congress of the Republic of Guatemala enacted the Food and Nutritional Security Law (Decree 32-2005) and the then President Oscar Berger established the Presidential Secretariat for Food and Nutritional Security (SESAN), with the goal of orienting the efforts of the institutions of the government, non governmental organizations, and international organizations in the areas of food security and nutrition.

In 2005 the World Food Programme (WFP) conducted a survey of food and nutritional security conditions in Guatemala (WFP, 2005) and reported that Guatemala was among the countries with the highest rate of malnutrition in Latin America. Experts stated that in 2005, chronic malnutrition was present in 49.5% of children below 5 years of age. In addition, the report stated that between the years 2000 and 2005, chronic malnutrition rose due to factors such as the coffee crisis, a situation of drought that manifested itself in the years 2001 and 2002, and other weather-related events which reduced the agricultural outputs.

Among the factors cited for such chronic malnutrition, WFP experts cited:

- Inadequate access to food, due to insufficient production and capacity to purchase food. Particularly in rural families which may not have access to adequate food for infants and toddlers.
- Inadequate feeding practices in the case of infants and children, especially through the provision of liquid food of low density in terms of energy and nutrients.
- Poor hygiene practices.
- High prevalence of infectious diseases, mainly respiratory and gastrointestinal diseases.
- Weak nutritional wellbeing of women, pregnancies at a young age, and extremely frequent pregnancies.

In addition, the report states that most efforts on behalf of the government and other organizations have focused on curative practices as opposed to preventive practices; and the fact that the quality of information concerning nutrition is inadequate.

Figure G12 presents a map of the vulnerability to food insecurity as generated by WFP and MAGA. The map has been elaborated using as inputs climatic hazards, coping capacities, and the current nutritional situation in each municipal district. Climatic hazards covered drought, floods, and freezing conditions. Coping capacities were assessed using as a parameter the network of highways throughout the country.

Unfortunately, as World Bank experts comment (World Bank, 2009), the lack of updated information regarding nutrition is a symptom of the lack of attention to this problem. In fact, these experts claim that the lack of updated information on the situation of chronic malnutrition was a limiting factor when identifying where improvements are needed.

Remittances

The termination of the military conflict with the guerrilla in 1996 enabled prosperity through the reallocation of the national budget related to defence into social and economic programmes; through the support of the international community which also demanded efforts to combat poverty; and through the privatization of government companies such as the telephone and the railroad companies. However, poverty in rural areas and a large birth rate in those areas, particularly in geographical areas where the population of composed mostly by ethnic groups, led to migration of young people to urban areas within Guatemala, in particular Guatemala city, and to the United States (MIF-IADB and PHC,

2003). Such migration in turn led to an increase in the amount of remittances sent from relatives within Guatemala (internal remittances) and from relatives living abroad to their families left behind in Guatemala (international remittances). Figure G13 displays the amount of international remittances sent to Guatemala between January 1994 and December 2006 (BANGUAT, 2011). As it can be seen, the amount of remittances begins to rise sharply in the beginning of the year 2002. Experts from the World Bank point out that the international coffee crisis may have triggered a wave of migration to the United States in 2002 (Cheikhrouhou et al. 2006) which continued for several years.

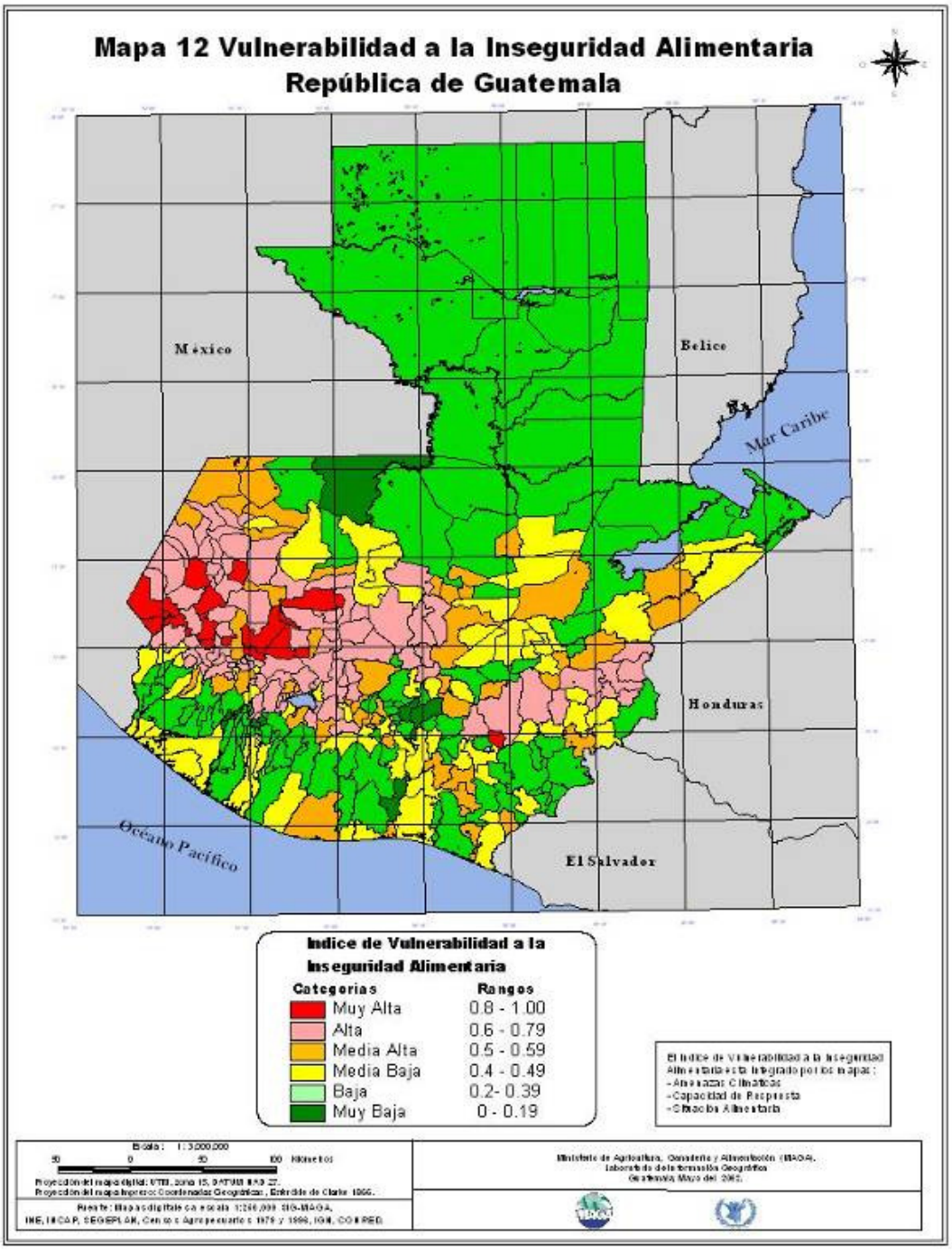


Figure G12: Vulnerability to food insecurity by Municipal District (Source: MAGA and WFP, 2005).

Remittances play an important role in the economic capital of communities, particularly rural communities. However, as World Bank experts noted (Adams, 2005), remittances tend to reduce more the severity of poverty than the poverty gap itself. Such a conclusion is based on the examination of the kinds of income which different types of groups have access to. In 2006, Cheikhrouhou et al (2006) commented that nearly 3.7 million inhabitants in Guatemala were benefiting from remittances at the time when the population of the country was estimated at 12.6 million inhabitants. In a more regional context, Fajnzylber and Lopez (2007) comment that remittances may reduce poverty and inequality, but the effects are generally modest. These experts estimate that for each percentage point increase in the share of remittances to gross domestic product (GDP), the fraction of the population living in poverty is reduced by an average of about 0.4 percent and cite Guatemala as one of only three countries in Latin America where remittances have reduced poverty gaps. In the context of inequality, these experts estimate that in the case of Guatemala, the Gini coefficient may have been reduced by 2.9% as a consequence of remittances.

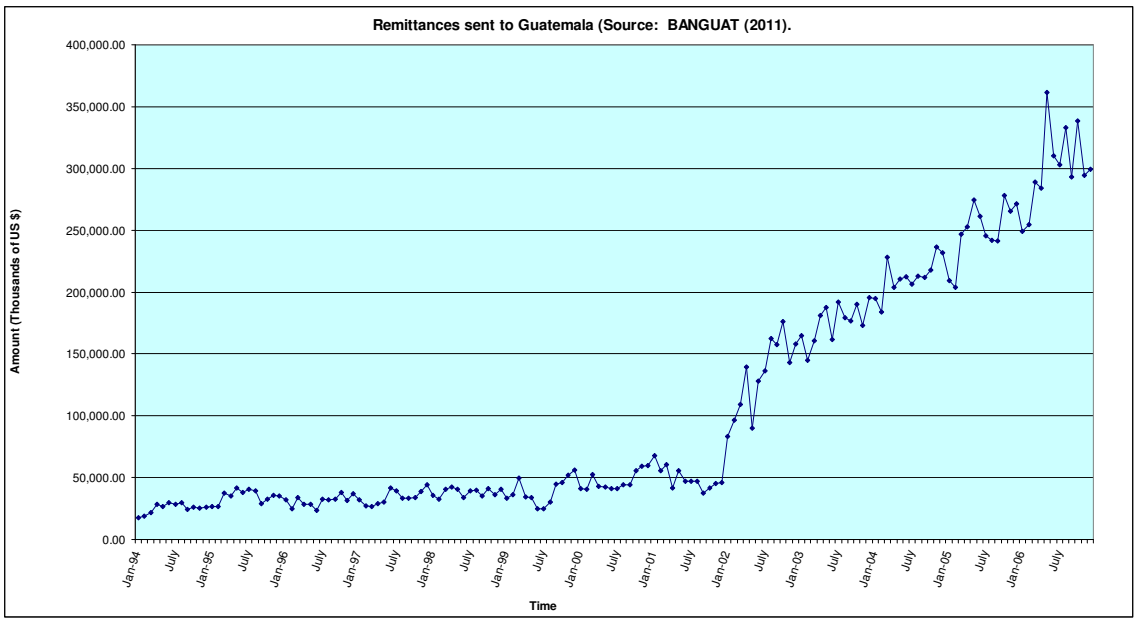


Figure G13: Amount of remittances sent to Guatemala during the period January 1994 – December 2006.

Adams (2004) pointed out the fact that in 2004 remittances were already very important to those households which were receiving them. The per-capita expenditures associated with households receiving internal remittances was estimated at 13.4% and was estimated at 20.8% in the case of households receiving international remittances.

According to SEGEPLAN (2010a), , the number of household receiving remittances rose from 9% to 17% between 2000 and 2006. The World Bank commented (2009) that between 2000 and 2006 the number of households receiving international remittances increased twofold and the average volume rose by 30% in this period. According the INE (2006), remittances in the Jutiapa, Chiquimula, and Zapaca departments may reach between 7% and 9% of the households in those departments; between 3% to 5% of the households in the case of Escuintla; 1% of the households in the case of Sololá, 2% of the households in the case of Chimaltenango, and 6% of the households in the case of the Totonicapan department. According to the report by MFEWS on livelihoods (2009), the Mountain Range of the Chucumatanes is the livelihood that most depends on remittances. In this region the income of the extreme poor is composed as follows: 7% on remittances and 93% on unskilled labour for agriculture. In the case of the poor, 14% of the income is based on remittances, 75% on unskilled labour for

agriculture, 5% on formal skilled labour, and 6% on commercial activities. In the case of middle class households, remittances may be as high as 30% of the income, while both formal and informal commerce may account for 45%, and skilled labour may account for 25% of the total income.

Experts from the World Bank (2009) indicate that the increase in the volume of internal and international remittances between 2000 and 2006 may have reduced extreme poverty by up to 3.1 percentage points and general poverty up to 2.5 percentage points.

Unfortunately, as commented by experts from various agencies and as documented by MFEWS (2009), the majority of remittances are sent to those households with the highest incomes (non-poor), and poor people benefit less from such remittances (Adams, 2004; Cheikhrouhou et al, 2006; Fajnzylber, and López, 2007; World Bank, 2009; SEGEPLAN, 2010a). While such remittances constitute a substantial fraction of the per-capita income for the poorest households, all these experts note the critical issue that the high dependency on remittances by the poorest households implies a vulnerability in the case of the GEC and any other crisis which may impacts this process of remittances.

While data on remittances is available at the national level on a monthly basis, such data is not available in a disaggregated fashion at the provincial, municipal or local levels. This represents a critical issue for the project and for other similar projects which may focus on determining the impacts of international crisis at the local level, as no data is available at this provincial or municipal level to detect more precisely in which geographic regions the impacts of such crisis are having a major effect. Remittances in Guatemala are sent directly from abroad through the private bank system within Guatemala to families in urban and rural areas (Cheikhrouhou, et al, 2006). So, a recommendation along these lines would be for the United Nations Global Pulse initiative to address this issue with the World Bank.

International Influences

Guatemala, as one of the Central American countries, is under the influence of the United States industrially, politically, and economically. Manufacturing of a variety of products and goods takes place using US standards in many cases. Steel bars for construction are usually sold in US standards of inches and fractions of inches throughout the country. Fuel, including gasoline and diesel, are sold in commercial stations in units of gallons, and many commercially available products are manufactured and sold making use of US standards and units.

Politically, the influence of the United States has also been strong since the last century. In 1954 a coup was conducted with the support of the CIA as a way to oust a pro-communist, democratically-elected government. While military coups were frequent in the last century, since 1986 the country has embarked on a more solid democratic process. Elections are held every four years to elect decision makers at the level of the presidency, congress, and majors in municipal districts.

The cold war had one of its manifestations in Guatemala through a military conflict fought between the guerrilla groups and the armed forces of Guatemala between the 1960s and 1990s. The final peace agreements were signed in 1996 leading to a stable period and improved human security in those regions of the country where the conflict took place.

The economy of Guatemala depends to a large extent on exports to the United States and on imports from the United States and on the economic situation of the United States and the global economy in general. Financially, the Guatemalan currency labelled Quetzal (GTQ), is always paired to the United States dollar (USD). International transactions are usually made in US dollars, and in recent years the government has allowed private banks within Guatemala to manage accounts for private citizens and

companies in US currency. In recent years the national and local economy has been influenced by remittances sent by Guatemalan citizens working mostly in the United States. Such remittances are now taking relevance, particularly when compared with macroeconomic parameters as the Gross Domestic Product (GDP).

Disasters

Due to its geographical location at the intersection of three tectonic places and in the path of hurricanes, Guatemala is exposed to a variety of hazards such as earthquakes, volcanic eruptions, landslides, hurricanes, tropical storms and droughts that have impacted the country in the last decades. Taking into consideration the existing vulnerability, events associated to these hazards have triggered disasters impacting many sectors of development and livelihoods, which have provoked severe losses in the private and public sectors. Hurricanes Mitch in 1998 and Stan in 2005 could be seen as the largest ones before the GEC, impacting a variety of sectors of development, road infrastructure and public infrastructure. Tropical storm Agatha impacted the country again in June 2010, affecting again the extremely relevant public infrastructure as well as several sectors of development. In the context of droughts, two severe droughts have taken place during the last decade. The 2001/2002 drought came after the coffee crisis and increases the levels of malnutrition within the country, particularly in areas affected by the drought, and more severely those where families depended on temporary income from labour in coffee plantations. The drought in 2009 again affected rural communities increasing malnutrition, and in particular those communities also affected by the GEC directly through reductions in remittances.

According to ECLAC (CEPAL in Spanish Language), such large events have impacts and effects on a variety of sectors of development and on sustainable development itself (ECLAC, 2011). In addition, according to the World Bank's Global Facility for Disaster Reduction and Recovery (GFDRR, 2010), Guatemala is considered as a high risk country given the exposition of its territory to multiple hazards and the vulnerability of its GDP. According to GFRDD, the vulnerability to adverse natural events is due to a variety of factors including:

- Increased urbanization and insufficient planning;
- Inadequate application and enforcement of building codes;
- Establishment of informal settlements in hazardous areas.

Villagran de León (2006, 2010) has included other factors that increase vulnerability including:

- Lack of experience or awareness on behalf of many of its citizens concerning risks;
- Poverty;
- Social and armed conflicts;
- Weak governance;
- Non-existent culture regarding disaster prevention;
- Migration processes;
- Uncontrolled population growth;
- Unwillingness to change.

As a consequence, urban and rural communities experience the impacts of a variety of events, and the government is forced to reconstruct private and public physical infrastructure on a frequent basis, having to shift budgets originally dedicated to promote development to reconstruction efforts.

In the context of this project, the timeline presented in figure G14 puts into a temporal context recent disasters before the GEC, as well as the two other international economic crises which have impacted the country: the coffee prices crisis and the IO&FC.

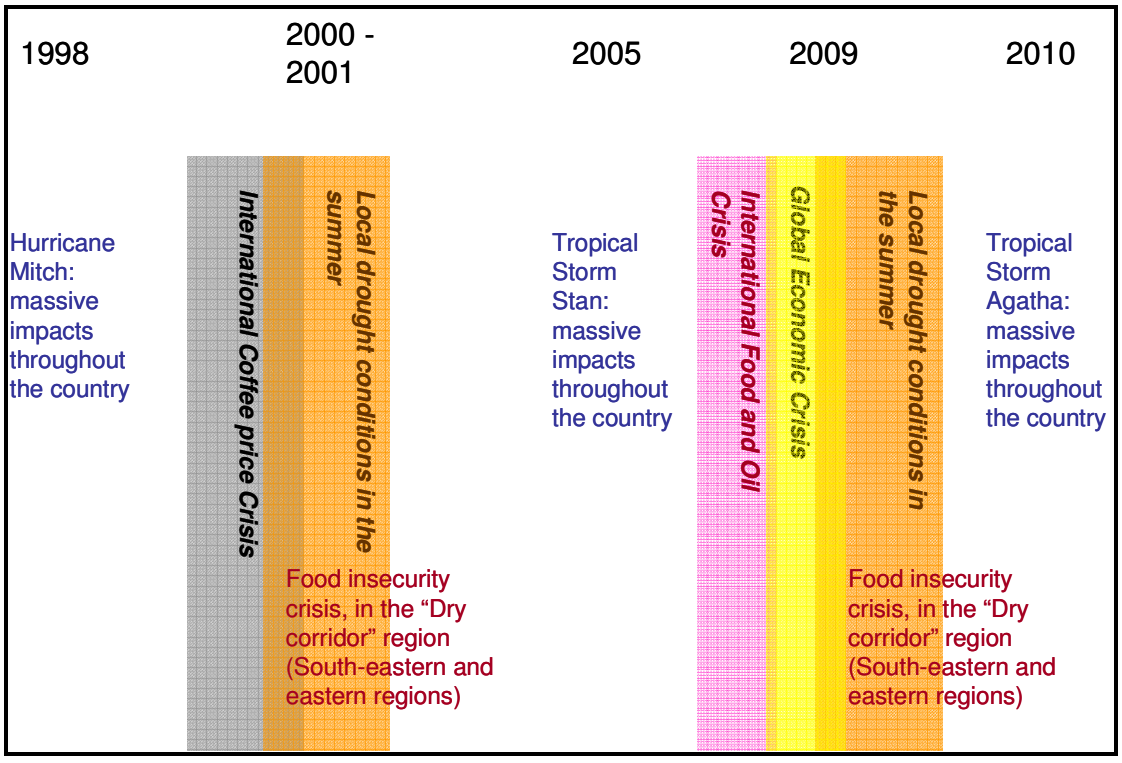


Figure G14: The GEC, other international crisis and recent disasters in Guatemala.

