



SPIDER Thematic Partnership for Latin America and the Caribbean

Guatemala is a country exposed to a variety of hazards including earthquakes. Located at the intersection of three tectonic plates, the country is prone to large earthquakes such as the one which took place on 4 February 1976, which killed more than 23,000 inhabitants and affected nearly five million inhabitants.

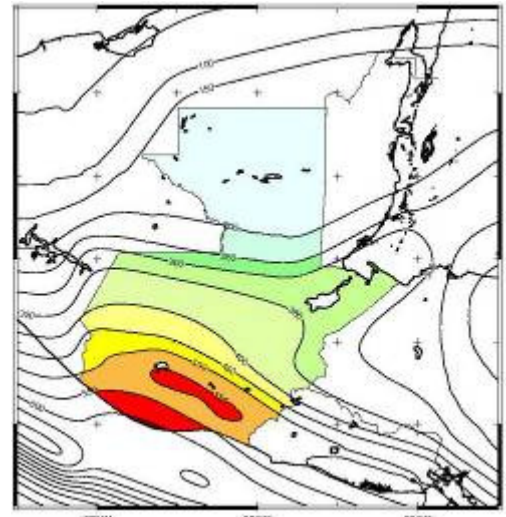
To illustrate the capacity of geo-viewers to enhance situational awareness, the Southern Command and Thermopylae S+T of the United States; and CONRED, Mariano Galvez University, and CIMDEN from Guatemala have joined forces to upload information into the 3D-UDOP geo-viewer. The geo-viewer has been adapted to display information relevant to seismic risk in Guatemala through a dynamic and collaborative environment that visualizes earthquakes' real and potential effects on local areas.

Using the 3D-UDOP
Geo-viewer to
enhance situational
awareness
concerning seismic
risk in Guatemala.

Focusing on the seismic risk of the housing sector

Seismic risk represents the potential for losses in lives, health status, livelihoods, assets and services, which could occur to a particular community or society over some specified future time period as a consequence of a devastating earthquake. Seismic risk is represented as the combination of the probability of a seismic event and its negative consequences. Seismic risk in the context of the housing sector represents the potential for losses in this sector due to the exposition of vulnerable houses to seismic hazard.

The 3D-UDOP geo-viewer is used to visualize both the seismic hazard of Guatemala and the vulnerability of the housing sector, and to display estimates of impacts in case of hypothetical earthquakes in different regions of the country.



Seismic hazard map for Guatemala (Source: RESIS II Project; NORAD-CEPRENAC).

The *SPIDER Thematic Partnership for Latin America and the Caribbean* (SPIDER TP-LAC) is a structure established by the UN-SPIDER Programme to support National Platforms for Disaster Reduction. Thermopylae S+T has been a member of the SPIDER TP-LAC since 2010 and has participated in a variety of activities organized by the Partnership. The 3D-UDOP geo-viewer developed by Thermopylae S+T has been used in disasters such as the Haiti and Chile earthquakes of 2010, the oil spill in the Gulf of Mexico, and the volcanic eruptions and floods in Guatemala in 2010.

The SPIDER Thematic
Partnership for Latin
America and the
Caribbean and
Thermopylae S+T



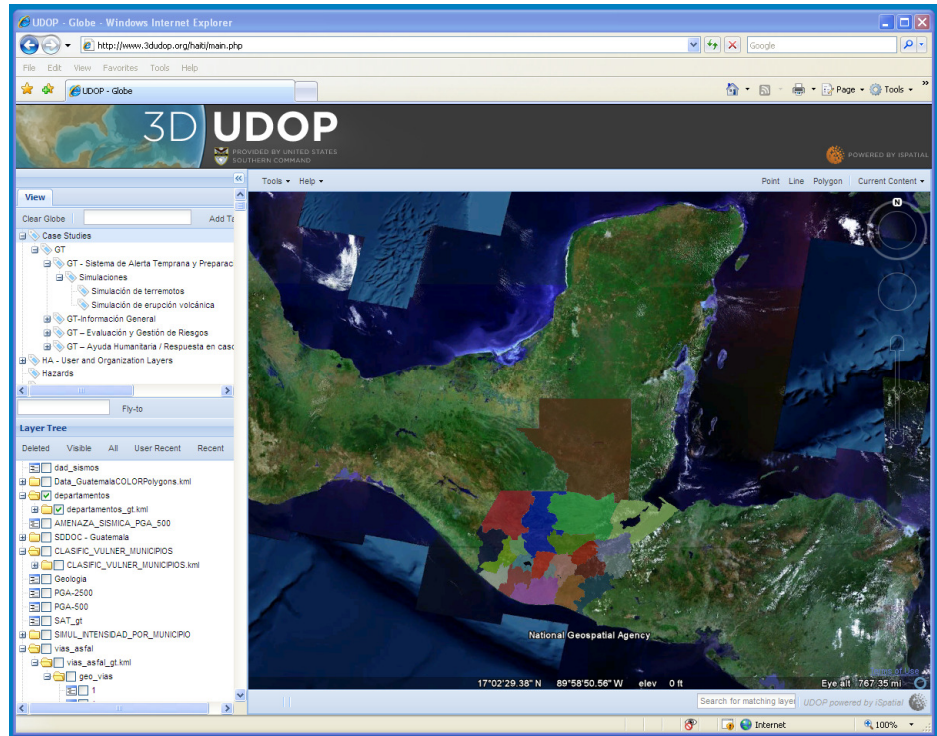
SPIDER Thematic Partnership for Latin America and the Caribbean



