

# Environmental



## Vintage

Release 2017

## Content

The environmental suite of data consists of several separate database components including:

- WeatherRisk
- QuakeRisk
- Climate
- Air Quality

A wide range of applications benefit from these databases, including insurance underwriting, retail merchandising, and real estate.

WeatherRisk includes four separate types of hazards: hurricanes, tornadoes, hail, and damaging winds. Each of these exhibits distinctive geographic patterns – both in terms of frequency and intensity.

QuakeRisk can often provide some surprising insights in areas outside of the well-known seismic zones of the far western states.

For automated merchandising systems, the climate data (average January, July, and annual temperatures, rainfall, and snowfall) can help to avoid costly stocking errors. The heating and cooling degree days can assist in determining demand for heating and cooling equipment, for example.

Finally, there are a number of air quality measures which can be important to individuals contemplating relocation, among others.

## Methodology

The WeatherRisk database consists of four separate types of weather-related hazards: hurricanes, tornadoes, hail, and damaging winds. The data are the results of a series of spatial analysis carried out on records compiled from publicly available USGS sources aimed at producing risk index estimates at the block group level and above.

Cartographic databases, while certainly interesting, do not provide any “actionable” information to the user, as it is extremely difficult to interpret the likely risk for any given point using historical location data. The spatial analysis undertaken is based on several underlying facts:

- At a “macro” scale, there is a clear pattern of incidents of any type (e.g. “tornado alley”)
- At a “micro” scale, the particular path which a single tornado or hurricane takes, or the precise location of high wind incidents or

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hail is essentially a random occurrence. It is only through the accumulation of a large number of historical records that the randomness at the local scale begins to show a pattern at a regional scale.

As such, a simple count of how many tornadoes have passed through any particular block group is of no value, as this certainly falls within the “micro” scale. Given a long enough historical record (e.g. several thousand years), this might be an appropriate technique for evaluating the potential risk. However, given the relative shortness of these data series, a simple arithmetic exercise is not sufficient. Instead, for any particular point occurrence (e.g. hail observation) a conical filter was applied using a simple distance decay measure. For path events (e.g. a tornado path), a distance-decayed linear filter was applied. For any particular point in space, the accumulated probabilities could then be calculated by summing the areas underneath these conical and linear filters.

All of the resulting indexes are “100” based, which means that a value of 100 for a particular level of geography is the average national value. A value of 200 indicates that the area has two times the average risk level, while a value of 50 indicates that the area is at half the average risk level. For example, a value of 200 for the “HailIndex” indicates that the particular area is two times as likely to suffer hail damage in any given time period than an area with a 100 score.

Hurricane track data was obtained from publicly available USGS records. Atlantic hurricane coverage is from 1851 to 2016, covering a total of 1,360 storms. Pacific hurricane coverage is from 1949 to 2016, covering a total of 384 storms. Storm locations are tracked every six hours while the storm maintains the minimum wind speed required to be classified as a tropical storm. Along with location, the database includes information on wind speed and barometric pressure.

The risk indexes were derived using a distance decay spatial filter along the line of the storm track with a width of 100. Statistics at the block group level were then compiled by computing summary statistics of hurricane impact at the block group centroid.

Tornado records published by the USGS from 1950 were analyzed for the purpose of identifying relative risk at the block group level. Unlike hurricanes, which are always presented as a hurricane path, tornadoes are

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presented either as a path or as a single touchdown point. A total of 65,306 separate tornado events were analyzed. Similar spatial filters to those described under hurricanes were applied to both the point and path data.

Reports of damaging hail (over 0.75 inch in diameter) were compiled from USGS data sources, consisting of 320,182 records dating back to 1955. Point filters were applied to this database to derive relative frequency and intensity measures at the block group level.

The WindRisk data elements are based on reported events with wind speeds exceeding 50 mph, and consist of 222,640 separate events dating from 1955.

The composite risk index presents a unified risk index based on the relative damage expected from each of the four types of events. The relative weights of each of the source indexes were derived by weighting estimates of total annual damage caused by storms of each type.

QuakeRisk presents the relative risk of damaging earthquakes on a 100 based scale, with 100 being the national average risk. The data was constructed from USGS models using 0.01-degree grids, except in Hawaii where a 0.02-degree grid was utilized, and Alaska which used a 0.05-degree grid.

The climate database was created from two separate sources. The temperature, precipitation, and degree days variables were derived from an analysis of weather observations from federal government sources. In order to derive values for individual block groups, the data for each observation point (over ten thousand in all) were analyzed using Vertical Mapper in order to estimate the likely values at block and block group centroids.

The air quality indexes were derived from data obtained from the EPA and modeled using similar methods.

## Further Information

Contact customer service at 877-944-4AGS or email [support@appliedgeographic.com](mailto:support@appliedgeographic.com).