Table G16 presents data gathered from the OFDA/CRED International Database regarding the number of people killed and affected by recent events associated with natural and biologic phenomena between 1992 and 2011. As it can be seen, tropical storm Stan provoked the largest number of fatalities, although this figure is still far below in comparison to the 1976 earthquake which killed nearly 25,000 inhabitants. In contracts, the drought of 2009 after the GEC is presented as the event that has affected the largest number of people, roughly 20% of the population of the country in that year.

Table G16: Data on disasters in Guatemala between 1992 and 2011. Source (EM-DAT: The OFDA/CRED International Disaster Database)

Killed			Affected		
Disaster	**Date**	**No. Killed**	**Disaster**	**Date**	**Affected**
Mass Movement Wet	04/09/2010	53	Mass Movement Wet	04/09/2010	50696
T. Storm AGATHA	28/05/2010	174	T. Storm AGATHA	28/05/2010	397962
Mass Movement Dry	04/01/2009	36	Flood	19/06/2009	10800
T. Storm STAN	**01/10/2005**	**1513**	**DROUGHT**	**Mar-09**	**2500000**
Mass movement wet	15/06/2005	63	Flood	22/10/2008	180000
Mass movement wet	13/09/2002	68	Flood	02/07/2008	17300
Drought	Sep-01	41	T. Storm STAN	01/10/2005	475314
T. Storm MITCH	26/10/1998	384	Flood	04/02/2002	98740
Mass movement wet	26/08/1998	51	DROUGHT	Sep-01	113596
Epidemic	Jan-92	206	T. Storm MITCH	26/10/1998	105700

Source: EM-DAT: The OFDA/CRED International Disaster Database; www.em-dat.net-Université Catholique de Louvain-Brussels–Belgium.

The largest disasters triggered by hurricane Mitch, tropical storms Agatha and Stan, and the droughts have forced the President of the Republic to declare National States of Calamity and to officially request humanitarian assistance to cope with the severe impacts and effects of these events.

Within the scope of this project, four departments have been selected for a more thorough analysis given the fact that these departments have faced disasters of different types in recent years. Chiquimula and Jutiapa are located in the southeast region of the country and border with El Salvador and Honduras. These departments have faced the severe impacts of droughts in 2001 and in 2009 given their climatic conditions as some of the most arid regions of the country, the vocation of most the land in these departments to be used as forest given the fact that these are mountainous areas with high topographic relief and the soils are poor in the context of agriculture. Recognizing the poor condition of such soils, inhabitants in these provinces, particularly the poor, often seek income as temporary workers in coffee and sugar cane plantations, particularly during the crop season. To this end, the livelihoods of such people are highly dependant on the international prices of these agricultural products, as both are targeted for export. Figure G15 presents a map elaborated by the Ministry of Agriculture, Livestock and Food displaying the different types of soils using the USDA's soils classification scheme. Given the extremely high topographic relief of many areas and the geology of the country, it can be seen that most soils in the country belong to Class VII (light brown), which in theory are apt for agriculture, but rather for forestry. However, Escuintla, located in the Pacific plains, has most of its soils in class II, which are good for agriculture.

Nevertheless, Escuintla, located in the Pacific plains, often experiences the impacts of floods due to tropical storms and hurricanes. Rural communities located on the banks of the Coyolate, Achiguate, and Maria Linda rivers are often flooded, in extreme cases two of three times per year. The agricultural vocation of the Pacific plains is used by large agro-industries focusing on sugar cane and rubber, although many decades ago, it as one of the largest banana producer departments when most the land belonged to the United Fruit Company of the United States. Given the fact that the northern regions of this department are located on the foothills of the Fuego, Agua, and Pacaya volcanoes, some of the land at higher altitudes is also used for coffee production. To this end, people in rural areas often work in large sugar cane or coffee plantations. Escuintla also operates the only port in the Pacific, Puerto Quetzal, and its sugar-cane industries generate energy which is fed into the general electric grid of the country. Several rivers in Escuintla are also used to generate electricity via hydroelectric plants. Finally, several cities in Escuintla are large commercial centres including Escuintla, Santa Lucía Cotzumalguapa, Palin, and the Port of San Jose near the Quetzal shipping port.

The fourth department selected for this study is Solola, which is located in the highlands of the country. Solola is populated mostly by descendants from the Maya and some of its inhabitants take advantage of the tourism that the Lake Atitlan region offers. To this end, women and female children often involve themselves in the production of folkloric textiles which are sold to tourists in markets within Solola and in Guatemala city. Given its high topographic relief and its geological conditions, and the fact that lake Atitlan is a volcanic caldera, regions within this department have often experienced massive landslides and debris flows such as the one that took place in Panabaj in 2005 as a consequence of hurricane Stan, which killed more than 600 people who lived in this suburb of Santiago Atitlan, on the foothills of the Toliman volcano. Some of the highlands in the Solola province are plateaus and are used for agriculture, including vegetables, fruits, and non-traditional crops now being exported. Within the rim of lake Atitlan there are also coffee plantations. As expected, there are also many areas used for corn and black bean production. However, as stated in previous sections, three quarters of the population in this department live below the poverty line. One more relevant issue to consider in the context of Solola is the fact that the Pan American Highway crosses this department and is a lifeline linking the capital city with the western regions of the country.

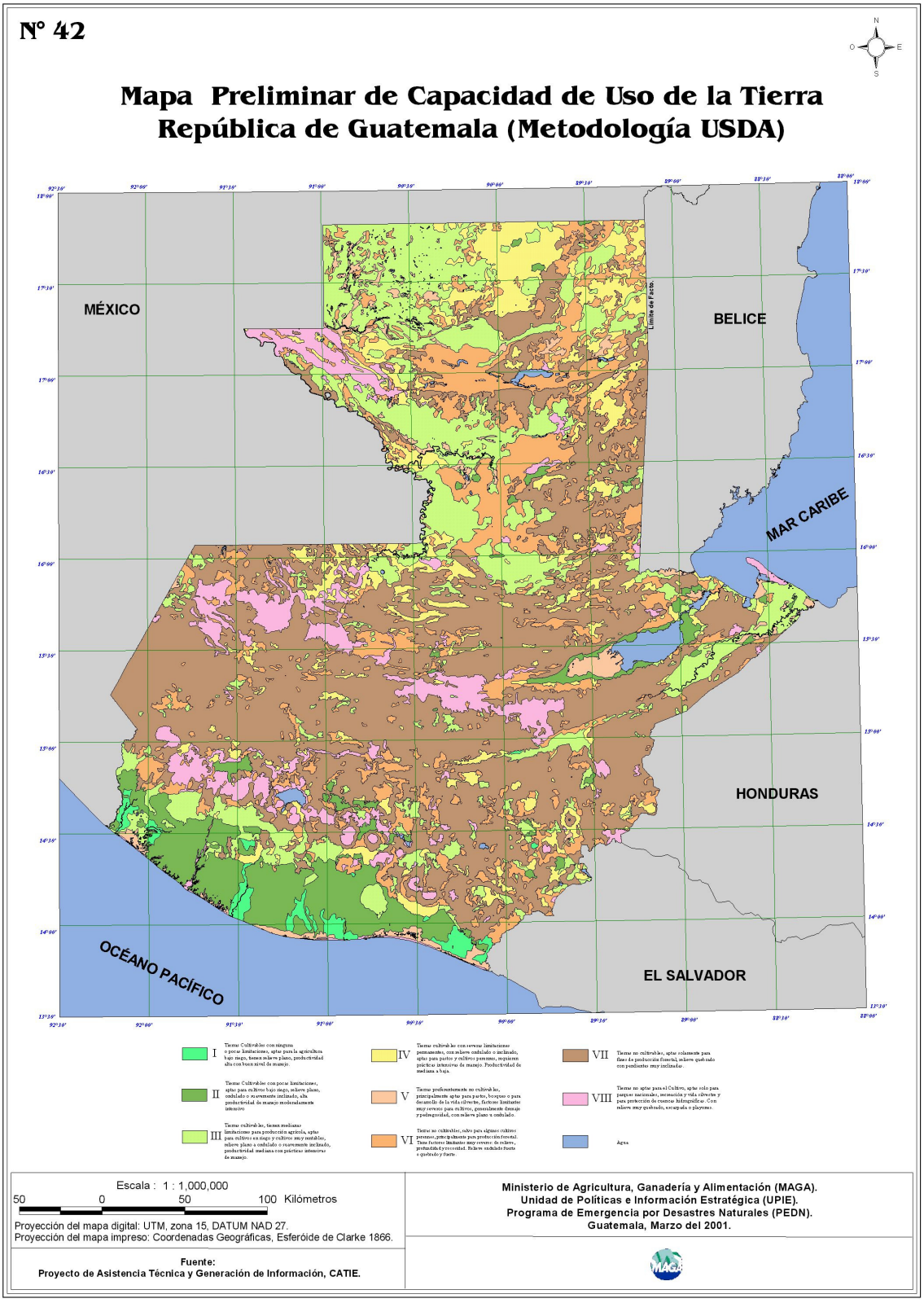


Figure G15: Soils classes for Guatemala based on the USDA soil classification scheme (Source: MAGA).

Table G17 presents a brief classification of the susceptibility of the sectors which are most affected by natural phenomena. The table has been compiled based on a historical overview of impacts of

disasters in Guatemala. The susceptibility of infrastructure depends of course on the type of construction materials and the type of building codes employed. In the case of roads and bridges, susceptibility may be high depending on the design of such infrastructure, particularly in those areas susceptible to landslides, where the susceptibility of the slopes may be increased as a consequence of the construction of the road itself and in the case of bridges depending in the elevation of the bridge with respect to the flow of the river where the bridge is being built.

Table G17: Susceptibility of sectors to damage, destruction

Phenomena / Sector		Tropical Storm		Earthquakes	Volcanic eruptions		Drought
		Rainfall	Floods		Pyroclastic debris	Gaseous emanations	
Infrastructure	Public	Low, except if landslides are triggered	Low to Medium, high in case of roads & bridges	High if infrastructure is weak	Low	Very Low	No susceptibility
	Housing		Medium		Low to high if infrastructure is weak		
	Industry		Low		Low		
Agriculture		Low, except in case of landslides	High in floodplains for most crops except coffee	No susceptibility or extremely low	Medium to high, depending on exposition	Medium to high, depending on exposition	High, particularly for subsistence crops
Livestock		Low	High in floodplains	No susceptibility or very low	Medium to high, depending on exposition	Medium to high, depending on exposition	Medium to high
Commerce		Low	Medium	High if infrastructure is weak	Medium	Very low	Medium

Taking into consideration the high dependence of livelihoods and of the national economy on agriculture and commerce, and livestock to a lesser degree; the table also includes susceptibility information based on historical impacts of disasters.

The disasters which have taken place over the centuries in Guatemala manifest the pre-existing risk conditions, namely vulnerability and exposition to hazards. As a way to be more proactive than reactive, the Government of Guatemala modified in 1996 its legislation transforming the then National Emergency Committee (CONE) into the National Coordinating Agency for Disaster Reduction (CONRED) through the Congress Decree 109-96. In addition and as a way to understand more precisely the root causes of such disasters, government agencies such as INSIVUMEH and MAGA and professionals from Guatemala; as well as international agencies such as USGS and experts from other countries have generated a variety of hazard maps for different types of hazards targeting either the whole country or specific regions. In addition, through a project conducted by the Japanese International Cooperation Agency (JICA), several hazard maps were updated and improved between the years 1999 and 2003. A variety of NGOs have also contributed to the generation of hazard maps, but at a more local scale in geographic areas where such NGOs are conducting projects. However, the most difficult hurdle is the assessment of vulnerability, as there are too many definitions for this term and no consensus on how to assess it (Thywissen, 2004; Villagran, 2004). Preliminary efforts have been conducted within Guatemala to represent vulnerability in terms of historic disasters, and using the frequency of manifestation of disasters in particular communities as the proxy indicator for their vulnerability. In recent years, the World Bank and the Inter American Development Bank have provided funds for the conduction of the project entitled: Central American Probabilistic Risk Assessment (CAPRA). This project is aiming to contribute to efforts to promote sustainable development recognizing the fact that disasters are often inhibiting such sustainable development.

One of the difficulties that arises when trying to elaborate information on risks is the lack of data and information. In terms of maps, the National Geographic Institute (IGN) has elaborated since a few decades ago maps covering the whole country at scales 1:50,000; 1:250,000; and 1:1,000,000. Unfortunately, in the case of particular hazards such as floods and landslides, maps at these scales are still not useful to carry out the required analysis. After tropical Storm Agatha in 2010, the Government of Guatemala recognized the need to improve the resolution of maps, and requested financial support from the World Bank, the Inter American Development Bank and other agencies so that IGN could elaborate maps of 8 critical basins at a scale of 1:25,000.

The international oil and food crisis which preceded the GEC

In developing countries like Guatemala, where corn plays a major role in the culture and in the diet of its people and where poverty is high, and where diesel, gasoline, and other refined products from petrol are imported; it is important to take into consideration the effect of the International Oil and Food Crisis (IO&FC) which preceded the GEC in the context of livelihoods and vulnerability to shocks and stresses.

At the global level, the Human Development Network of the World Bank reports (2008) that the rise in the prices of food and fuel have an impact on four dimensions of human development:

- Increasing poverty, which is linked to financial capital;
- Depleting the productive assets of the poor, reducing their capacity to generate and accumulate financial capital;
- Worsening nutrition, which would have a direct impact on human capital;
- Reducing the utilization of education and health services, again having a direct impact on human capital.

In addition, the experts from this network foresaw that effects from the IO&FC could have lasting effects in developing countries as Guatemala. As a figure of merit, these experts indicated that "prices of food grains, which account for more than half of total calories in developing countries, increased 150 percent between January 2006 and June 2008, and about 40 percent of this increase has occurred since January 2008 alone". Foreseeing the need to take action, the World Bank implemented the Global Food Crisis Response Program (GFRP) to coordinate its response to the crisis with other multilateral organizations and donor agencies. Efforts on behalf of the World Bank would aim to stabilize the market and food prices through policies, facilitate social protection and access to food to minimize the nutritional impact of this crisis particularly on the poor and vulnerable, and promote domestic food production. In addition the World Bank also developed a proposal for an Energy Price Crisis Response taking into consideration the steep rise in the price of oil in the global markets, particularly recognizing the fact that such rises in oil prices induced increases in prices of a variety of good, and in particular fertilizers used in agriculture, as well as in transport costs. Furthermore, rises in prices of oil would directly lead to income losses in particular sectors of development.

Rosen and Shapouri (2008) from the United States Department of Agriculture commented that from 2004 to 2006 worldwide agricultural commodity prices increased significantly: the price of corn rose 54%, wheat rose 34%, soybean oil 71% and sugar rose 75%. In addition, these experts indicated that the novel use of food crops such as corn for bio-fuels also induced sharp increases in the prices of such food crops. In addition, these experts stated that food aid had stagnated in the last two decades, which manifested a weakening of the capacity of the international community to cope with disasters such as droughts that make it necessary to provide food to countries facing such droughts.

In the case of many developing countries, including Guatemala, where corn is a basis subsistence crop, these experts warned about the impacts of such increases in food and oil, as corn and similar products constitute a main source of food. In addition, they commented that while responses to the rises in prices of food and oil varied from region to region, food gaps in Guatemala, Honduras, and Peru were expected to rise more that 20% by 2016. In addition, these experts indicated that in the case of Guatemala, grain imports had risen by 10% since 1990 and in 2006 grain imports exceeded domestic production by 55% in Guatemala and by 30% in Honduras. Finally, and taking into consideration the fact that in many developing countries social welfare programmes and safety nets are very weak, these experts warned about long-term food insecurity impacts should such a crisis extend for a long time.

In its Briefing prepared for the Consultative Group on International Agricultural Research (CGIAR) meeting in December, 2008, J. von Braun of the International Food Policy Research Institute (von Braun, 2008)) indicated that this IO&FC generated an economic imbalance in many developing countries and raised inflation. This imbalance and the rise in inflation would need to be dealt with via financial and monetary policies. This expert commented that the rise of prices in every type of agricultural commodity in 2007 and 2008 created a "global food price bubble", citing that international prices for wheat and corn increased threefold and the price of rice increased nearly fivefold by 2008 in relation to the prices of such products in 2003. This expert confirmed the warnings made by Rosen and Shapouri regarding the fact that the increase in prices of oil and food would impact the livelihoods of the poor and vulnerable people in developing countries and could lead to food insecurity. In the particular case of Guatemala, this expert commented that "the cost of feeding just one person is almost three quarters of the total income of a poor household living on a dollar-a day". He based his comments on the fact that the cost of a corn tortilla and oil, which represents slightly above 25% of the recommended nutrient density, was US$ 0.40. In contrast, the cost of a corn tortilla, vegetable oil, fruits and vegetables which are required to ensure 100% of the recommended nutrient density had a cost of US$ 0.72.

As stated by SEGEPLAN (2008a), BANGUAT (2008), as by INE (2011e), the effect of the rise in international prices of oil, corn and other products in the international market had severe impacts in a the cost on a variety of products. As a way to track the increase in prices of goods, INE keeps track of the Vital Basic Food Basket (VBFB) which is defined as the cost of the food required to achieve the minimum dietary uptake for a Guatemalan adult and includes other basis services such as access to potable water, electricity, clothing, housing, health, transport, recreation, education, etc. Figure G16 presents data from INE for the period Jan. 2004 to June 2008 corresponding to the daily cost of the VBFB. Within this period, the data from INE shows that the daily cost rose in this period by 52% with respect to its cost in 2004 and began to rise more sharply at October 2006.

While this data is presented on a monthly basis, the Ministry of Agriculture maintains a database of prices of products in the main public markets of Guatemala city starting in May 2007 on an almost daily basis. Figure G17 presents data on the wholesale prices of 3 different types of corn in the La Terminal public market in Guatemala city. The types of corn presented in the figure are:

- Yellow corn, 1st quality
- Yellow corn, 2nd quality
- White corn, 1st quality

The figure presents the cost of 100 pound bags to distributors in the market. As it can be seen, the cost rose consistently from May on a daily basis until it peaked in August to September of that year, and then dropped to its lowest prices in December of that year, and began rising again until the end of the graph corresponding to June 2008. It is important to take note that while corn is an essential element of the basic basket, it is not by far the only one.

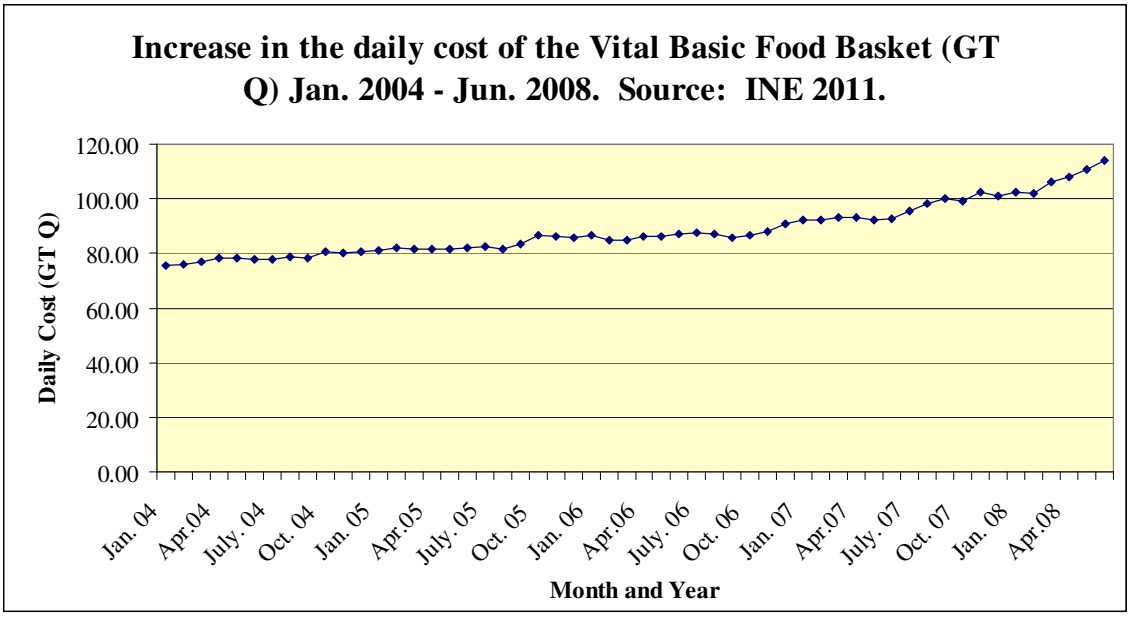


Figure G16: Evolution of the cost the Vital Basic Food Basked between 2004 and 2008. (Source: INE 2011).