The 3D-UDOP Geo-viewer

The 3D-UDOP Geo-viewer was developed by Thermopylae Sciences + Technology of the United States at the request of the United States Southern Command as a tool to support emergency response activities in Haiti. The company focuses on software development, cyber security, geospatial application solutions, personnel and infrastructure protective solutions, cloud/grid computing in cleared environments, and Event-Driven-Architecture development.

For more information on Thermopylae visit: <http://www.thermopylae.com/>



CONRED



The National Coordinating Agency for Disaster Reduction (CONRED) was established through the Decree-Law 109-96 in order to prevent, mitigate, respond, and participate in the rehabilitation and reconstruction of the damage resulting from the impacts of disasters.

CONRED is structured in terms of a National Council for Disaster Reduction, the Board and Executive Secretariat, and a hierarchical structure of Coordinating Agencies for Disaster Reduction at the regional, departmental, municipal, and local levels.

For more information on CONRED visit: <http://www.conred.gob.gt>

Universidad Mariano Gálvez



In recent decades, the Faculty of Engineering at Mariano Galvez University has conducted an M.Sc. program as part of its academic activities focusing on structural engineering, including basic and applied research. The Faculty acknowledges that research, analysis, and design of structures, including the study of relevant properties of the materials with which these structures are built, are essential for these structures to perform their function safely, particularly in case of earthquakes.

For more information on Mariano Galvez University visit: http://www.umg.edu.gt/es/maestrias_ingenieria.

CIMDEN



The Center for Research and Mitigation of Natural Disasters (CIMDEN) is a technical and scientific organization dedicated to the investigation of the root causes of disasters caused by natural phenomena and aims to systematize such causes as a way to identify and propose measures designed to reduce the impacts provoked by such phenomena in urban and rural societies in Central America.

CIMDEN has developed methodologies to assess vulnerabilities and risks associated with various hazards and has also focused efforts in the area of early warning systems.

The aim of the *User Defined Operating Picture (UDOP)* is to create a collaborative environment that allows users to filter and synthesize a myriad of spatial/temporal data points from a wide variety of sources and modalities into a coherent and interactive representation of the user's area of operation. The intent of UDOP is to enable sense making at different levels of abstraction and geographic/temporal scales. Levels of abstraction may range from the person in the field who needs information about his or her immediate area by directly tapping into core data, to those operating at a higher level of abstraction that require more complex interpretations and transformations of the data into concepts. The idea that sense making is user-dependent is the foundation of the UDOP's "user defined" concept. The "net-centric" characteristic of the 3D-UDOP allows it to enable shared situational awareness or sense making among many individuals through a dynamic environment in which real-time events can be monitored and the significance of change can be understood. The 3D-UDOP can be accessed through: <http://www.3dudop.org/haiti>

Technical aspects regarding the 3D-UDOP Geo-viewer



Type of information to be displayed in the 3D-UDOP geo-viewer.

Information to be uploaded into the 3D-UDOP geo-viewer includes:

- Typical cartographic layers (political-administrative boundaries, road network, location of major cities in the country);
- Seismic hazard maps for Guatemala (RESIS II Project, NORAD-CEPRENAC);
- Census data on type of wall material and roof material at the municipal district level (IX Population Census and VI Housing Census, INE, Guatemala, 2002);
- Vulnerability classes for the housing sector associated with seismic risk at the municipal level (CIMDEN, 2008);
- Network of early warning systems operated by CONRED.
- Estimates of impacts in case of hypothetical earthquakes.

