

Disaster in Paradise? Even the Sweetest Dreams Can Become Nightmares without Adequate Information and Preparation, Part 3 of 3



By [Leo Wrobel](#), [Sharon Wrobel](#)

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Leo and Sharon Wrobel conclude their three-part series with an example of the sort of helpful information available to businesses that are interested in relocating to exotic locations. (Or any location for that matter.) Organizations like the Pacific Disaster Center can provide the details to help you make the right decision.

The first two parts of this series presented some insights from the [Pacific Disaster Center](#) and the unique perspective of this quasi-government organization on disaster recovery planning. We've saved best for last! Before taking the plunge and moving your business to some idyllic location [see Figure 1](#)), how would you like to be able to compute the precise probability of a disaster there? Using information and tools provided by the PDC, it's possible to make extraordinarily accurate estimates of the probability of disaster. And a lot of this information is *free*. Since you probably don't have the server capacity to store the literally terabytes of data you'll need to make a rational judgment (demographic, seismic, weather, topographic, oceanic, and more), organizations like this can help you out by letting you look at their data instead.



[Figure 1](#) Gorgeous rainbows in [Lahaina](#), on the island of Maui in Hawaii, October 2007

The PDC has developed the [Asia Pacific Natural Hazards and Vulnerabilities Atlas](#), an extraordinary repository of data that can be used to examine the populations and infrastructure at risk due to natural hazards present in a given region. The Atlas provides decision makers and contingency planners like you with a resource for understanding the types, frequencies, and severities of hazards that may threaten their communities. It can play an important role in raising awareness of these hazards and their associated risks, and in helping policy makers, humanitarian assistance organizations, the international development community, and the public at large to develop potential mitigation strategies.

NOTE

Many thanks to Ted Sheppard and Chris Chiesa from the Pacific Disaster Center for their insightful contributions to this series of articles.

Southeast Asia Multi-Hazard Case Study

To show you the value of the available data for making decisions, we present a case study that illustrates how the PDC's Atlas can be used to examine the combined risk posed by tropical cyclones and earthquakes in Southeast Asia.

Step 1: Look for Natural Hazards

We begin by examining the potential for natural hazards that can cause harm to a society's people, infrastructure,

environment. Historical records of these events can be examined using the PDCoes As. [Figure 2](#) shows the locations and intensity of recent major earthquakes [1] in the Southeast Asia region. The earthquake intensity layer underlying this diagram maps (with a 20% probability) the Modified Mercalli intensity [2] expected to be exceeded during a 50-year period for a given location. (The 50-year period represents the average design life of a building.) For example, in [Figure 2](#) the dark green areas correspond to intensity expectations of V and below, while orange areas have a 20% probability of experiencing an earthquake intensity of IX or higher over the next 50 years. In the most seismically active areas, the symbols representing epicenter locations almost completely obscure the underlying intensity layer at this scale



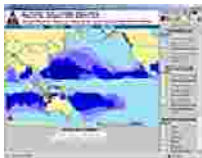
[Figure 2](#) Earthquake epicenters clearly outline the "Ring of Fire" along tectonic plate boundaries. The background colors correspond to earthquake intensity zones and are derived from the earthquake epicenter data.

The Zoom tools of the Atlas can be used to examine the data at a higher resolution. The Identify and Select tools can be used to view details, including magnitude and date, of recent or historical earthquake events.

TIP

The Help function of the Atlas provides details on the usage of these and other tools.

Tropical cyclones can be investigated in much the same way. [Figure 3](#) shows tropical cyclone intensity zones for the same region we've just discussed. The data maps areas that have a 10% probability of experiencing a tropical storm of a given intensity during a 10-year period. Darker shades of blue correspond to higher storm intensities. For example, light blue bands show areas that are expected to experience a tropical storm with maximum sustained winds of 118 to 153 km/hr, while the darkest blue areas could expect a tropical storm with maximum sustained winds over 250 km/hr.



[Figure 3](#) Tropical storm intensity zones estimate the most severe storm that a region is expected to experience during a 10-year period based on analysis of historical storm data. Tropical storm Nigo, active at the time this graphic was captured (April 2003), can be seen off the western coast of Australia.

Now let's take this data and compare it to the critical infrastructure located around our proposed business. Using the PDCoes tools, the relationship between these hazards and potentially impacted resources can be observed by displaying the hazards along with population centers, roads, railroads, and airports. [Figure 4](#) shows the earthquake risks, along with transportation infrastructure, for a portion of the Philippines including Manila. [Figure 5](#) shows tropical storm risks for the same area.



[Figure 4](#) The frequency and severity of earthquakes in and around Manila places much of the region in the top two categories of earthquake intensity. Most of metropolitan Manila can expect an earthquake of intensity VIII or higher once per 50-year period (with a 20% probability), while the remaining eastern region can expect earthquakes with even higher intensity (IX) during the same timeframe.

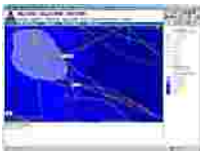


Figure 5 By analytically combining both the Earthquake Hazard Index and the Tropical Storm Hazard Index into a Multi-Hazard Index, the patterns are made even more evident and, more importantly, can be used to assess hazard exposure to various categories of human and natural resources.