An increase in the cost of such a basket without an equivalent rise in income forces poor people to start sacrificing their food intake, initially replacing more expensive products of this basket by less expensive ones, but which may be less nutritive, leading to malnutrition. In addition, the reduction in food intake of children, especially infants, can impair their physical and intellectual development (UNICEF, 2010).

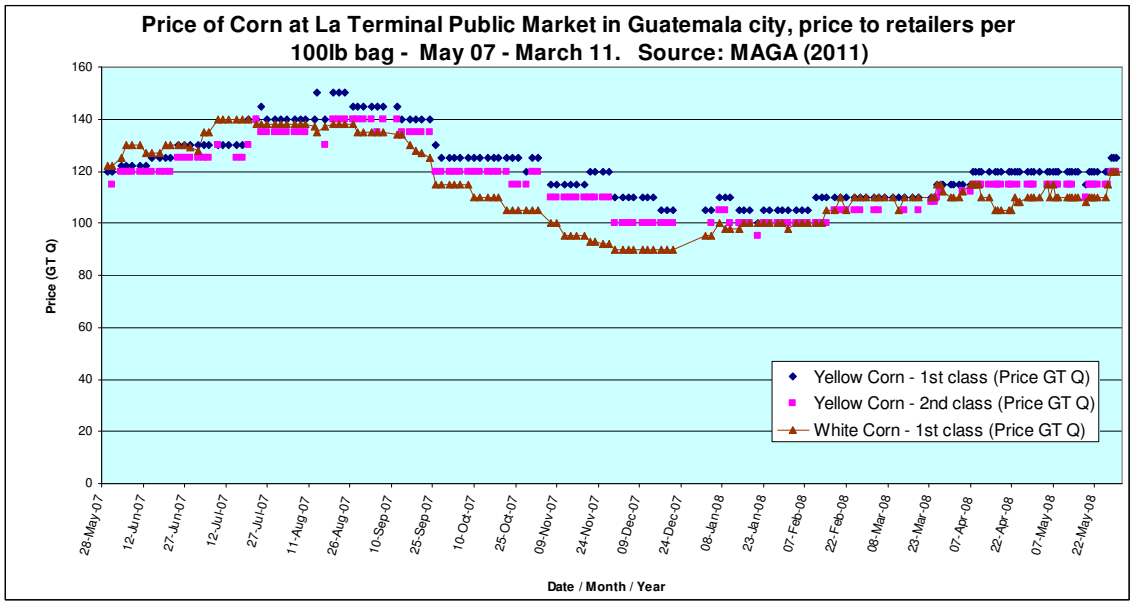


Figure G17: Weekly-reported prices of corn at La Terminal public marked in Guatemala city. (Source: MAGA, 2011).

Another product which is important to take note of within the local context of Guatemala is the price of diesel fuel. Diesel is the main fuel used in the public bus transportation industry within the country. The cost of diesel fuel is an important parameter to keep in mind when considering the cost of transportation of people in rural areas which may depend on public transportation to reach cities where they need to either sell their products or purchase basic products including food.

Figure G18 presents the evolution of prices of diesel fuel in public gasoline stations in Guatemala city on a weekly basis for the three main brands which are sold in the country: Esso, Shell, and Texaco (MAGA, 2011). In contrast to the cost of the VBFB, the price of diesel did not vary between June and October of 2007. Between October and November it experienced an increment and then levelled off until February 2008 when it began to rise until the end of this graph at the end of May 2008. Figure G19 presents the cost of the vital basic food basket for the same period for comparison purposes (INE, 2001e). As it can be seen, the trends may be different in the second half of 2007, but are similar in 2008.

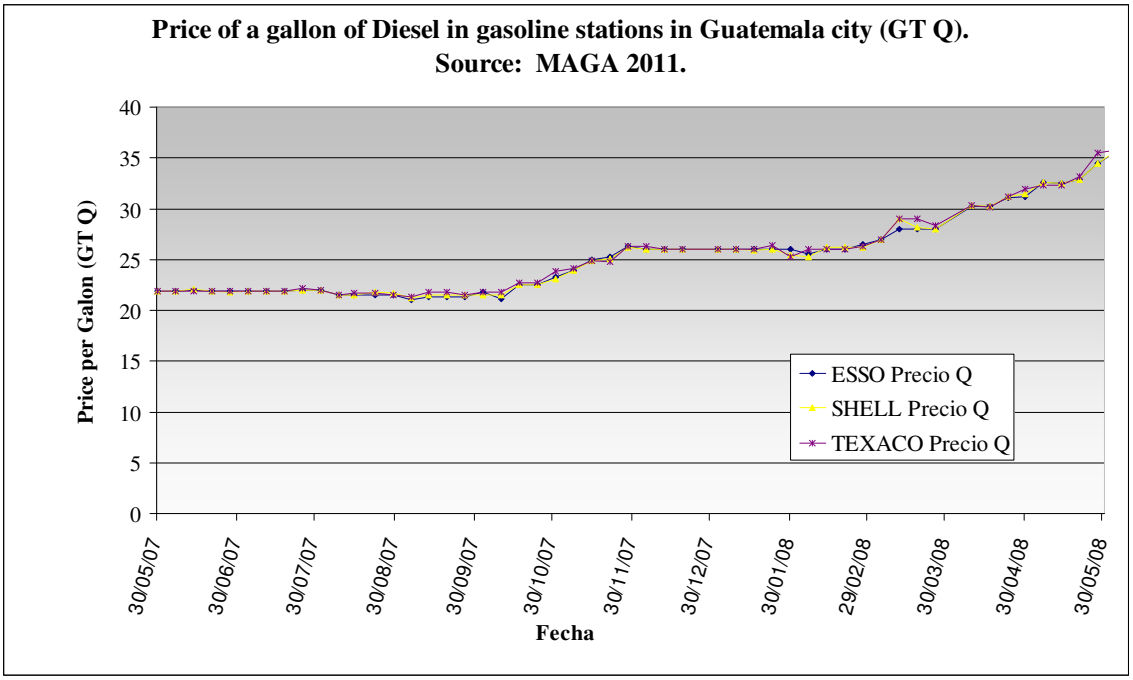


Figure G18: Weekly-reported price per gallon of diesel fuel in typical Guatemala city fuel stations for the period May 2007 – May 2008) (Source: BANGUAT, 2011).

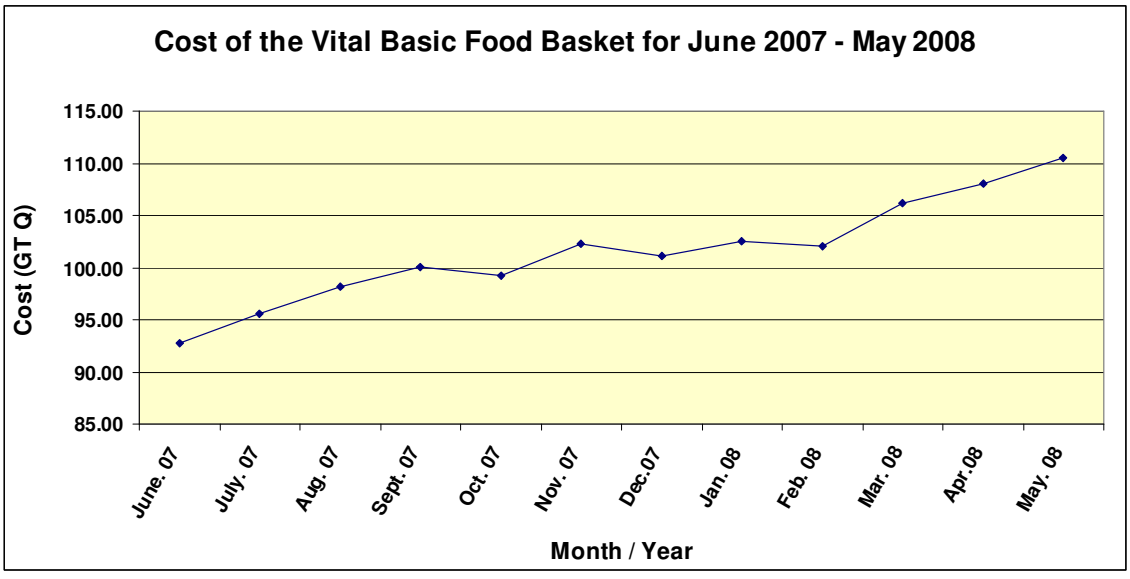


Figure G19: Daily average cost of the Vital Food Basked reported on a monthly basis for the period June 2007 – May 2008 (Source: INE, 2011e).

BANGUAT (2007) stated that inflation rose during this period dramatically, and experts from the Bank were able to assess both the inflation due to external factors such as the rise in international prices of oil and food products, and internal factors. According to these experts from BANGUAT, the inflationary rhythm was influenced by what they call the "imported inflation". In 2007 the inflation rate was 8.75%. 3.17% could be linked to imported inflation. However, BANGUAT also reports that while international prices of oil and food rose, coffee exports rose by 24.5% due to both an increase in the amount of coffee exported and an increase in the international price of coffee (24.5% with respect to the value in 2006). In a similar fashion, exports of sugar also rose during 2007 due to the an increase in the international price of sugar. BANGUAT also reports that imports also rose by 14% in 2007 when compared with 2006. Nevertheless, BANGUAT also comments that part of this increase in imports was related to an increase in the international price of oil, as Guatemala, despite being a producer and exporter of oil, has to import fuels such as gasoline, diesel, bunker and lubricants.

According to experts from the World Bank (2009), food rose by 14% due to this increase in international prices of oil and food, while the level of inflation was estimated for this period at 10.4%. These experts state that the difference in inflation between the Consumer Price Index and the inflation in the prices of food during the period April 2007 to April 2008 had a lesser impact on poverty in general. Poverty rose by 0.8 percent (0.4 percentage points) due to the consumption characteristics of poor people. However, the impact of inflation was more severe in those in extreme poverty and in the indices of severity and depth of poverty. These experts state that extreme poverty rose by 3.9 percent, while poverty only rose by 0.8 percent. The increments in the severity of poverty are 2.5 percent for general poverty and 5.9 percent for extreme poverty.

Taking into consideration the fact that most families in Guatemala rely on the markets to purchase goods, including food; a rise in the international prices of oil and food can result in an increase number of people living in poverty (WFP 2008).

As a way to deal with the effects of increases in these international prices of oil, corn, wheat, and other products and the effects on inflation, the Monetary Commission[3] of the Bank of Guatemala took special measures with respect to the leading interest rates (tasa lider de interes). In addition, the government introduced a programme to assist rural economies to become more dynamic. This programme targeted rural families living in poverty in 129 municipal districts which were selected on the basis of their poverty indexes (SEGEPLAN, 2008a). Experts from SEGEPLAN indicate that by the end of 2008 (SEGEPLAN, 2009), the effects of this rise of international prices of oil and food were manifested as a reduction in tax revenues triggered by a contraction in internal consumer spending, which in turn affected tax revenues associated with local purchase of gasoline and diesel fuels.

An issue that is important to keep in mind when discussing the impact of this crisis is the fact that between 2006 and 2008, there were no major natural disasters in Guatemala, which may have led to additional poverty. In addition, remittances sent by relatives abroad had been rising in recent years. Figure G20 presents data on remittances for the period from Jan. 2006 until April 2008 are reported by BANGUAT (2011). As it can be seen, the amount of remittances sent to Guatemala in 2007 was higher than the one in 2006, thereby alleviating the increased cost of living in the case of those families receiving such remittances.

Another factor to take into consideration is the fact that export crops such as coffee and sugar cane, which are labour-intensive, did not experience drops in their international prices, and hence it could be concluded that there would not be no job losses associated with these agricultural export crops. Table G18 presents data as reported by Guatemala's National Coffee Association (ANACAFE, 2011a). As

[3] The official name in Spanish language is "Junta Monetaria".

it can be seen, between 2003 and 2008, the amount of coffee exported abroad increased, and the income derived from such exports also increased in this period.

Figure G21 summarizes in a graphic fashion the direct impacts of this crisis (solid arrows) on the increases of fuels such as diesel and gasoline and related refined oil products (fertilizers), and on the prices of food that play a role at the national and local levels. The increase in the cost of living has a direct impact on human and economic capitals of households (solid arrows). As a consequence of the increase in the cost of living, there is a reduction in economic capitals at this household level, which may lead to income insecurity and to increases in malnutrition in the case of families in extreme poverty and in poverty as commented earlier by experts from the World Bank, UNICEF (2010), USDA, and IFPRI (dashed arrows).

Table G18: Coffee exports reported in 60 kg bags and the corresponding income in US$. Source: ANACAFE (2011a)

Crop	Number of bags	Income (US$)
2003/2004	3,305,661	314,855,342
2004/2005	3 ,451,559	469,082,877
2005/2006	3 ,350,274	463,360,178
2006/2007	3 ,745,893	557,151,652
2007/2008	3 ,820,072	655,878,072

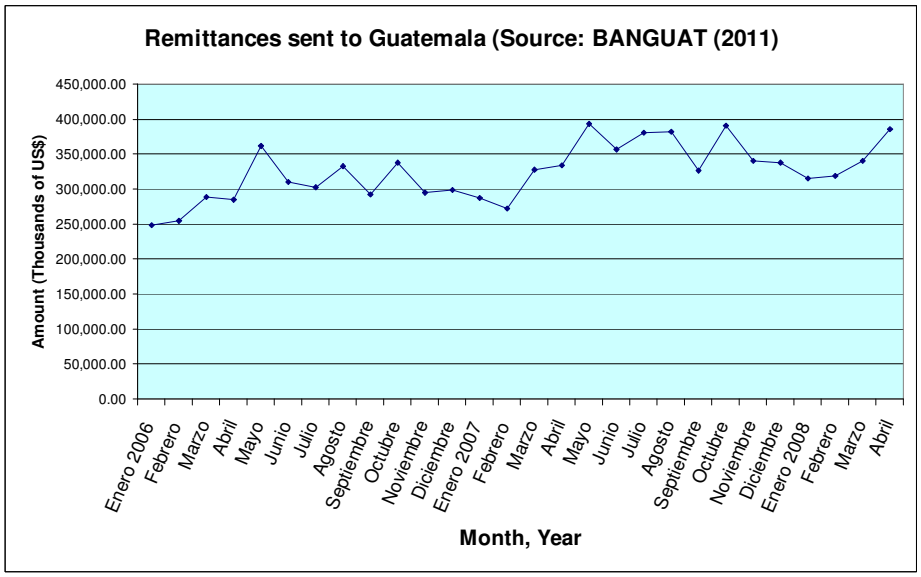


Figure G20: Time Remittances sent to Guatemala for the period Jan. 2006 to April 2008 (Source: BANGUAT, 2011).

The figure also links the direct and indirect impacts of the IO&FC on the government (reduced tax revenues) thereby reducing budgets allocated to combat poverty and increase social welfare, and on livelihoods in terms of increases in susceptibility of communities to natural hazards and on reductions in capacities of such communities to cope with the impacts of disasters.

Within the context of the vulnerability of communities to external shocks associated with disasters, Figure G21 also makes reference to an increase in the susceptibility of vulnerable groups and to a decrease in coping capacities to cope with the impacts of such shocks (dashed arrows).Unfortunately, tracking such an increase in susceptibility and a decrease in coping capacities directly at the community level is very difficult, as there are no explicit parameters to measure both susceptibility and coping capacities. Typical parameters to measure susceptibility include the number of people in the household, the ratio of adults to children and elderly within the household, the sex of the head of the household, and the type of incomes. Proxy indicators for coping capacities such as distances from the house to a road or to public infrastructure such as hospitals and towns have also been proposed. Unfortunately, these parameters would not change o a month-to-month basis as a way to track impacts of this crisis. Therefore, it is important to identify other potential indicators at the local level which may reflect such changes in susceptibility and coping capacities.

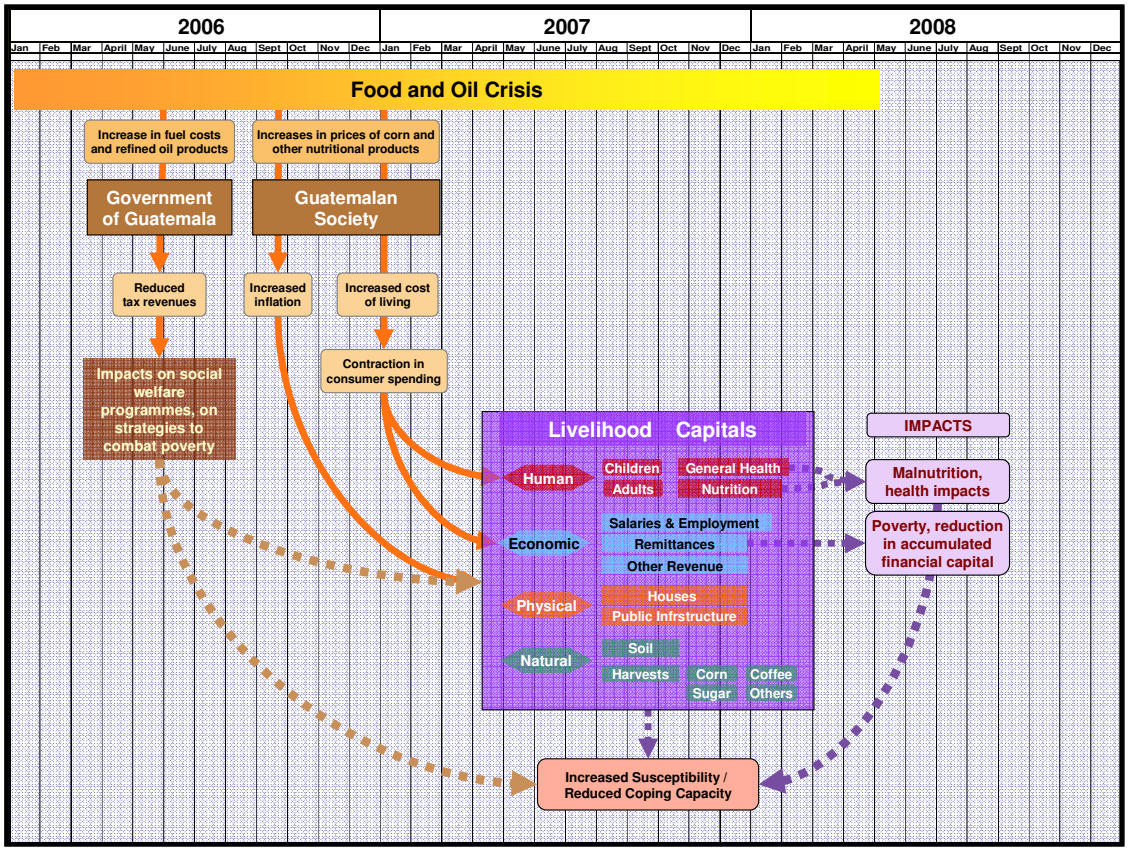


Figure G21: Time chart displaying the IO&FC of 2006-2008, its manifestations in the Guatemalan context regarding livelihoods and corresponding capitals. The figure also displays 4 capitals associated with livelihoods, the impact of this crisis on poverty, malnutrition and on health; and how all these factors contribute to increasing the susceptibility of communities and reducing the coping capacities of communities and of the government with respect to natural hazards.