Institutional contributions:



Thermopylae S + T has adapted the hierarchical structure of the layers within the 3D-UDOP geo-viewer and has introduced all the data generated for this case study into the layers of the geo-viewer.



CONRED has developed several layers of information in the environment of geographic information systems to be uploaded into the 3D-UDOP geo-viewer.



The Faculty of Engineering of Mariano Galvez University has provided information on seismic hazard and has performed modeling scenarios to estimate the theoretical earthquake intensity for this case study.



CIMDEN has generated and provided information on the vulnerability of the housing sector and has carried out the modeling of theoretical impacts of the earthquake for this case study.

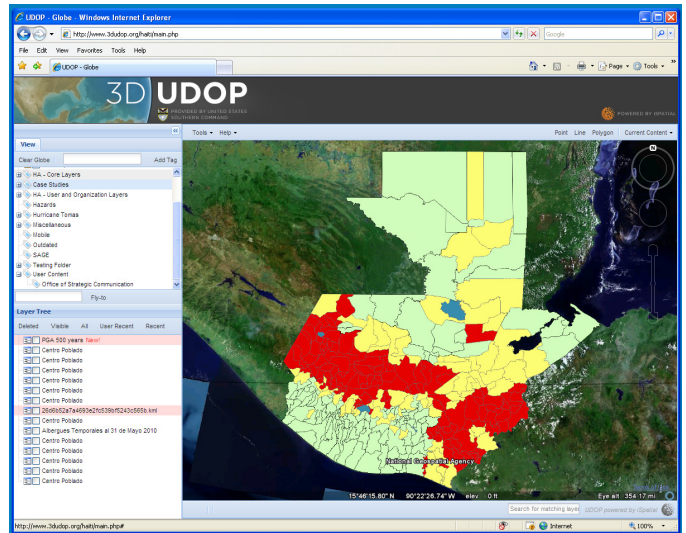
Visualizing the physical vulnerability of the housing sector

The Physical vulnerability of the housing sector was assessed using the framework of the European Macroseismic Scale 1998. The percentage of houses in each municipal district classified as type "A" was used to divide all districts in the country into 3 ranges:

High (red): 51% – 100% of houses in the district are classified as type "A".

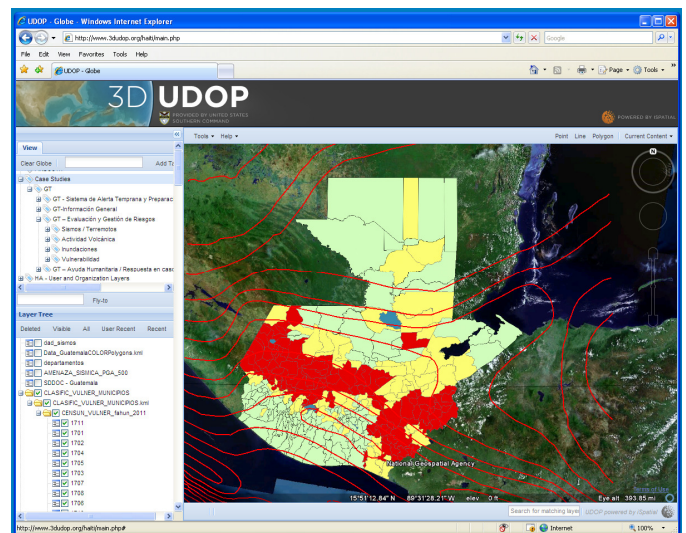
Medium (yellow); 21% - 50% of houses in the district are classified as type "A".

Low (green): 0 – 20% of houses in the district are classified as type "A".



Overlaying the Peak Ground Acceleration (RESIS II Project).

Peak Ground Acceleration for events with period of return of 500 years as estimated by researchers participating in the RESIS II Project (NORAD-CEPRENAC).



Estimating the intensity of a hypothetical earthquake

On 2-4 March 2011, CONRED, with the support of CEPREDENAC and the US Southern Command, conducted a regional simulation exercise. A hypothetical earthquake of magnitude 6.2 in the Richter scale accompanied by a volcanic eruption was used for the simulation. Within the scope of the SPIDER TP-LAC, Thermolpylae S+T, CONRED, UMG, and CIMDEN contributed with this activity.