As Figure 4 shows, this area is frequented by tropical storms, and falls within the top end of the storm intensity zones. By creating a virtual overlay of earthquake and tropical storm risk (see Figure 6), it's possible to draw some conclusions about the potential natural hazards to human populations (see Figure 7).



Figure 6 Some regions, such as the western portion of Borneo, face relatively low risk; others, such as the Philippines, face a high risk of both earthquakes and tropical storms.



Figure 7 Southeast Asian countries have some of the highest population densities in the world. Indonesia, for example, is the fourth most populous country (behind only China, India, and the U.S.), but has less than one quarter of the land area of the U.S.

Step 2: Analyze Potential Exposure to Hazards

The next step in the multi-hazard risk assessment process is to analyze the varying degree of potential exposure of people and infrastructure to the hazards present in a region. The Atlas contains data layers for both population density and transportation infrastructure (roads, railroads, airports). By combining population density (see Figure 8) with transportation infrastructure (see Figure 9), we can examine the relative magnitude (or density) of people and infrastructure exposed to potential harm from future occurrences of earthquakes and tropical storms.



Figure 8 Population density around the proposed business location.



Figure 9 Transportation and infrastructure including roads, railroads, and airports are subject to exposure to natural hazards as well as key to a region's recovery following such an event. The PDC's supports assessment of the vulnerability of these critical assets to various hazards. Here this data is superimposed over the population density data.

Step 3: Identify High Impact Potential

Finally, the categorized population density data, along with the transportation infrastructure data, are combined analytically with the multi-hazard index to identify those areas with a high potential for impact from these natural hazards (see Figure 10).



Figure 10 Areas with a high hazard index and a high number of people and infrastructure systems would warrant the most attention from mitigation efforts, as well as be expected to require significant resources during the response and recovery phases of a natural disaster

Summary

The PDC's Atlas is a great resource for providing a geospatial context for assessing the risk exposure of human, natural, and societal resources to natural hazards. Using this information, it's possible to produce up-to-date information on tropical storms, earthquakes, and volcanoes that is dynamically integrated with comprehensive historical records on natural hazards and disaster events throughout the region. With the results, you can characterize hazards from both a real-time and probabilistic perspective. Resource data, including people and infrastructure, provides the basis for understanding exposure to and vulnerability from these hazards. This data in turn can be used to gauge the vulnerability of anything from a new beachfront hotel complex, to a potential factory location, even to things like the potential vulnerability of undersea telephone cables to seismic and other events.

In addition, the PDC Atlas data can be used both within the Atlas and within external analysis tools to develop measures of risk and vulnerability to support decision-making processes by disaster managers and policy makers. For example, resource allocation associated with mitigation planning or humanitarian assistance efforts can be prioritized using these techniques. (Stated another way, it's possible to use data like this to present a compelling case to get management on board and get your plan funded.)

In the final analysis, the goal of the PDC is not simply to record disasters, but rather to present accurate data that can be manipulated by a wide variety of organizations to gauge probabilities and ultimately reduce the loss of lives from these terrible events. The Atlas is one of many resources that can guide the development of policies leading to more disaster-resistant business, governments, and communities. [Take a good look at this valuable resource](#), and best of luck in your planning pursuits.

References

[1] The earthquake epicenter database includes information from the National Ocean and Atmospheric Administration (NOAA) National Geophysical Data Center (NGDC) Catalog of Significant Earthquakes (2150 B.C. to present) and Database for Instrumentally Recorded Earthquakes (1962 to present). Detailed information on these and all other Hazard Atlas layers are included under the Atlas Info link from the [main page of the Atlas](#), as well as in associated metadata documents.

[2] Intensity is a measure of the effect of an earthquake on the Earth's surface. The [Modified Mercalli intensity scale](#) has 12 levels, ranging from I (not felt) to XII (total damage), and is widely used in the U.S. by the [U.S. Geological Survey](#), the [Federal Emergency Management Agency \(FEMA\)](#), and other organizations.

Leo A. Wrobel has more than 30 years of experience with a host of firms engaged in banking, manufacturing, telecommunications services, and government. An active author and technical futurist, he has published 10 books and more than 400 trade articles on a wide variety of technical subjects. Leo served 10 years as an elected mayor and city councilman (but says he is better now). A sought-after speaker, he has lectured throughout the United States and overseas and has appeared on several television news programs. Leo is presently CEO of Dallas-based TelLAWCom Labs Inc. and b4Ci, Inc. Contact Leo at 214-888-1300 or email leo@b4ci.com.

Sharon M. (Ford) Wrobel served as corporate secretary and director of personnel for Premiere Network Services Inc. prior to joining b4Ci, Inc. in 2004. During that time, Sharon was instrumental in getting Premiere certified as the first CLEC to be certified in all 50 states, by aiding in filings and attending hearings. She also engaged in extensive research for Premiere, a function she continues with b4Ci as vice president of business development. Sharon was also president of the Ellis County Early Childhood PTA and the Ovella Lions Club. She attended the University of Maryland and El Centro College in Dallas and received training as a registered nurse before joining Leo in business in the late 1990s. Sharon also served as a public official by accepting appointments to the local Planning and Zoning Commission and the Historical Commission.