The Global Economic Crisis

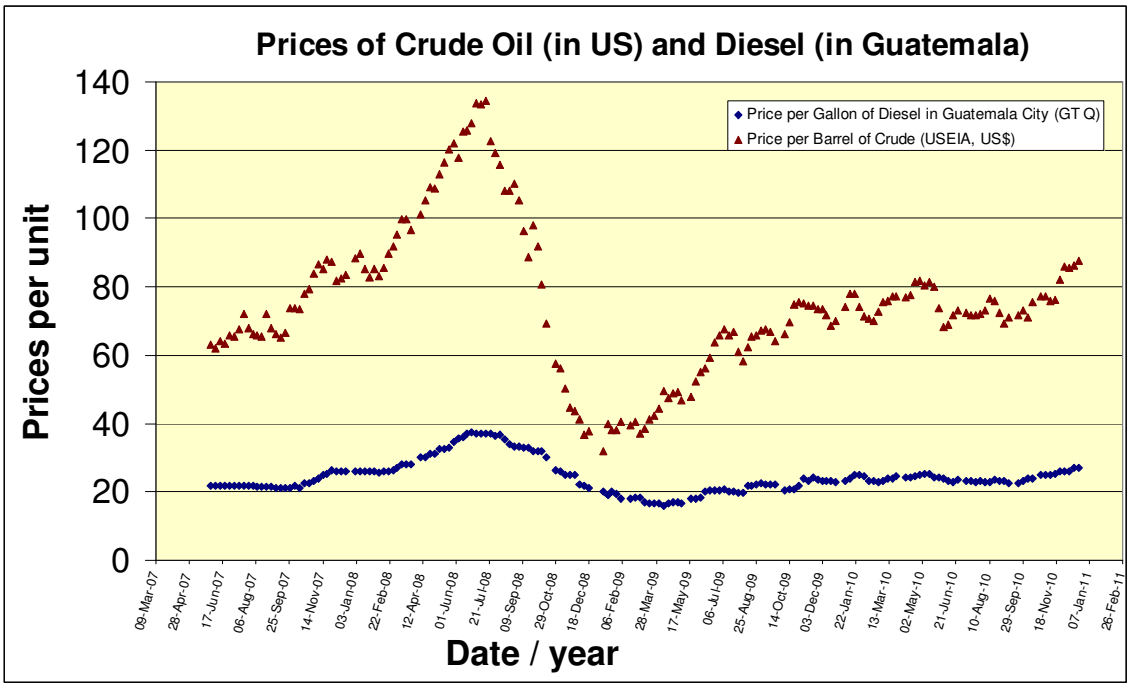
Taking into consideration the IO&FC, it could be stated that the GEC had both positive and negative impacts on the country and on communities. On the one had, the GEC brought down prices of oil and food both internationally and nationally, alleviating the higher cost of living and the inflation that had taken place in 2007 and early 2008 (BANGUAT 2010, SEGEPLAN, 2010b). However, such a reduction in the prices of export product also led to a reduction in tax revenues as reported by government institutions in Guatemala and decreased the access to credits needed to fuel the economy. In addition, the GEC also had a more local impact on households receiving remittances. The amount of remittances sent from relatives abroad declined at the end of 2009 and only started picking up at the end of 2010 again.

According to the research conducted in this project, the earliest explicit warning regarding the vulnerability of the poor in relation to remittances and the impacts of the GEC on such remittances in the case of Guatemala was issued early 2009 by the World Bank (2009). Experts in the World Bank (2009) reported that international remittances represented 38.1% of the consumption of the poor in Guatemala, and cited explicitly the concern that those households receiving such remittances could be vulnerable to international shocks given their higher dependency on such remittances.

When discussing the temporal trends associated with the GEC, its important to keep in mind an international indicator of relevance concerning the GEC, namely the Dow Jones index. The Dow Jones Index reached its lower value associated with this crisis in February 2008.

Figure G22: Evolution of the Dow Jones index in the New York Stock Exchange for the period 2005 - 2010.

In the context of prices of products, it can be stated that the prices of some products dropped more than others. For example the price of a gallon of diesel or a gallon of gasoline dropped substantially and with a small delay compared to the prices in the international stock exchange. Figure G23 presents a comparison of the prices of a barrel of crude oil in the United States and the price of diesel fuel in Guatemala city. As it can be seen, the price of diesel fuel reached its lowest value nearly three months after the crude oil reached its lowest value in the United States. From the figure one can also deduct that diesel in Guatemala experienced a sharp drop in price per gallon as did crude oil in the United States. Diesel dropped 57% from its highest value in June 2008,



while crude oil dropped 76% from its highest value in July 2008

Figure G23: Evolution of prices of crude oil in the United States and Diesel in Guatemala for the period June 2007 - January 2011. Source: MAGA, 2011.

Unfortunately, the consumer price index did not experience such a sharp drop as fuels like diesel in general. The consumer price index rose steadily until September 2008, it levelled off until January

2010, and then started to rise again. Figure G24 presents the evolution of the CPI for the period January 2007 – March 2011.

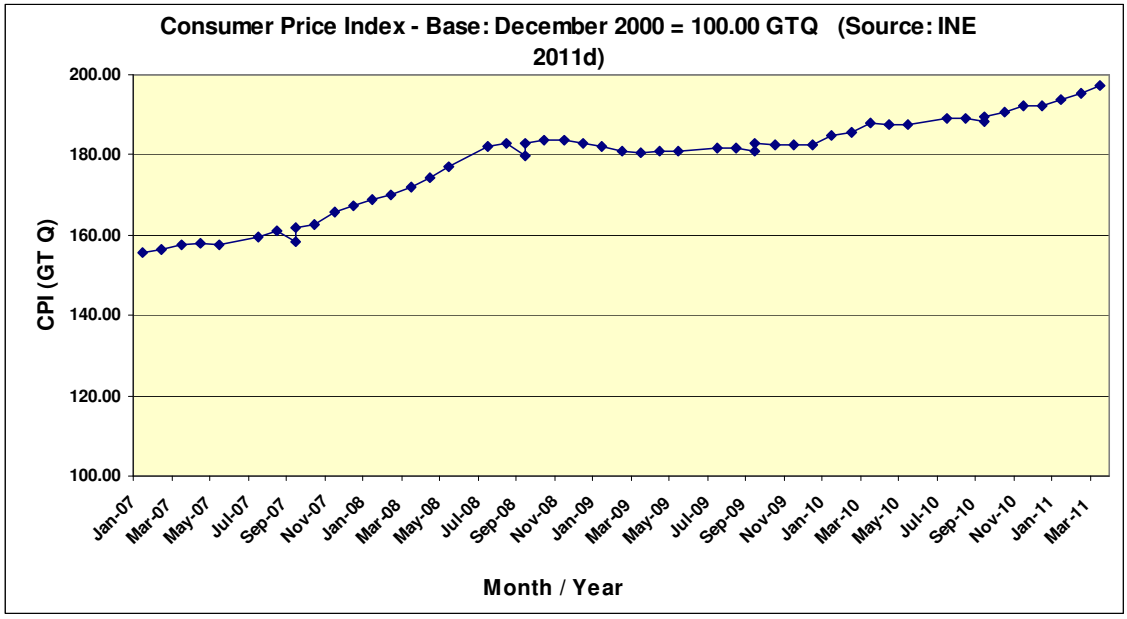


Figure G24: Evolution of the Consumer Price Index for the period January 2007 - March 2011.

Figure 25 presents the daily evolution of the prices of corn for retailers at the La Terminal public market in Guatemala city for the period June 2007 – May 2011. As it can be seen, prices of corn did not really experience a sharp decline due to the GEC, explaining why the Consumer Price Index did not experience a similar reduction as well.

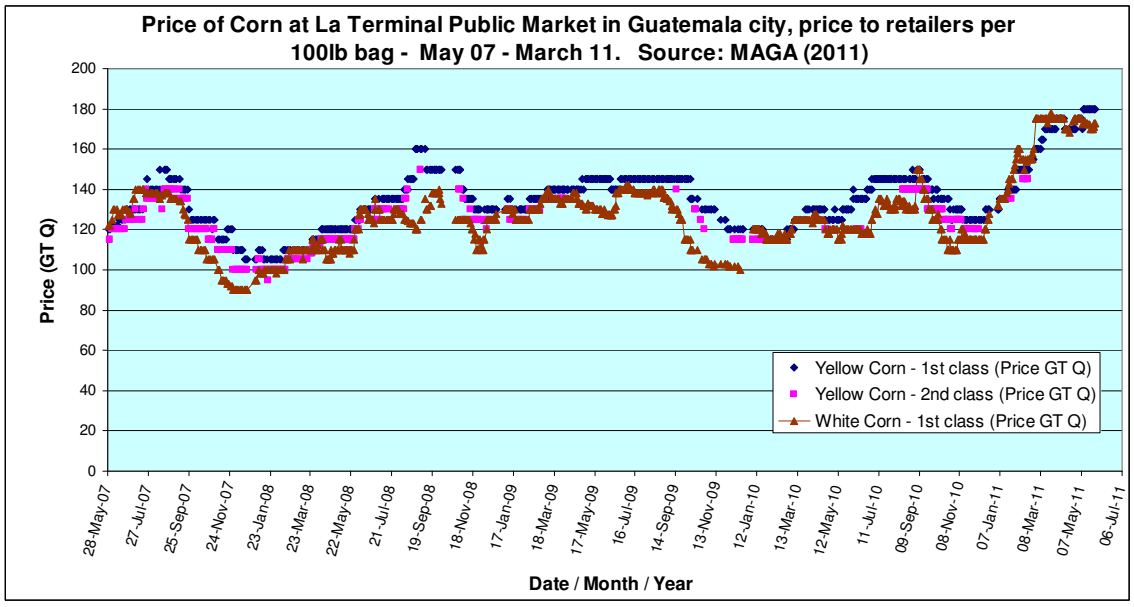


Figure G25: Evolution of the daily prices of corn at La Terminal public market in Guatemala city (Source: MAGA 2011).

Nevertheless, BANGUAT reported a sharp drop in inflation during 2009 as presented in figure G26. As it can be seen, the monthly inflationary rate in percentage reached its highest value in July 2008 and dropped to its lowest values a year later.

In early 2010 SEGEPLAN reported that the GEC had a variety of effects on the Guatemalan economy (SEGEPLAN, 2010b), the main one being the drop in tax revenues due to the deceleration of the economy and the decrease in exports of non-traditional products. In addition, SEGEPLAN also reported reductions related to imports, on tourism, and on remittances. As a result, SEGEPLAN commented that the reduction in tax revenues forced the government to sharply cut budgets of public institutions and to reduce its efforts targeting "*historically-accumulated social demands*". In that same report SEGEPLAN commented that the low increase in the prices of goods that compose the Basic Food Basked allowed citizens to dampen the adverse effects of the GEC.

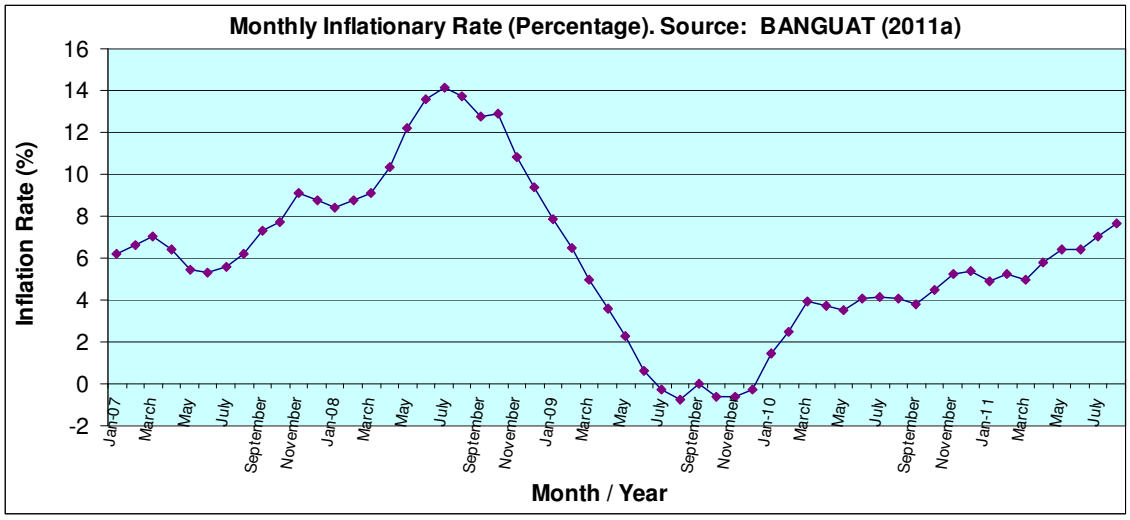


Figure G26: Evolution of the Monthly Inflationary Rate for the period January 2007 - July 2011.

According to SEGEPLAN, nearly 30% of the tax revenues stemmed from the VAT on imports. Imports declined by 24%, and so tax revenues associated with this source of VAT dropped 13.5% with respect to the previous year, and nearly 28% with respect to what was contemplated in the fiscal budget for the year 2009. In addition, SEGEPLAN reported that exports to Central America and the rest of the world dropped by 23.3%. As a way to cope with the effects of the crisis, the Presidency of the Republic implemented a set of austerity measures, and was granted approval from Congress regarding the emission of bonds in the amount of GTQ 3,000 millions.

BANGUAT (2009) reported that the effects of the GEC were also detected during 2008 in the reduction in tax revenues associated with the VAT, with tax revenues associated with the distribution of petroleum (crude oil) and fuels, tobacco and cigarettes, and tax revenues associated with the distribution of cement. However, BANGUAT also reported that in monetary terms coffee exports rose 12.0% in 2008 with respect to exports in 2007; citing an overall increase in the international price of coffee of nearly 12.2%. In a similar fashion, in monetary values sugar cane exports rose by 5.6% when compared with exports in 2007. Again, the increase was due to higher international prices which were triggered by a reduction in sugar cane exports from Brazil.

In 2010 BANGUAT (2010) reported that the GEC had an impact manifested through a reduction in exports, remittances and in tourism during 2009. In addition, experts from BANGUAT report that in monetary values, coffee exports experiences a drop of 10.3% in comparison with those of 2008 due to a reduction in the international prices of coffee. However, sugar cane exports rose by 34.3%, due to increases in the international prices of sugar. In this report BANGUAT states that the FOB value of imports in 2009 fell by 20.7% when compared to 2008, citing that most reductions were associated with imports destined to industrial purposes. Furthermore, BANGUAT commented that in 2009 the GEC manifested itself also via a reduction in the availability of international credit lines and an increase in the cost to access such international credit lines. To minimize the impact related to access

to these international credit lines, BANGUAT forced banking entities within Guatemala to keep a higher amount of liquid resources to maintain popular trust in the banking system.

Table G19 presents macroeconomic figures for the period 2005 – 2009 as generated by ECLAC (2011, page 125). In this period, inflation rose during 2007 and 2008 due to the rise in international prices of oil and food, reaching its peak by 2008, at the time the GEC was being manifested most severely in the United States. However, as the table shows, in the year 2009 the inflation experienced a drastic reduction due to the sharp drop in the international prices of oil and food.

Table G19: Main macro-economic indicators as a function of GDP. Source: ECLAC (2011)

Description	2005	2006	2007	2008	2009
Inflation as percentage of GDP	8.6	5.8	8.7	9.4	-0.3
Fiscal Deficit as percentage of GDP	1.7	1.9	1.4	1.6	3.2

Figure G27 presents additional data generated by ECLAC (2011) concerning the annual economic growth as a percentage of GDP for the period 2001 – 2010. This graph confirms the severe impacts of the GEC in 2008 and most drastically in 2009. although the recovery can be already detected in 2010.

Nevertheless, the continuous migration of Guatemalan citizens to the United States and to other countries, particularly in the last decade, has led to a new source of economic growth for Guatemala in terms of remittances which have been increasing steadily, as it will be presented in a subsequent section more explicitly.

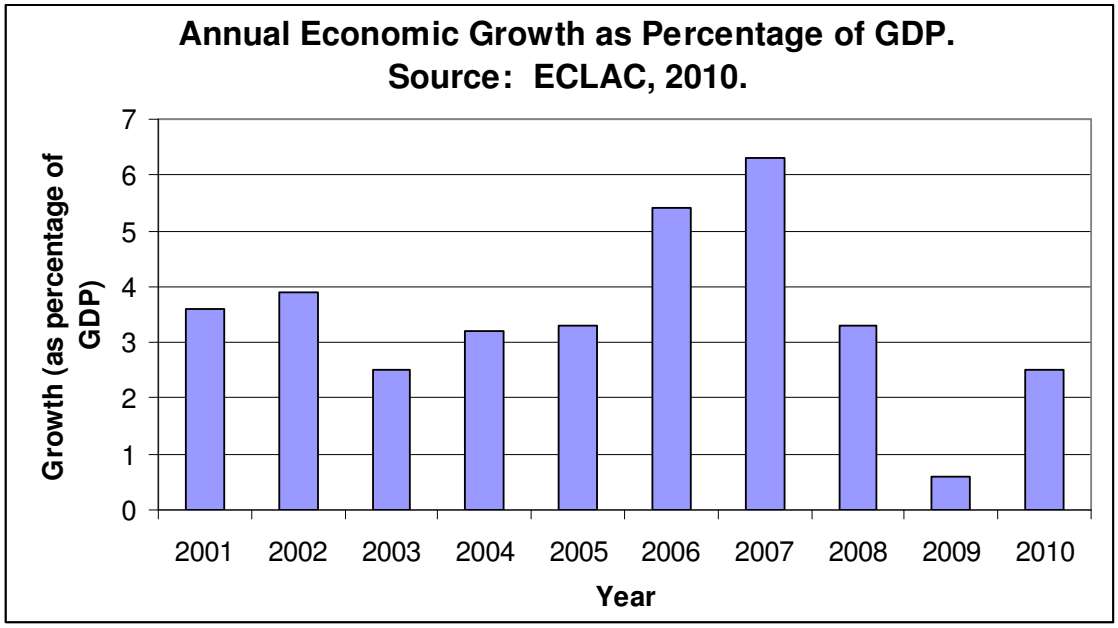


Figure G27: Evolution of the Annual Economic Growth for the period 2001- 2010.

The effect of the GEC can also be seen as a reduction in the amount of remittances starting in July 2008 and recovering their Pre-GEC values by the middle of 2010 and in 2011, but not the annual rate of increase seen between 2002 and 2007. As it can be seen remittances during this period had large variations, but no upward or downward trend in general, except during the 2009 year when values of remittances where lower in general than in the rest of the period displayed in the graph.

Figure G28 presents the temporal evolution of remittances for the period 2007 to 2011. Experts in the Multilateral Investment Fund of the Inter American Development Bank (MIF-IADB, 2009) commented that the GEC resulted in job losses for many migrants, and hence they had to reduce the

amount of remittances sent back to Guatemala. Nevertheless, remittances showed signs of positive growth by the middle of 2010 (MIF-IADB, 2011)

As a way to cope with the impacts of the GEC, the Government of Guatemala established credits with the World Bank (US$ 200 million), with the Inter American Development Bank (US$ 650 millions), and established a Stand By Agreement with the International Monetary Fund in the amount of US$ 935 millions (GoG 2010). Such credits increased the public debt of Guatemala from 20% in 2008 to 23.2% in 2009.

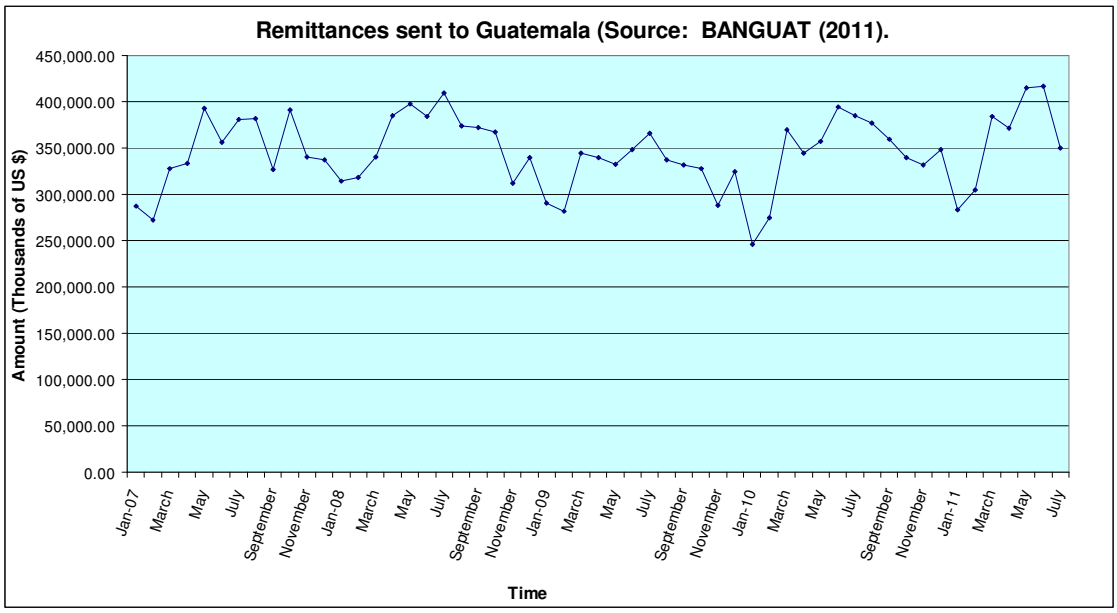


Figure G28: Evolution of remittances for the period Jan. 2007 - July 2011. Source: BANGUAT (2011).

Livelihoods and vulnerability

In the context of livelihoods and vulnerability to disasters, it is difficult to separate the impact of the GEC from the impact of the IO&FC and from the impact of previous disasters and previous crises. On the one hand, the GEC reduced the ongoing rise in inflation that was created by the IO&FC. However, it is also important to recognize that while the GEC reduced remittances by nearly 10%. If in addition one considers the fact that the Consumer Price Index did drop considerably, then it could be concluded that poor families may have had to use economic capital to cope with the increases in prices of food triggered by the IO&FC.

In an attempt to figure out which regions of the country could be most affected by the GEC, it is important to recognize which regions:

- Rely more on remittances;
- May have the highest levels of poverty;
- May not benefit from the drop in prices of goods (consumer price index); and
- May be more impacted by reductions in the international prices of coffee.

As stated earlier, INE (2006) reported that remittances in the Jutiapa, Chiquimula, and Zapaca departments may reach between 7% and 9% of the households in those departments; from 3% to 5% of the households in the case of Escuintla; 1% of the households in the case of Sololá, 2% of the households in the case of Chimaltenango, and 6% of the households in the case of the Totonicapan department. According to the report by MFEWS on livelihoods (2009), the Mountain Range of the Chucumatanes in Quiché and Huehuetenango departments is the livelihood that most depends on

remittances. This would imply that it would be Huhuetenango an Quiché which could me most affected by the drop in remittances.

In the context of poverty, in 2006 INE reported the following departments with percentages of extreme poverty above 25 percent: El Progreso (89.62%), Alta Verapaz (41.23%), Quiche (33.24%), Huehuetenango (30.27%), Jalapa (29.96%), and Solola (29.18%). In the case of general poverty (including extreme poverty), in 2006 INE reported the following departments with percentages of poverty above 70%: Quiche (84.6%), Alta Verapaz (84.05%), Huehuetenango (78.32%), Solola (77.51%), Totonicapan (73.73%), Baja Verapaz (73.2%), San Marcos (73.1%), and Jalapa (72.02%).

The variation in CPI for different regions of the country is displayed in figure G29 for the period February 2006 until February 2011. The figure displays the continuous rise in the CPI in all regions, and how it levels off due to the GEC for nearly a year and in 2010 and 2011 it starts rising again. From the figure one can detect that in some regions of the country the CPI dropped slightly as a consequence of the GEC, particularly in the Guatemala, Quetzaltenango and Escuintla regions. It is interesting to note that regions with borders to El Salvador (Jutiapa), Honduras (Chiquimula), and Mexico (Huehuetenango) have a higher CPI than other regions in the country. In addition, in these three regions (Huehuetenango, Chiquimula, and Jutiapa) the CPI only levelled off during the GEC.

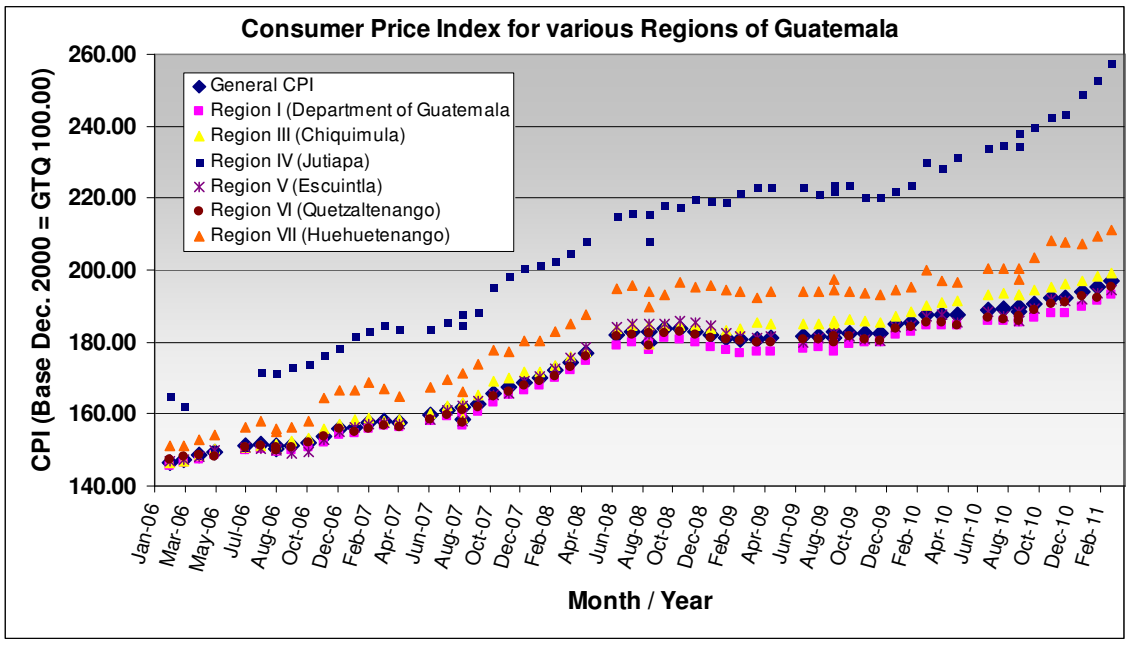


Figure G29: Evolution of the Consumer Price Index for various regions of the country from January 2006 until (SOURCE: INE 2011d)

In the context of coffee there are no up to date figures by province. However, in 2001, the International Organization for Migrations (IOM, 2001) reported that the eight departments of the country with the highest number of jobs related to coffee were Santa Rosa (156,557), Chiquimula (76,960), Huehuetenango (71,243), Alta Verapaz (70,025), Quetzaltenango (63,070), Suchitepequez (51,316), Guatemala (49,198), and San Marcos (43,916). In this report IOM states that at that time these eight departments accounted for 78% of the total production of coffee in the country.

Combining trends in terms of remittances, CPI, poverty and extreme poverty, and coffee production, it could be stated that Huehuetenango, Alta Verapaz, and Chiquimula may experience impacts associated to the GEC as shown in table G20. Huehuetenango is a department that appears in all five factors which are affected by the GEC, and in top places in several cases. Alta Verapaz could also be

impacted given the fact that it appears in four of the five factors. Chiquimula appears three times. Other departments which could be considered from this list include Quiche, Jutiapa, Solola, and Quetzaltenango which appear in two of the five factors presented in table G18.

	Table G20: Factors influencing impact of the GEC in departments of Guatemala				
Ranking	**Remittances**	**Extreme Poverty**	**Poverty (incl. Extreme Poverty**	**Consumer Price Index**	**Coffee production**
Highest	Huehuetenango	El Progreso	Alta Verapaz	Jutiapa	Santa Rosa
2nd Highest	Quiche	Alta Verapaz	Huehuetenango	Huehuetenango	Chiquimula
3rd Highest	Jutiapa	Quiche	Solola	Alta Verapaz	Huehuetenango
4th Highest	Chiquimula	Huehuetenango	Totonicapan	Chiquimula	Alta Verapaz
5th Highest	Zacapa	Jalapa	Baja Verapaz	Quetzaltenango	Quetzaltenango
6th Highest	Chimaltenango	Solola	San Marcos	Escuintla	Suchitepequez

The Global Economic Crisis and disasters

This project has a special focus on disasters, particularly trying to find the links between the GEC, vulnerability and the impacts of disasters. As stated in the original project proposed, one of the broad objectives of this project is to understand how the quantifiable impacts of natural disasters may be potential indicators of the GEC impacts.

Figure G28 shows a time chart making reference to the IO&FC, the GEC, the main disasters following the GEC, pre-existing conditions regarding the United States economy and its influence in Guatemala; the local Guatemalan context of government policies and financial and economic situation; and the effects of the all of these on livelihoods, thereby exacerbating vulnerability, which is represented in terms of susceptibility and coping capacity.

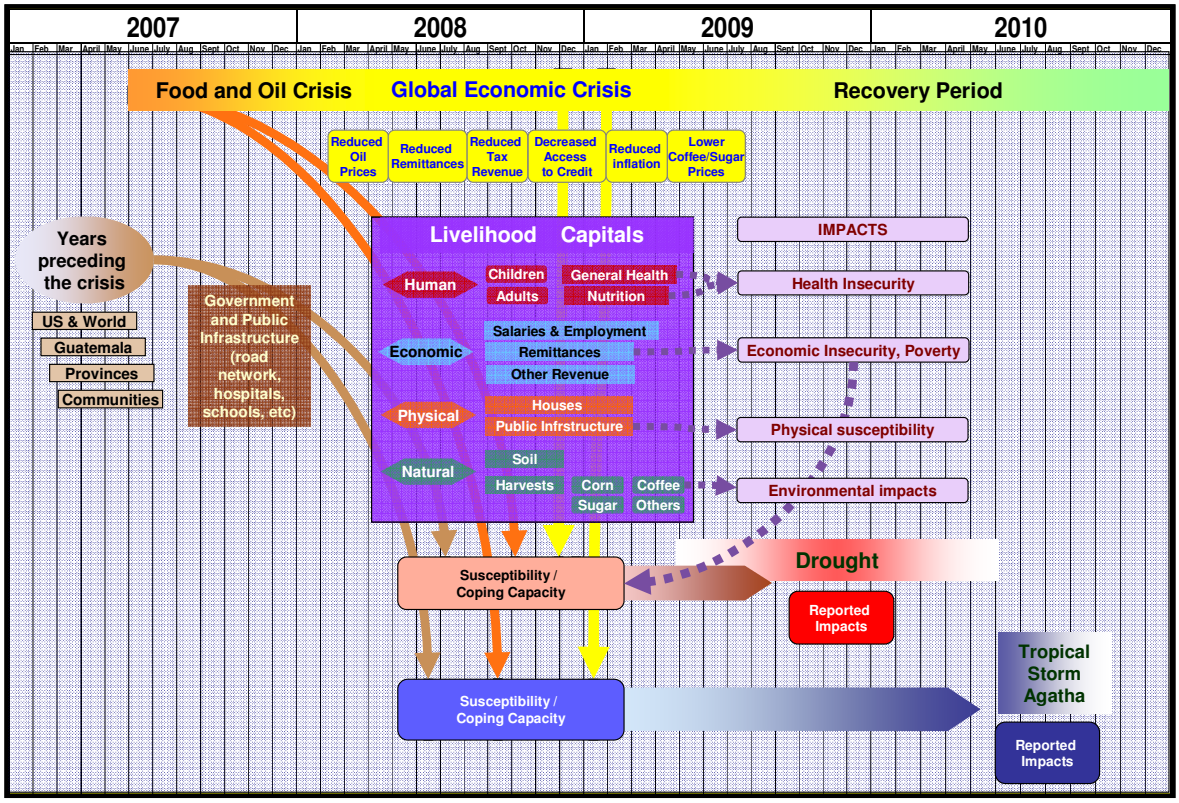


Figure G28: Time chart displaying the GEC, its manifestations in the Guatemalan context and natural disasters taking place after the GEC. The figure also displays 4 capitals associated with livelihoods, the government and the public infrastructure it manages and is responsible for and makes reference to pre-crisis conditions.

As it was stated earlier, disasters reflect pre-existing vulnerabilities. However, as many experts have indicated (Wisner et al, 2004; Wilches-Chaux, 1993; Villagran, 2001, 2006; Maskrey, 1993; Lavell, 2003; ECLAC, 2000; Cardona 2001, 2003, 2004, 2007), the generation of vulnerability is a process that takes decades if not centuries. Century-old traditions regarding building techniques, access to power and resources, social trends, economic trends; all these shape up societies and how they make use of the environment to survive. To this end, this report has tried to present not only the impacts of the GEC within Guatemala, but also the impacts of the IO&FC and the general trends that preceded these crises.

In the context of disasters and Guatemala, two major disasters took place after the GEC: a drought that impacted the dry corridor in 2009 and early 2010; and tropical storm Agatha which impacted the country in June 2010 provoking extensive damage to public infrastructure, services, and agriculture.

The 2009/10 drought

The 2009/10 drought impacted mostly the "dry corridor" of the country, forcing the government to decree a National State of Public Calamity in September 2009 (Gov. of Guatemala, 2009). Drought conditions in this case were associated with changes in the typical patterns of rainfall for different regions of Guatemala and were associated with climate change in the official decree. The decree also stated that it was being enacted to avoid larger consequences in the context of food insecurity due to potential depletion of food reserves throughout the country. The impacts of the drought and the enactment of this National State of Public Calamity led the United Nations to launch the Food Insecurity and Acute Malnutrition Appeal in 2010.

According to a special report prepared by experts who participated in the FAO/WFP Mission which conducted a rapid evaluation of crops and food security in Guatemala that took in November 2009 (FAO & WFP, 2009), the drought conditions manifested themselves mostly in the "Corredor Seco" of the country, covering the eastern, central and some western areas of the country. These conditions had a severe impact on corn and bean crops, and in some areas losses rose up to 80% of the total crops and in severe cases losses were of such high degree that farmers were not able to recuperate even seeds for the next crops. According to this report, roughly 400,000 families were affected by the drought and 145,400 families would require humanitarian assistance from the government and the international community given their food insecurity condition.

The Dry Corridor spans two areas: a stretch of semi-arid land where droughts may be recurring, with degraded soils, low yields, and with high topographic relief. This stretch includes areas of the Quiche, Baja Verapaz, Chiquimula, Zacapa, El Progreso, Jutiapa and Jalapa departments. The second area is a stretch of the coast in the Pacific plains next to the ocean, roughly 6 kilometers wide, spanning departments bordering with Mexico to departments bordering with El Salvador.

Table G21 reproduces data in the location of food insecurity at the level of departments as presented in this FAO/WFP report. The table presents data on the number of families affected by the drought, and the number of families in severe and moderate food insecurity. Izabal, Jalapa and Santa Rosa are the three departments with the highest numbers of families affected by the drought. In contrast, the four departments with the largest number of families in food insecurity (severe and moderate) are Jalapa, Jutiapa, Izabal, and Chiquimula.

Data on losses in corn crops (white and yellow corn) according to the FAO/WFP report are presented in Table G21. Jutiapa, Chiquimula, Quiche and Zacapa are the departments which suffered the most in terms of lost production (tonnes of corn). However, in terms of percentage of hectares lost with respect to total number of hectares planted, Chiquimula, Zapaca, Baja Verapaz, Totonicapan and El Progreso,Jutiapa and Quiche stand out.

In November 2009, REDHUM reported (2009) the results of a rapid survey which had been conducted in October 2009 which targeted 54 municipal districts the Dry Corridor spanning seven departments. The rapid survey targeted high risk populations in the context of food insecurity and was also conducted at the request of the Government of Guatemala. According to this report, even before the drought already 36,500 families were already facing food insecurity problems in the departments of Peten, Quiche, Alta Verapaz, Izabal, San Marcos, and Huehuetenango. According to this report, 65,500 families were already affected by the drought in the Dry Corridor.

Table G21: Data on Families in Departments with high food insecurity in 2009 / 2010 (Source: FAO/WFP 2010).

Department	Families affected by drought	Families in severe food insecurity	Families in moderate food insecurity	Total number of families in food insecurity
Jalapa	60,351	12,070	12,674	24,744
Jutiapa	44,965	10,792	13,040	23,831
Izabal	66,634	4,465	16,975	21,440
Chiquimula	37,972	6,076	15,189	21,264
Baja Verapaz	45,104	5,413	9,021	14,433
Totonicapan	36,338	3,634	6,904	10,538
Santa Rosa	52,360	3,142	7,330	10,472
Quiche	33,489	1,479	5,428	6,906
El Progreso	23,346	2,568	3,502	6,070
Alta Verapaz		840	2,886	3,726
Peten		417	1,516	1,933
TOTAL	**400,559**	**50,893**	**94,465**	**145,358**

In the United Nations flash appeal for Guatemala entitled**: Guatemala - Food Insecurity and Acute Malnutrition Appeal in 2010** (UN 2010), it is stated that the drought had a variety of impacts which included a three-fold increase in the number of severe acute malnutrition cases reported in the Jalapa department, an increase in cases of acute malnutrition in the Guatemala department, more than 240 deaths of children under 5 years of age due to severe acute malnutrition, and an increase in levels of malnutrition in other departments of the Republic. The report indicates that the Flash Appeal would target 137,000 families in of Baja Verapaz, Chiquimula, El Progreso, Jalapa, Jutiapa, Santa Rosa, Zacapa, Izabal and El Quiché. The assistance provided through this Flash Appeal would support efforts in agriculture, water, sanitation and hygiene, food, nutrition, health and early recovery. The main effects of this drought and of the preceding crises documented in this report include:

- A rate of 11% of acute malnutrition in children under five (0.9% being the national rate);
- A rate of 13% of acute malnutrition in women of childbearing age;
- As of January 2010, 77.5% of households in the Dry Corridor, including those at the highest risk of food insecurity, have depleted their food reserves;
- 77% of families depend on agriculture for their livelihoods, household staple foods being corn (cultivated by 95%) and beans (cultivated by 88%);
- Subsistence farmers have reported crop losses of 50-100% for corn, beans, sorghum and yucca, limiting food availability to the region.

In terms of livelihoods, it could be stated that the drought had a severe impact on the natural capital that rural households make use for their sustainability (soil for agriculture and on crops), particularly in the dry corridor. As a consequence of the loss of crops and an increase in the price of food, and reductions in remittances, it is to be expected that the economic and human capitals of rural livelihoods would have been affected in households in some areas of the Dry Corridor,. In the context of human capital, the United Nations and SEGEPLAN provided a map related to the Flash Appeal highlighting the geographic area of intervention for this Flash Appeal, which is presented in figure G31.

Table G22: Estimated losses in production of corn (yellow and white) for the 2009 / 2010 crop. Source (FAO/WFP 2009)

Department	Planted Area (hectareas)	Hectares Lost in 1st crop	Percentage of hectares lost in 1st crop	Hectares lost in 2nd crop	Percentage of hectares lost in 2nd crop	Production Lost (tonnes)
Chiquimula	26,740.84	15,381.10	**57.52**	6,068.30	**22.69**	**25,516.11**
Zacapa	26,161.59	10,310.58	**39.41**	3,662.40	**14.00**	**15,863.19**
Baja Verapaz	29,751.61	6,503.28	**21.86**	1,823.99	**6.13**	**5,747.10**
Totonicapan	10,748.01	2,217.74	**20.63**	0.00	0.00	**7,284.76**
El Progreso	16,905.00	3,409.42	**20.17**	1,309.28	**7.74**	**9,987.63**
Jutiapa	84,054.39	13,482.84	**16.04**	1,821.61	2.17	**40,934.88**
Quiche	65,156.00	8,340.78	**12.80**	4,760.21	**7.31**	**23,542.28**
Guatemala	27,298.25	1,840.44	6.74	286.16	1.05	5,377.63
Suchitepequez	42,019.60	2,227.54	5.30	214.69	0.51	4,065.08
Retalhuleu	26,661.74	826.14	3.10	46.76	0.18	3,785.47
Santa Rosa	16,868.95	445.90	2.64	263.90	1.56	3,101.03
Huehuetenango	78,732.50	1,313.20	1.67	897.82	1.14	3,988.32
Izabal	28,170.94	450.80	1.60	326.48	1.16	1,090.28
Jalapa	38,273.34	514.50	1.34	14.00	0.04	852.76
Alta Verapaz	147,155.05	1,553.30	1.06	1,215.76	0.83	6,064.18
San Marcos	61,216.96	343.00	0.56	171.36	0.28	458.00
Peten	91,565.39	151.90	0.17	136.64	0.15	478.39
Sacatepequez	4,444.93	3.92	0.09	0.00	0.00	7.87
Quetzaltenango	26,266.80	1.96	0.01	0.00	0.00	4.48
Chimaltenango	18,571.49	0.98	0.01	0.00	0.00	1.69
Solola	22,265.81	0.00	0.00	0.00	0.00	0.00
Escuintla	32,854.08	0.00	0.00	0.00	0.00	0.00
TOTAL	**921,883.27**	**69,319.32**	**7.52**	**23,019.36**	**2.50**	**158,151.15**

Based on the definition of vulnerability employed in this project in terms of susceptibility and coping capacities, it can be stated that the following capitals have manifested a susceptibility to the drought, the GEC, the IO&FC, and pre-existing conditions:

Natural Capital: As expected, crops are susceptible to droughts.

Economic Capital: The economic capital of rural communities is composed of various inputs including remittances, income derived from the commercialization of

agricultural products such as basic grains, and wages in some cases. The GEC had an impact in terms of reducing remittances by nearly 10% in Guatemala in general, but the percentage of income that remittances represents vary from department to department. Furthermore, the losses in crops meant that households in areas affected by the drought could not commercialize basic grains to increase their economic capitals. In addition, the higher cost of living as represented through the CPI implies that there is a susceptibility of economic capital when families have to use some of their savings to cope with the combined impacts of droughts. Nevertheless, there has been no account of major job losses associated with droughts, implying the fact that at least incomes related to wages did not vary during the drought.

Human Capital: Impacts manifested through severe and chronic malnutrition, as well as through deaths of children as a result of malnutrition reveal the susceptibility of human capital.

Physical capital: Physical capital is basically associated with infrastructure and hence, it is not expected to be susceptible to droughts.

Deficiencies in coping capacities, which complement the notion of vulnerability, have been tracked through the need for families to request assistance from the government to cope with the combined impacts of the crises and the drought. As it is to be expected, it is the extremely poor and the poor to a lesser degree that face the largest difficulties when coping with the impacts of these stresses.

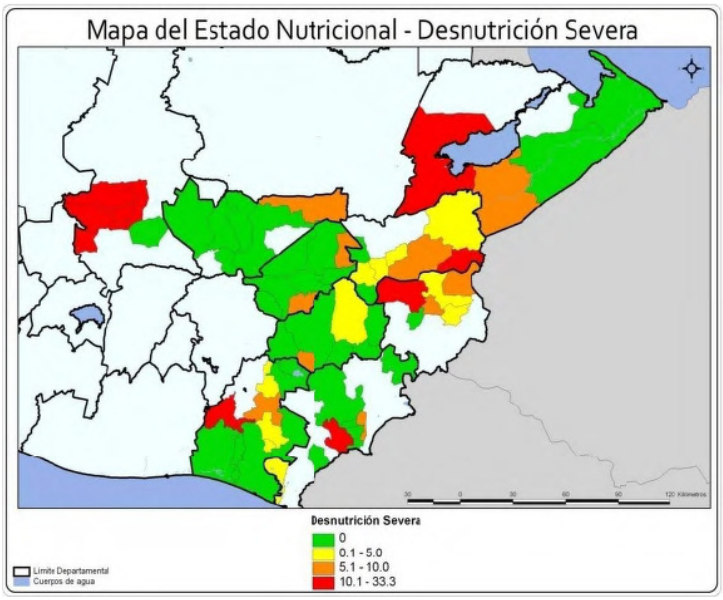


Figure G31: Map depicting areas of intervention for the Flash Appeal of 2010 (SOURCE: SEGEPLAN & UN 2010).

As it was stated in various reports, as a way for communities to cope with this drought and its impacts, efforts need to be conducted on behalf of the government with the support of the international community. The Government of Guatemala initiated actions through the allocation of national funds to help those people which were affected by the drought and subsequent food insecurity conditions and elevated requests for international assistance. By the spring of 2010, the Government of Guatemala had already invested already US$ 17.5 million, the United Nations Central Emergency Response Fund (CERF) provided US$ 5 million in late 2009, and the international community had committed roughly US$ 27 million in financial aid (UN 2010). While such an assistance was targeted to those municipal districts within the Dry Corridor where poverty was high, the Flash Appeal report stated that given the limitations of households to generate different types of incomes, such households could be expected to continue facing food insecurity problems in the coming months.

In his official report to Congress corresponding to the year 2009, the President of Guatemala (SEGEPLAN 2010b) stated that the Government, despite the impacts of the GEC in terms of a sharp and unforeseen reduction in tax revenues, made efforts to continue targeting social welfare and social

development through such programmes as "*Mi Familia Progresa*" (financial assistance to families through conditioned financial tranfers), "*Bolsas Solidarias*" (provision of a bag of food in exchange for families attending training events organized by the government on social welfare and development), "*Mi Comunidad Produce*" (low-interest credits to support production in rural areas), "*Centros de Atención y Desarrollo Infantil*" (day-care services for children targeting food, education, recreation and preventive health) and "*Creciendo Bien*" (targeting support to women). The *Mi Familia Progresa* programme targeted cash contributions to families mostly in Alta Verapaz, Quiché, Huehuetenango, San Marcos, Sololá and Totonicapán; as according to this Presidential Report, these were the departments with the higher indexes of poverty and extreme poverty. Unfortunately, experts from the World Bank (2009) comment that such conditioned cash contributions may not necessarily reach all those households in extreme poverty or vulnerable groups such as women and infants.

As a way to provide assistance to families at risk of famine due to the drought taking into consideration unforeseen and substantial reductions in tax revenues, the government reduced budgets in different areas and introduced strong austerity measures. Between September and December 2009, the government provided food bags to roughly 173,211 families in 2346 communities of the Dry Corridor in the departments of El Progreso, Zacapa, Baja Verapaz, Jutiapa, Jalapa, Santa Rosa and Chiquimula.

As a way to make some sense of the GEC and the impacts of the drought, table G23 presents rankings of departments in terms of:

- Potential impacts related to the GEC (Table G20);
- Departments belonging to the Dry Corridor;
- Families affected by drought;
- Families in a state of food insecurity (table G21); and
- Losses in corn production (table G22).

From the point of view of the GEC only 3 departments would lie inside the Dry Corridor: Chiquimula, Jutiapa, and Quiche. In terms of the GEC, Chiquimula is impacted through reduction in remittances, a higher CPI and no drop in the CPI during the GEC, and potential reductions in income related to coffee production (both due to the impacts related to the drought and the reduction in international prices of coffee). In this same context of the GEC, Jutiapa would be impacted by drops in remittances and a higher CPI and also no drop in the CPI as a consequence of the GEC. Quiche would be affected by remittances and extreme poverty.

Table G23: Ranking of Departments by category

GEC	Dry Corridor (% of area inside)	Families affected by drought	Total number of families in food insecurity	% Losses (Corn production)
Huehuetenango	El Progreso	Izabal	Jalapa	Chiquimula
Alta Verapaz	Zacapa	Jalapa	Jutiapa	Zacapa
Chiquimula	Baja Verapaz	Santa Rosa	Izabal	Baja Verapaz
Jutiapa	Chiquimula	Baja Verapaz	Chiquimula	Totonicapan
Quiche	Jutiapa	Jutiapa	Baja Verapaz	El Progreso
Solola	Jalapa	Chiquimula	Totonicapan	Jutiapa
Quetzaltenango	Quiche	Totonicapan	Santa Rosa	Quiche

From this table it can be concluded that the departments which stand out in terms of being severely affected by the GEC and by the drought would be Chiquimula, Jutiapa and Baja Verapaz Quiche, Jalapa and Totonicapan, would also be highly affected. El Progreso, Zacapa, Izabal and Santa Rosa would be moderately affected, while Solola and Quetzaltenango would be also affected, but not as much.

Tropical Storm Agatha in June 2010

In June 2010, just days after the eruption of Pacaya volcano, tropical storm Agatha impacted the country provoking extensive losses. In contrast to droughts, recent tropical storms such as Agatha in 2010 and Stan in 2005, as well as hurricane Mitch in 1998, have impacted the territory provoking extensive damage or destruction of infrastructure, particularly in the case of the road network and schools. Damage to infrastructure occurs due to landslides and debris flows and in the case of roads due to the collapse of damage to bridges, in many cases the approaches to the bridges themselves. In addition, such tropical storms and hurricanes also impact crops due to either excessive rainfall or flood.

Figure G32 presents a map depicting the regions affected by tropical storm Agatha according to CONRED as of 31st May 2010.

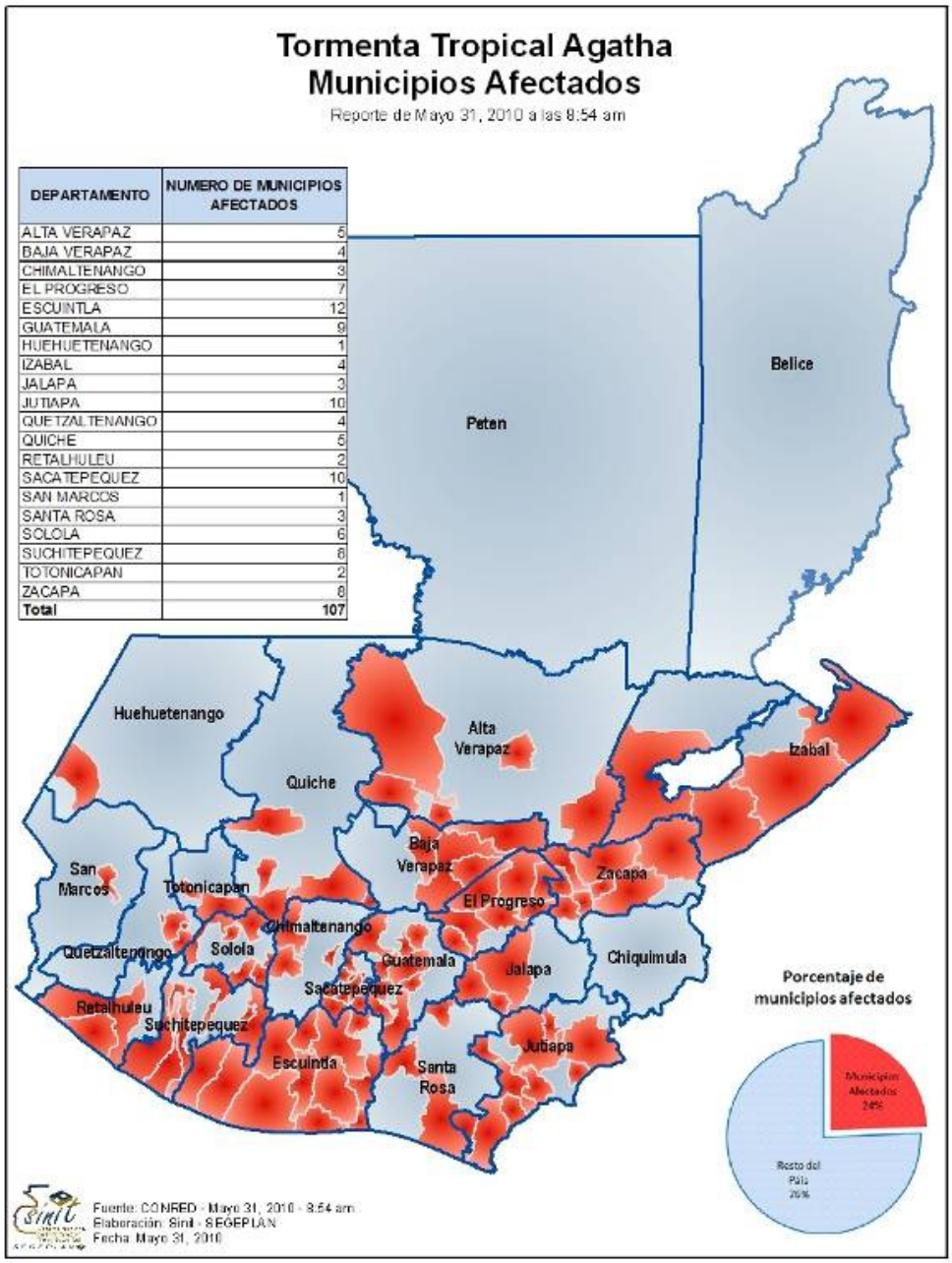


Figure G32: Map depicting areas affected by tropical storm Agatha (SOURCE: CONRED 2010).

As it can be seen, only two departments were not really impacted: Peten and Chiquimula. Departments which were most affected included Escuintla, Izabal, Solola, Retalhuleu, and Guatemala. Figure G33 presents the location of impacts as of 2 June 2010 (CONRED, 2010).

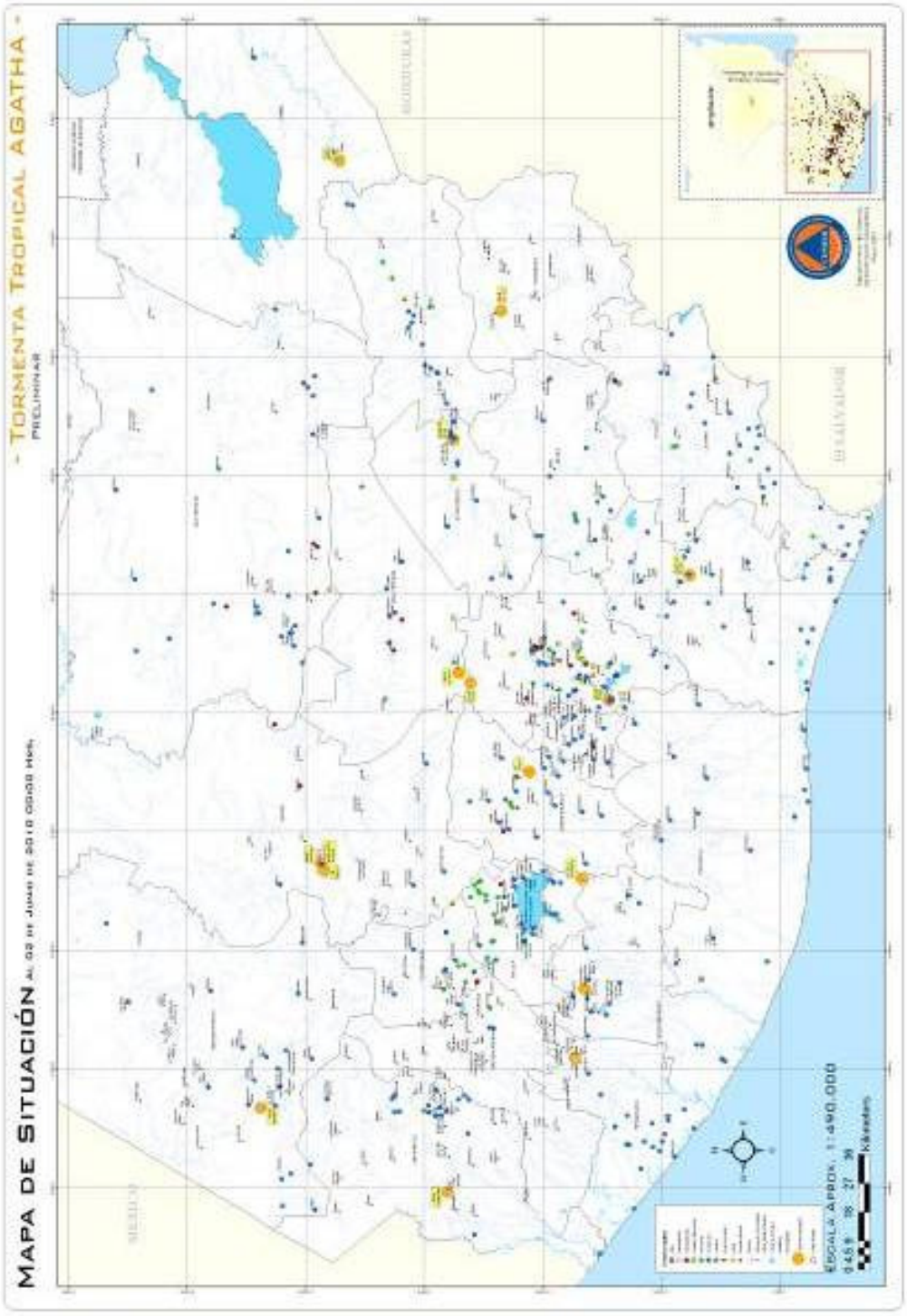


Figure G33: Map depicting sites affected by tropical storm Agatha (SOURCE: CONRED 2010). The large orange circles depict the bridges which were affected or destroyed by the storm; the blue circles depict floods, the green, red, and grown circles depict mass movements of various kinds (landslides, debris flows, etc).

The Government of Guatemala, with the support of various international agencies, elaborated a preliminary report of damages (GoG 2010), citing the difficulties encountered to cope with this event due to the previous effects of the IO&FC and GEC crises and the drought conditions. The storm provoked 96 fatalities, 23 injured, and 62 missing persons. The affected population was in the order of 340,000 inhabitants, and losses amounted to GTQ 7,855.7 million (approximately US$ 982 million), corresponding to slightly more than 2.2% of the GDP of the country. 39% of these financial losses were due to destruction of assets, and 61% due to changes in economic fluxes and production losses. 70% of the financial impacts are related to public property while 30% of the losses are related to private property (GoG, 2010; ECLAC, 2011). Table G24 presents monetary figures regarding damages and losses.

Table G24: Summary of damages and losses due to Tropical Storm Agatha (Monetary figures in millions of GTQ - Source: GoG 2010)

	Damages	Losses			
Sub-Sector			**TOTAL**	**Public**	**Private**
SOCIAL	**1,333.60**	**234.2**	**1,567.80**	**788.4**	**779.4**
Housing	646.3	127.1	773.4		773.4
Health	27.9	88.8	116.7	110.7	6
Education	640.4	14.9	655.2	655.2	0
Cultural and Sports Facilities	19.1	3.4	22.5	22.5	
PRODUCTIVE	**230.4**	**802.9**	**1,033.30**	**25.6**	**1,007.70**
Agriculture, livestock, fishing	84.2	562.6	646.7	25.6	621.1
Industry	123.3	194.3	317.6		317.6
Commerce	9.8	23.8	33.7		33.7
Tourism	13.1	22.3	35.4	0	35.4
INFRAESTRUCTURE	**2,615.70**	**221**	**2,836.70**	**2,620.00**	**216.8**
Transport	2,456.40	168.4	2,624.80	2,456.40	168.4
Energy	78.1	16.6	94.7	49.7	45
Water and Sanitation	81.1	36.1	117.3	113.8	3.4
CROSS-CUTTING	**620.8**	**1,797.10**	**2,417.90**	**2,044.10**	**373.8**
Environment	335.6	1,756.60	2,092.20	1,893.40	198.7
Impact of Women	150.5	40.6	191	16	175
Risk Management	134.7		134.7	134.7	0
Total GTQ	**4,800.50**	**3,055.30**	**7,855.70**	**5,478.00**	**2,377.60**
Total US$ [a]	**600.1**	**381.9**	**982**	**684.8**	**297.2**

[a] **Exchange rate: 8 GTQ per 1 US$**

According to this report, infrastructure suffered the greatest impact (36% of damages and losses), followed by the social impacts (20%), particularly in the area of housing. The main national and international highways linking a vast majority of the country were severely impacted. The productive sector experienced damages and losses amounting to 13% of the total amount, potentially having an impact on employment and livelihoods, particularly in the case of rural people in poverty and extreme poverty.

In its report on the impacts of tropical storm Agatha, ECLAC (2011) reiterated the fact that impacts were more concentrated on infrastructure than in other sectors. According to this report, impacts on the population were as follows:

Affected population:	559 923
Evacuated:	207 845
People in shelters:	142 775

Number of shelters:	440
Missing persons:	42
Injured:	223
Deaths:	235

The ECLAC report states that the root causes for damages and losses include the use of inadequate building techniques, the location of houses in high hazard areas, exposed to floods, landslides, and volcanic eruptions; implying a weakness in the enforcement of land-use plans in urban and rural areas; and the long-term effects of inadequate land-use practices, environmental degradation, and the accumulated effect of several disasters for which there is no real and full recovery.

Impacts on the housing sector are presented in table G25. As it can be seen from the table, Izabal, Solola and Chimaltenango are the departments with the higher percentage of houses destroyed by the storm. However, the departments with the largest numbers of houses affected are Escuintla, Izabal and Zacapa.

Table G25: Impacts of tropical storm Agatha on the Housing Sector (Source: ECLAC 2011)

Department	Number of Houses according to degree of damage				Percentage of houses destroyed
	Slight damage	Partially destroyed	Totally destroyed	Total affected	
Izabal	2,056	859	691	3,606	17.6
Sololá	157	82	635	874	16.1
Chimaltenango	0	20	556	576	14.1
Totonicapan	88	30	418	536	10.6
Zacapa	267	851	380	1,498	9.7
Jutiapa	0	403	370	773	9.4
Escuintla	3,418	429	235	4,082	6.0
El Progreso	0	487	197	684	5.0
Retalhuleu	43	0	111	154	2.8
Quiche	490	214	80	784	2.0
Suchitepéquez	96	564	70	730	1.8
Huehuetenango	5	84	48	137	1.2
Baja Verapaz	9	126	45	180	1.1
Jalapa	6	49	45	100	1.1
Guatemala	46	27	23	96	0.6
Quetzaltenango	220	38	8	266	0.2
Alta Verapaz	41	10	8	59	0.2
Santa	679	31	6	716	0.2
Chiquimula	11	40	6	57	0.2
Sacatepéquez	53	105	2	160	0.1
San	5	6	0	11	0.0
Petén	0	0	0	0	0.0
Totales	**7,690**	**4,455**	**3,934**	**16,079**	**100.0**

In the context of houses destroyed by the storm, the departments with the highest impacts are Izabal, Solola, Chimaltenango, Totonicapan, Zacapa, and Jutiapa. In contrast, Escuintla and Izabal are the departments with the most number of houses slightly damaged.

Damages to houses in Izabal, Zacapa, Jutiapa, Chimaltenango, Escuintla, Solola, and Totonicapan account for 72.4% of the economic impacts within this housing sector.

In the agricultural sector, ECLAC reports that damages and losses account for nearly GTQ 672.4 million, of which 88% correspond to production losses and the rest are losses associated with capital assets. The crops most affected by the storm were corn, banana, vegetables, plantain, coffee, and to a lesser degree sugar cane. While basically 21 departments were impacted by the storm, the impacts within the agricultural sector (including livestock and fishing) were most severe in Escuintla, Zacapa, El Progreso, Chimaltenango, Sololá, Izabal, Santa Rosa and Retalhuleu. Within the context of the indigenous population, losses in the highlands were severe given the impact of losses on livelihoods. Corn losses accounted for 14.1% of all agricultural losses and 9% with respect to total losses, thereby impacting on food security. It is estimated that 11% of the families affected by crop losses were cultivating corn. In

the case of black beans, losses amount to 3.6% of the total losses of the country, and it is estimated that 6% of the families affected by crop losses cultivated corn. Table G26 presents data on impacts on crops

Table G26: Crop losses due to tropical storm Agatha and Pacaya volcano Eruption (Source: ECLAC 2011).

Crop		Thousands of tonnes			Percentage
		Forecasted production before Agatha	Forecasted crop after Agatha	Crop loss	Relation between lost and forecasted
For local consumption	Corn	1648,1	1598,0	50,0	3.0
	Beans	198,7	197,7	1,0	0.5
	Rice	25,4	25,3	0,2	0.8
	Fruits (general)	4,550,3	4,436,2	114,1	0,8
Export crops	Coffee	247,4	241,8	5,6	2.3
	Sugar cane	25,822,5	25,821,4	1,1	0.0
	Bananas	2,859,6	2,628,6	231,0	8,1

The table highlights corn and beans as subsistence crops which are cultivated by families in rural areas. Coffee and sugar cane are also crops which provide jobs to people in rural areas.

The ECLAC report states that 2010 remittances alleviated the impacts, particularly in the case of those households benefiting from such remittances. In 2010, it is estimated that remittances represented 10.5% of the national GDP. In addition, the report states that damages and losses due to the storm could have an impact of 0.5 percentage points on the GDP.

In the context of livelihoods, it can be seen that tropical storms such as Agatha have a major impact on physical capital. In addition, given the impacts of the storm in departments located in the highlands where poverty is higher, losses in crops may lead to reductions in economic capital and to food insecurity. However, the small impact on coffee and sugar cane would imply that income related to temporary work during the crop season is not affected.

Comparing disasters before and after the Global Economic Crisis

One of the goals of this project has been to understand the particular effects that the GEC has had on vulnerability to natural disasters, and consequently, to try to asses in which way the GEC may have worsened the impacts of events such as droughts and tropical storms. However, as it has been stated throughout this document, vulnerability to disasters stems from a combination of root causes and dynamic factors such as the GEC, the IO&FC, and recent disasters.

To this end, its important to put into perspective disasters which have taken place before and after the GEC, to see if impacts have been larger in those events which have taken place after the GEC, namely the 2009/10 drought and tropical storm Agatha in 2010. Table G27 presents data gathered from the database of OFDA/CRED regarding recent disasters in Guatemala between 1992 and 2010. The lists depicts the ten largest events in terms of people killed and people affected. The table highlights the two events which took place after the GEC.

In terms of fatalities, it could be stated that tropical storm Agatha in 2010 provoked less fatalities than tropical storm Stan in 2005 and hurricane Mitch in 1998. Furthermore, the drought in 2009/10 did not provoke fatalities in contrast to the drought during 2001/02. So, it is difficult to assess whether the GEC may have worsened the vulnerability of people when looking at the impacts of disasters in terms of people killed.

Table G27: Data on fatalities and people affected by disasters in Guatemala between 1992 and 2011. Source (EM-DAT: The OFDA/CRED International Disaster Database)

Disaster	Date	No. Killed	Disaster	Date	Affected
Hurricane Stan	01/10/2005	1513	Drought 2009/10	Mar-09	2500000
Hurricane Mitch	26/10/1998	384	Hurricane Stan	01/10/2005	475314
Epidemic	Jan-92	206	Tropical Storm Agatha	28/05/2010	397962
Tropical Storm Agatha	28/05/2010	174	Flood	22/10/2008	180000
Mass movement wet	13/09/2002	68	Drought 2001/02	Sep-01	113596
Mass movement wet	15/06/2005	63	Hurricane Mitch	26/10/1998	105700
Mass Movement Wet	04/09/2010	53	Flood	04/02/2002	98740
Mass movement wet	26/08/1998	51	Mass Movement Wet	04/09/2010	50696
Drought 2001/02	Sep-01	41	Flood	02/07/2008	17300
Mass Movement Dry	04/01/2009	36	Flood	19/06/2009	10800

In terms of people affected, the table allows one to conclude that tropical storm Agatha also affected less people than hurricane Stan but more people than hurricane Mitch. In addition, it can be seen that the drought in 2009/10 impacted more people that the drought in 2001/02.

The difficulty in making explicit comparison stems from the fact that natural events also manifest themselves either in different geographic regions or with a different degree of magnitude. Therefore, the impacts of disasters emerge as a combination of the magnitude of the events and the degree of vulnerability of the affected communities.

Comparing crises: the Global Economic Crisis and the International Coffee Crisis

A relevant event to the GEC in terms of a stressor that stems in the developed world (the United States, Europe and Japan in the context of Guatemala to name the most influential) is the international coffee crisis which took place in the years 2000 to 2003. The crisis manifested itself through a very large reduction in the international prices of coffee (slightly more than 50% reduction). Figure G34 presents data as reported by the International Coffee Organization on the prices of coffee in the international market and figure G35 presents potential revenues to coffee growers in Guatemala taking into consideration both the amount of coffee produced and the international price of coffee.

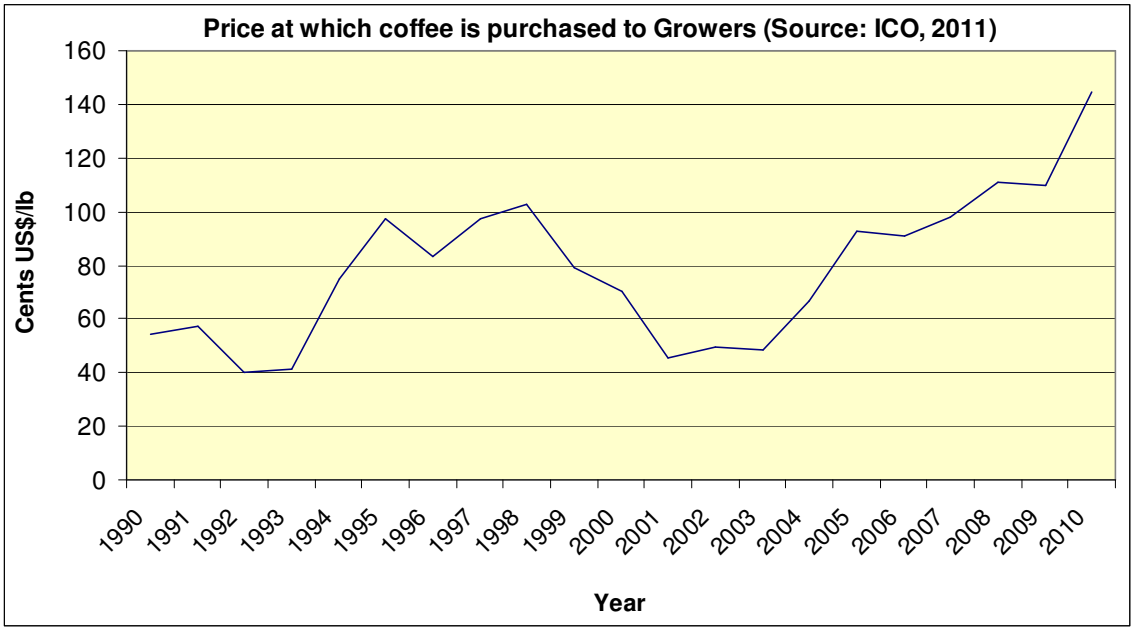


Figure G34: Evolution of prices in the international stock market.

As it can be seen from figure G35, prices had been up between 1995 and 1999, and then dropped sharply. Such a large drop forced large coffee plantations to go out of business, meaning that job losses were very large, as reported earlier. Given the fact that poverty was higher at the end of that decade than during the GEC, and taking into consideration the fact that rural families did not have an extra income from remittances then, the impacts of this International Coffee Crisis were considerably larger, and impacted not only the poor, but also the non-poor.

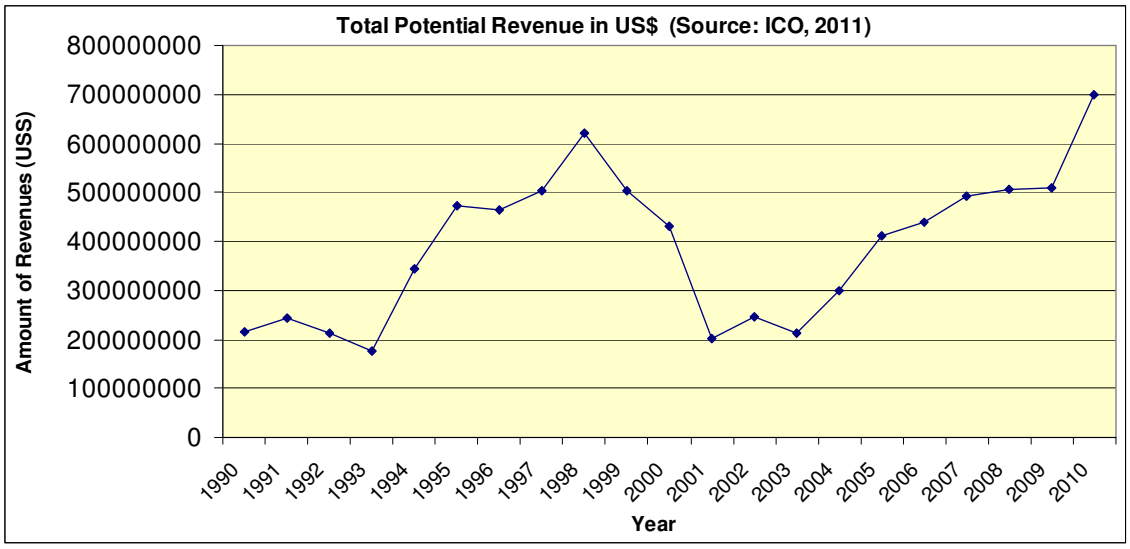


Figure G35: Evolution of revenues in Guatemala based on prices of coffee and annual production.

An important issue to visualize as well in these two graphs is the smaller impact of the GEC on coffee prices and hence on revenues as compared to the previous 2002 crisis. While the GEC may have weakened the rise in prices and revenues by 2009, its effects were much smaller in terms of job losses.

IV. Challenges related to data, information, and analysis

Data and information

As stated in the introduction, this project attempted to make use of novel visual analytic tools to assess the impacts of the GEC on livelihoods in developing countries, and the effects of such impacts in increasing poverty and vulnerability using data and information presented in a variety of formats. Unfortunately, as it has been reflected in the text, in some cases there is not enough data to assess how the GEC may have influenced poverty, livelihoods, and vulnerability in a precise fashion. In addition, data on the impacts of disasters may not blend itself to be disaggregated to see how the GEC may have influenced vulnerability.

The problem is related to the fact that national surveys to measure poverty and livelihoods have only been carried out twice in this decade, first in 2002 and then in 2006. Thus, it is impossible to track the effects of the GEC which took place between 2008 and 2010. However, the effects of the GEC were pieced together in terms of those departments which could be affected most severely based on pre-existing factors (poverty, extreme poverty, information on remittances, quality of life) those factors which are related to the GEC and are present in those departments. In the context of vulnerability, it has often been measured using proxy indicators that do not vary on a monthly or yearly basis, making it difficult then to assess any effects of the GEC. In addition, it is important to recognize the fact that both the GEC and disasters manifested themselves through impacts in a variety of sectors of development, and not just in one sector.

Figure 36 presents a map of all departments of the country and highlights those which could be most impacted by the GEC taking into consideration rankings in terms of population living below the extreme poverty and poverty lines and specific impacts of the GEC in terms of reductions in remittances, increases in the consumer price index and drops in the prices of coffee in the international markets (see table G20).

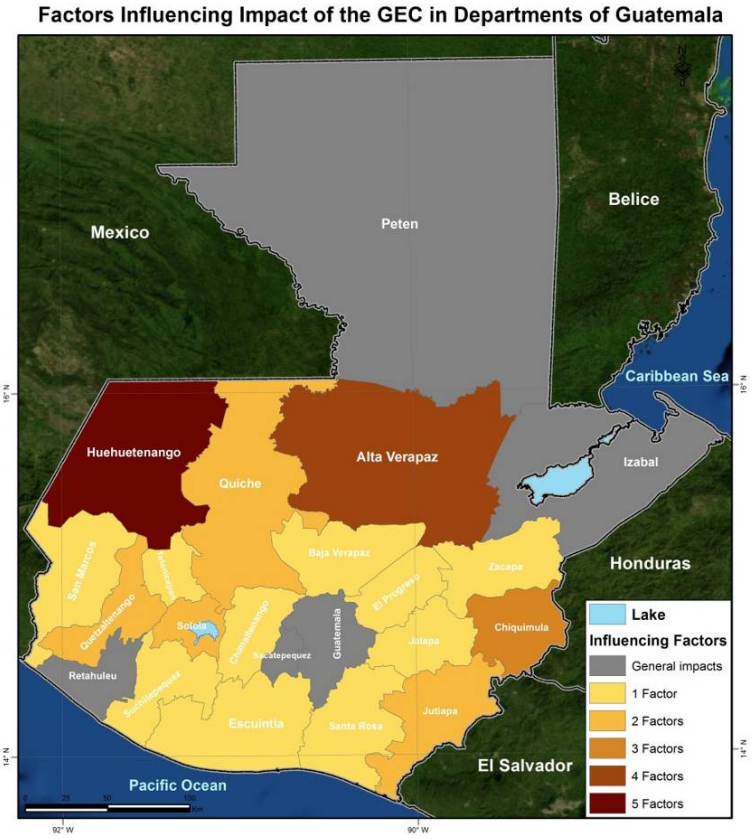


Figure G36: Departments which could be most affected by the GEC. The figure makes reference to factors which could enhance the impacts of the GEC.

The departments that stand out are Huehuetenango, Alta Verapaz and Chiquimula. To a lesser degree Quetzaltenango, Quiche, Solola and Jutiapa also stand out.

For a more precise assessment, it would be important to track drops in remittances more directly in each department. However, data on remittances is only provided at the national level.

Data on commercial products which are essential for subsistence including corn, black beans, eggs, meats, common fruits and vegetables and others would be needed at the level of departments so as to track their changes in prices. The data presented in this report only reflects the prices of products in the capital city of the country. Having data on prices of subsistence products such as corn and black beans, oil, eggs, and meats at the level of departments may allow researchers to track in a better fashion the effects of the GEC. Another key parameters that are not reported on a frequent basis are employment and un-employment figures by department and on a monthly basis. Given the lack of data, its difficult to track livelihood capitals and the effects of the GEC on such capitals.

Linking the impacts of disasters such as the 2009 drought or tropical Storm Agatha in 2010 to the GEC is also not straightforward given the types of parameters that are typically represented in reports presented by CONRED. Nevertheless, an attempt was made to combine data and information gathered from different sources to see where the combined effects of the GEC and the impacts of the drought would be larger, thereby implying a larger need for coping capacities. Figure G37 based on table G23 represents the information in a map.

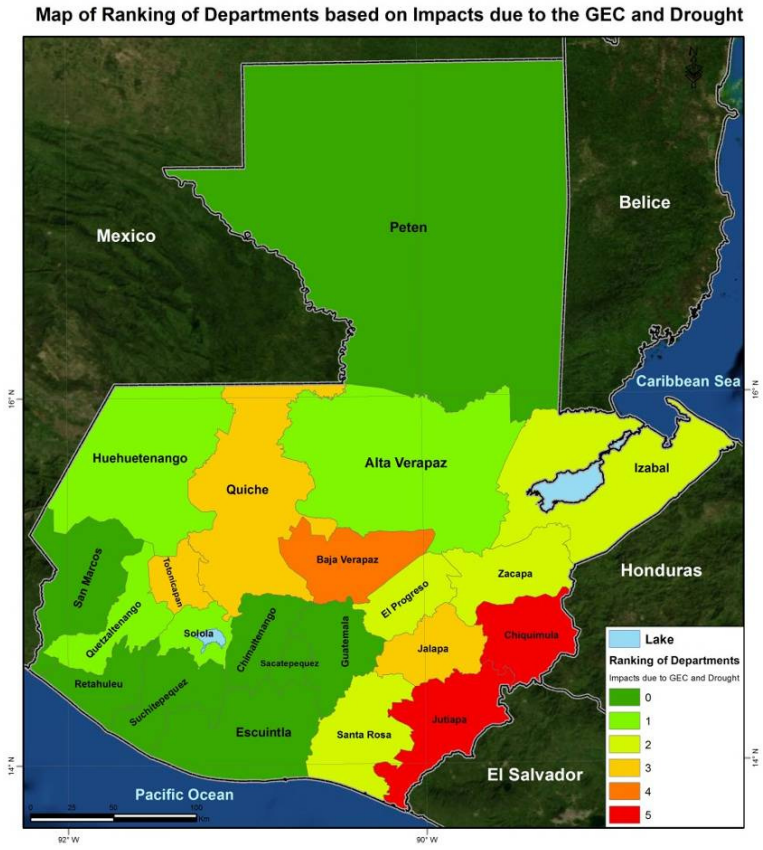


Figure G37: Departments which could be most affected by the GEC and the drought.

Visual Analytic Tools

A significant task within this project was the development of the Visual Analytic Globe as a tool to assist researchers in the analysis and visualization of the data. The VAG facilitated the viewing of data in terms of maps, charts, and text. It also served as a search engine to look for information in the internet through its built-in search capacities.

However, the VAG in its current version was not really useful to conduct a more in-depth search of the effects of the GEC in the two pilot countries. The search of documents through the use of keywords within all the documents that were compiled for this project did not really allow researchers to find explicit links between the GEC, poverty, livelihoods, vulnerability, and disasters. In addition, while the VAG was fitted to identify Named Entities specifically (names of persons, organizations, and dates), it was later found that a complete review of the text was necessary to really understand the connotation of names or persons or organizations and dates identified in the documents. To this end, an enhanced search capacity using an ontology would be needed. An initial version of the ontology was elaborated making the links between impacts of disasters, vulnerability, risks, and the GEC in terms of factors which would enhance vulnerability.

The geo-coding function allowed researchers to find which geographic regions or sites are mentioned in specific documents, and would allow researchers to identify which documents make reference to particular geographic sites or places. However, it was necessary to read the entire context of the text in order to determine the connotation of the sites are mentioned explicitly, as a way to determine if the information regarding such sites would be useful.

In this respect, it can be concluded that most of the analysis and the piecing together of the different factors describing the effects of the GEC was more based on expert knowledge of general conditions of poverty, vulnerability and livelihoods as opposed to the use of the VAG.

V. Next steps

In these concluding months geographical information system techniques and remote sensing techniques are being applied to the data gathered on Guatemala and Burkina Faso as a way to track other impacts related to droughts and floods and potential links to the GEC.

In addition, in the first week of November a mission is being planned to Guatemala to present these preliminary outcomes documented in this report to representatives of government agencies as a way to get their feedback on the findings, and any additional comments or suggestions regarding the impacts of the GEC in Guatemala.

The final report will be elaborated at the end of November, which will bring together these remaining segments of the analysis.

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ANNEX 1: Data and information related to Guatemala

Table 1: Data and Information gathered for Guatemala

Type of data	Institution	Year of elaboration	Comment
STATISTICS			
Census data – XI Population and VI Housing Census	INE	2002	The population census contains typical demographic data at the community level, which can be aggregated to the municipal level. The housing census data contains data on materials used for walls, roofs, floors. It is presented at the community level and can be aggregated to the municipal level as well.
Census data – X Population and V Housing Census	INE	1994	The population census contains typical demographic data at the community level, which can be aggregated to the municipal level. The housing census data contains data on materials used for walls, roofs, floors. It is presented at the community level and can be aggregated to the municipal level as well.
Basic Unsatisfied Needs	SEGEPLAN INE	2002	These cover: quality of house, over-crowding, access to water, access to sanitary services. These data are presented at the municipal level. The data have been deducted from the Population Census of 2002.
National Survey of Living Conditions	INE	2006	These data present characteristics of the population (sex, ethnical group, position in the household, leadership of the household (by sex), marital status, and age groups. Data is crossed against poverty variables (total population, all the population considered as in poverty, number of people in extreme poverty, number of people in not extreme poverty, and number of people not in poverty). These data are presented at the level of Department (province)
National Survey of Employment and Income	INE	2004, 2007, 2008, 2010	The survey covers parameters such as the structure of economically active population, statistics on main labour markets, and sub-employment.
Human Development Index by Municipal District – 1994 and 2002	SEGEPLAN (?)		This data include data on HDI and 3 indices: health index, education index, and income index. Sources of data to calculate these indices include INE, MSPAS, MINEDUC, UNDP, and WB. Data is presented for the years 1994, 2002, and 2006. At the municipal level, data is presented for 1994 and 2002.
Municipal Registries	SEGEPLAN	2009	SEGEPLAN has elaborated specific data registries for each municipal district of the country, which include data on population (projections based on the 2002 census up to 2010); births, deaths, birth and fecundity rates, illiteracy rates, percentage of indigenous population, indicators on education, health, housing, and types of employment.
Municipal Gaps to reach 11 MDGs	SEGEPLAN	2010	This document presents an analysis of the gaps between the current state of an MDG and the expected value of the MDG for 11 different MDGs or sub-MDGs. MDGs covered are: 1, 2, 3, 4, and 7. The baseline for the MDGs is the year 1994. The calculation is done comparing values for 1994 and 2002, as data from the census are used as inputs.
Quality of Life	SEGEPLAN (?)		This data present an index entitled: quality of life. Data is presented at the level of municipal district. Additional data includes population census data (2002) and population projections for 2008.
DOCUMENTS - MIGRATION PATTERNS			
Survey on International Emigration of	ILO	2003?	This report presents a result of a survey conducted by IOM to assess patterns of international emigration of Guatemalans. Parameters taken into consideration include sex of migrants, age group, ethnic group, marital status,

Guatemalans: Statistical Results			educational characteristics, destination patters, forms and evolution of emigration patterns, and remittances. Ref.: IOM: **Encuesta sobre Emigración Internacional de Guatemaltecos, 1ª Fase: Resultados Estadísticos**. Cuaderno de Trabajo sobre Migración No. 12
Survey on International Emigration of Guatemalans: Employment	ILO	2003?	This report presents a result of a survey conducted by IOM to assess patterns of international emigration of Guatemalans. Parameters taken into consideration include sex of migrants, age group, ethnic group, marital status, educational characteristics, destination patters, forms and evolution of emigration patterns, and remittances. Ref.: IOM: **Encuesta sobre Emigración Internacional de Guatemaltecos, 1ª Fase: El Empleo.** Cuaderno de Trabajo sobre Migración No. 13
Disasters and Migrations in Guatemala	ILO	2001?	Ref.: IOM: **Desastres y Migraciones en Guatemala.** Cuaderno de Trabajo sobre Migración No. 3.
DOCUMENTS – ECONOMY, PRICES			
Consumer Price Index data	INE	2011	INE maintains data on CPI on a monthly basis for the eight regions of the Republic and can be accessed through its website and downloaded into excel tables for further processing and analysis
Gross Domestic Product	INE	2011	INE maintains data on GDP and can be accessed through its website and downloaded into excel tables for further processing and analysis
Inflation	BANGUAT	2011	The BANGUAT website has links to inflation rates reported on a monthly basis, which can be accessed directly and then inserted into excel type documents.
Basic Food Basket prices	INE	2011	INE maintains data on the Vital Basic Food Basket and the Basic Food Basket prices and can be accessed through its website and downloaded into excel tables for further processing and analysis
Prices of fuels, food, and selected products in Guatemala city	MAGA	2011	The MAGA website has a link to data on prices of fuels, food, and other essential products, reported on a nearly daily basis. Data is reported for markets and fuel stations in Guatemala City on a nearly daily basis. The data can be downloaded and inserted into excel documents for further processing
Economic Evolution of Guatemala by year	BANGUAT	2006 -2009	BANGUAT has elaborated specific documents describing on a yearly basis for these years regarding trends in finances and the economy of the country.
Coffee Prices	ICO	2011	The International Coffee Organization maintains in its website data on prices of coffee for coffee exporting countries such as Guatemala.
Coffee production and prices for Guatemala	ANACAFE	2011	ANACAFE maintains tables regarding the production and international commercialization of coffee produced in Guatemala.
DOCUMENTS - HEALTH			
Epidemiological Bulletins	MSPAS	2011	MSPAS maintains in its website documents entitled **Boletines Epidemiológicos** which present an overview of the status of health in all departments of the Republic and according to different types of diseases.
General Health	PAHO	2011	The Pan American Health Organization maintains documents in its website regarding specific health issues related to countries in the American Hemisphere such as Guatemala.
DOCUMENTS - POVERTY, LIVELIHOODS, VULNERABILITY			
Guatemala: Population	SEGEPLAN,	2001	This document contains an analysis regarding issues such as child and mother mortality rates; birth rates; size,

and Development, A socio-demographic diagnostic	ECLAC		growth, and structure by age group, spatial distribution of internal migration within Guatemala, emigration, and demographic dynamics. This document has been elaborated as part of the policy-relevant research to enact the legislation of population and social development. Ref.: SEGEPLAN. **Guatemala: Población y Desarrollo – Diagnóstico socio demográfico.**
Poverty Maps for 2002	ASIES	2005	This document presents the results of analysis of the levels of poverty in different municipal districts of Guatemala. In this report, poverty is characterized in terms of three indices: incidence of poverty, severity of poverty, inequality (Theil Index). Poverty is analyzed using census data and surveys conducted in 2002. Ref.: ASIES. **Mapas de pobreza y desigualdad de Guatemala.** Reporte preliminar.
Guatemala: Livelihood profiles	MFEWS	2005	This document presents an analysis of livelihoods. Issues discussed include economic sources, sources of basic grains for consumption, and life zones. Livelihoods are represented for 16 different geographic regions of the country. The document was elaborated in 2005.
Guatemala: Livelihood profiles	MFEWS	2009	This document presents an analysis of livelihoods. Issues discussed include economic sources, sources of basic grains for consumption, and life zones. Livelihoods are represented for 20 different geographic regions of the country. The document was originally updated in 2007 and re-printed in 2009.
Guatemala: economic evolution in 2001	ECLAC	2002	This document present major findings regarding the economy of the country. The document reviews fiscal policies, monetary and exchange policies; production, employment, prices, and economic activity. The document includes 26 charts.
Third Report on the MDGs	SEGEPLAN	2010	This document presents a description of efforts conducted by the Guatemalan Government to achieve the MDGs.
National Risk Atlas	SEGEPLAN	2010	This CD presents the outcome of a survey conducted by SEGEPLAN. The survey targeted the perception of communities concerning the level of risk they are facing with respect to a variety of human insecurities, and is ranked in terms of 4 degrees. Inputs for this survey were provided by local leaders in communities throughout the country.
DOCUMENTS - VULNERABILITY, FOOD INSECURITY,			
Vulnerability of Municipal Districts and quality of life of their inhabitants.	SEGEPLAN	2008	This document reports on the estimation of the indicator of quality of life in municipal districts of Guatemala. Variables used to estimate this indicator include percentage of poverty, food insecurity vulnerability index, exclusion index, quality of housing, access to potable water, sanitary services, school assistance, job insecurity, percentage of extreme poverty and health deficiencies (size gap). The indicator is expressed in 5 different ranges.
Guatemala Food Insecurity and Malnutrition Humanitarian Appeal	UN	2010	This document outlines the case for the Flash Appeal being requested to support Guatemala as a consequence of the drought and other socio economic factors including the GEC that have triggered an episode of malnutrition or food insecurity.
Guatemala Food Insecurity and Malnutrition Humanitarian Appeal	Gov. of Guatemala, UN	2010	This presentation exposes the degree of malnutrition in Guatemala as a result of the drought of 2009, reduced income, exports, foreign investments, income from tourism, and higher unemployment rates.
Food security: estimation	Guardiola, J.;	2006	The document focuses on food security and vulnerability issues in Guatemala. Using the DFID livelihoods model, it

of vulnerability indices	González C, V.; Vivero, J. L.		links poverty, vulnerability, and malnutrition. It presents a vulnerability index related to food insecurity, characterizing it in terms of 4 levels. Data is presented for rural areas, ethnic groups, according to the sex and age group of the head of the household.
Food insecurity in the Departments of the Dry Corridor of the Eastern region of Guatemala, Quiche and Izabal	REDHUM	2009	This document displays the outcome of a survey conducted to identify high risk communities in the context of food insecurity, areas of acute malnutrition in children, women, and mothers. Ref: REDHUM: INFORME: RESULTADOS DE LA VALORACION DE INSEGURIDAD ALIMENTARIA Y NUTRICIONAL EN LOS DEPARTAMENTOS DEL CORREDOR SECO DEL ORIENTE DE GUATEMALA, QUICHE E IZABAL.
Recovery and prevention of malnutrition of vulnerable groups.	WFP	2010	This report presents the outcome of the evaluation of the prolonged operation of aid and recovery in Guatemala conducted between 2005 and 2008. It contains information on the situation of food insecurity in Guatemala, details of the operation and its impacts, as well as conclusions and recommendations.
Poverty, hunger and food security in Central America	ECLAC	2004	The report documents issues related to hunger, extreme poverty and food insecurity in Central America. Topics include the food system in Central American countries, food policies, aid programs targeting food and nutrition, and MDGs.
Food Security	MFEWS	2005 - 2011	MFEWS maintains in its website documents and reports focusing on food security conditions in Guatemala.
Report on measures implemented to cope with the food insecurity disaster of 2009	SEGEPLAN	2009	This document presents information on how the government is responding to this disasters. It discusses lines of intervention, solidarity of the international community, and perspectives and challenges related to this disaster.
DOCUMENTS: REMITTANCES			
Data on remittances for Guatemala	BANGUAT	2011	The BANGUAT website has links to remittances, which can be accessed directly and then inserted into excel type documents.
Receptors of remittances in Central America	IADB, MIF/FOMIn, PHC	2003	This document summarizes trends in remittances for Guatemala, El Salvador, and Honduras. Issues considered include the migratory process, immigration aspects, control of remittance flows by governments, and remittances and their use in development.
Close to Home: the development impacts of remittances in Latin America	WB	2007	This document discusses a variety of issues related to remittances in Latin America. Issues considered include the relevance of remittances, profile of recipients, migration patterns; and impacts of remittances in reducing inequality and poverty, promoting growth and investment, savings, expenditures, and labor.
The changing pattern of remittances	IADB / FOMIN	2008	This document presents an analysis of a survey concerning remittances from the United States to Latin America corresponding to the year 2008. The survey focuses on the Latin American population within the US that is sending remittances.
Report of the Expert Meeting regarding the productive use of remittances in Guatemala	ECLAC	1999	This document presents the outcome of the discussions held by a Group of Experts on the issue of remittances and their uses in Guatemala. The document outlines a series of recommendations made by these experts on various topics.

Remittances to Latin America and the Caribbean in 2010	IADB / FOMIN	2010	This document outlines how the amount of remittances is recovering after the GEC. In addition to presenting trends in remittances, this document includes discussions on topics such as the effects of sending and recipient countries on remittance flows, and provides conclusions and an outlook for 2011.
DOCUMENTS: IMPACTS OF DISASTERS			
Guatemala: the Perfect Storm.	UNICEF	2010	This document focuses on the impacts of climate change and the GEC on children and adolescents in Guatemala. In addition to discussing the impacts of the climate change and the GEC on employment and remittances, the document addresses consequences in a variety of sectors of development including health, education, and economy; as well as in topics such as dietary changes, child labor, exploitation and violence.
Data sets on disaster impacts	EM-DAT OFDA CRED	2011	Data on the worse 10 disasters have been downloaded from this international database for two periods: 1901 – 2011 and 1992 – 2011.
Damages due to hurricane Mitch in 1998	ECLAC	2004	Damage assessment due to hurricane Mitch in 1998.
Damages due to Tropical Storm Stan in 2005	ECLAC	2004	Damage assessment due to tropical storm Stan in 2005.
Preliminary notes concerning the impacts of Stan in Guatemala	SEGEPLAN, UN	2005	Preliminary impacts assessments due to tropical storm Stan in 2005. Impacts are also discussed in relation to sector of development including transport, housing, agriculture, and jobs. The document also introduces the notion of the accumulative impact of disasters, making reference to hurricane Mitch in 1998, the famine / food insecurity episode due to drought in 2001/2002 and hurricane Stan in 2005.
The disaster of October 2005 in Guatemala - Stan	SEGEPLAN, UN	2005	This power point presentation describes the impacts of tropical storm Stan in 2005. The presentation includes a variety of tables depicting impacts in a variety of sectors of development.
Guatemala, floods and mudslides, October 2005. Flash Appeal - Stan	UN		This document outlines the case for the Flash Appeal being requested to support Guatemala as a consequence of the impacts provoked by tropical storm Stan in 2005.
Summary of the impacts of hurricane Stan in Guatemala	INSIVUMEH	2005	This document describes the characteristics and the dynamics of this event, and estimates on the amount of precipitation associated with the event in all regions of the country.
Official Bulletins – CONRED - Stan	CONRED	2005	A set of bulletins issued by CONRED in relation to tropical storm Stan.
Data on impacts - Stan	CONRED	2005	Raw data concerning the impacts of Stan provided by CONRED. Data is contained in 74 excel files.
Maps - Stan	CONRED, MAGA, MINDEF MFEWS, UNDAC	2005	A collection of more than 150 maps elaborated by these agencies expressing a variety of facts related to the impacts of Stan.
Disaster Risk Management in Latin America and the	WB - GFDRR	2010	This document presents information concerning the level of risk of Guatemala in the context of disasters of natural origin. The document also presents efforts conducted by Guatemalan institutions in the area of disaster risk management and their relation to the 5 Priority Areas of the Hyogo Framework for Action.

Caribbean region - Guatemala			
Impacts and needs assessment due to tropical storm Agatha	ECLAC	2010	ECLAC conducted a special mission to Guatemala to assess the impacts of both the Pacaya volcano eruption and tropical storm Agatha. The preliminary report is available in its website.
Impact and needs assessment due to tropical storm Agatha	Government of Guatemala	2010	A preliminary report of the impacts provoked by tropical storm Agatha in June 2010, and needs identified. The report presents data on the impacts of Agatha in a variety of sector of development (health, housing, education, industry, agriculture, commerce, tourism, energy, transport, water, and environment).
Tables of shelters – CONRED - Agatha	CONRED	2010	This is a set of raw data including their shapes (GIS) representing statistics of temporary shelters set up to respond to the impacts of Agatha in different regions of the country.
Shape layers – impacts of Agatha	CONRED	2010	A collection of shape layers representing the impacts of Agatha on a variety of sectors including roads, bridges, affected municipal districts,
SHAPES - GIS			
Shapes and layers	CONRED, MAGA	2001 - 2010	A collection of shapes covering a variety of features including political-administrative boundaries, road networks, hydrology (precipitation, basins, rivers, lakes), climate (temperature, solar radiation, etc) types of soils and land-use trends. In addition. It includes a variety of additional layers on geology, landslides, slopes, volcanoes, earthquakes and hazard maps. Additional shape layers have been gathered depicting the impacts of various disasters.