



TECHNISCHE
UNIVERSITÄT
DRESDEN

LARGE-SCALE INDUSTRIAL SITE SELECTION USING A MINIMUM NATURAL RISK APPROACH CONCEPT AND PROTOTYPIC IMPLEMENTATION

Master Thesis Defence
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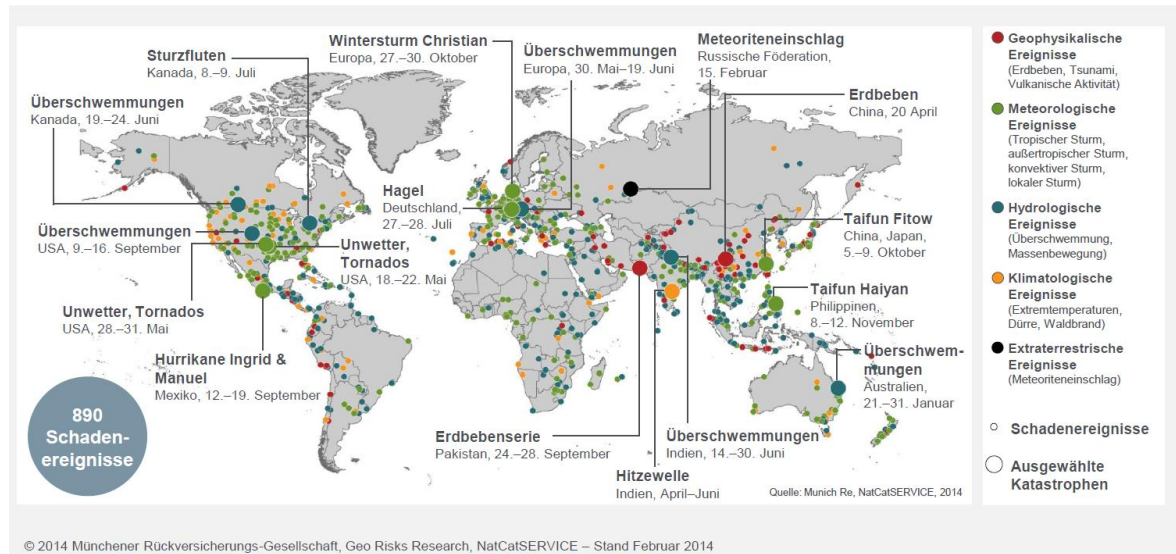
DRESDEN
concept
Exzellenz aus
Wissenschaft
und Kultur

Outline

1. Motivation
2. Hazard, Risk and Vulnerability
3. Natural Hazards in the USA
4. Risk Assessment Strategies
5. Data Acquisition
6. Data Processing
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1. Motivation

NatCatSERVICE
Schadenereignisse weltweit 2013
Geographische Übersicht



- Worldwide financial loss of 125 billion US\$ in 2013 (Munich Re, 2014)
- Avoid risky areas to prevent financial loss
- Lower vulnerability of new industrial sites

2. Hazard, Risk and Vulnerability

Hazard: „a dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage“ (UNISDR, 2007)

Risk: “the combination of the probability of an event and its negative consequences” (UNISDR, 2007)

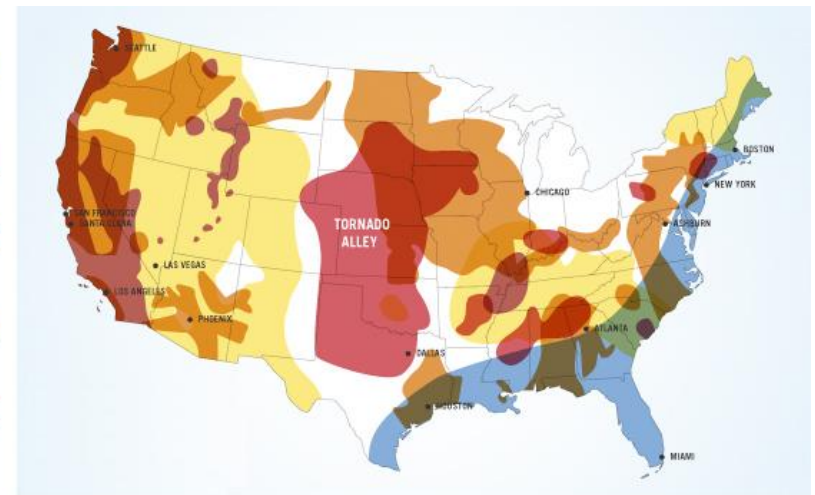
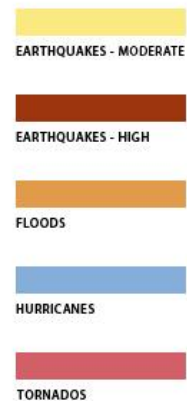
Vulnerability: “the characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard” (UNISDR, 2007)

2. Hazard, Risk and Vulnerability

- Hazardous events cause different damage in different areas
- Example:
 - Haiti 2010: 7.0, 222,570 deaths, 8 billion US\$
 - Japan 2011: 9.0, 15,880 deaths, 210 billion US\$
(Munich Re, 2014)
- Haiti has high vulnerability and high exposition
- Japan has low vulnerability and high exposition
(WeltrisikoindeX, 2013)

3. Natural Hazards in the USA

- Earthquakes
- Volcanoes
- Extreme wind events (hurricanes, tornadoes, blizzards)
- Landslides
- Floods
- Tsunamis
- Wildfires



Crisis HQ, 2012

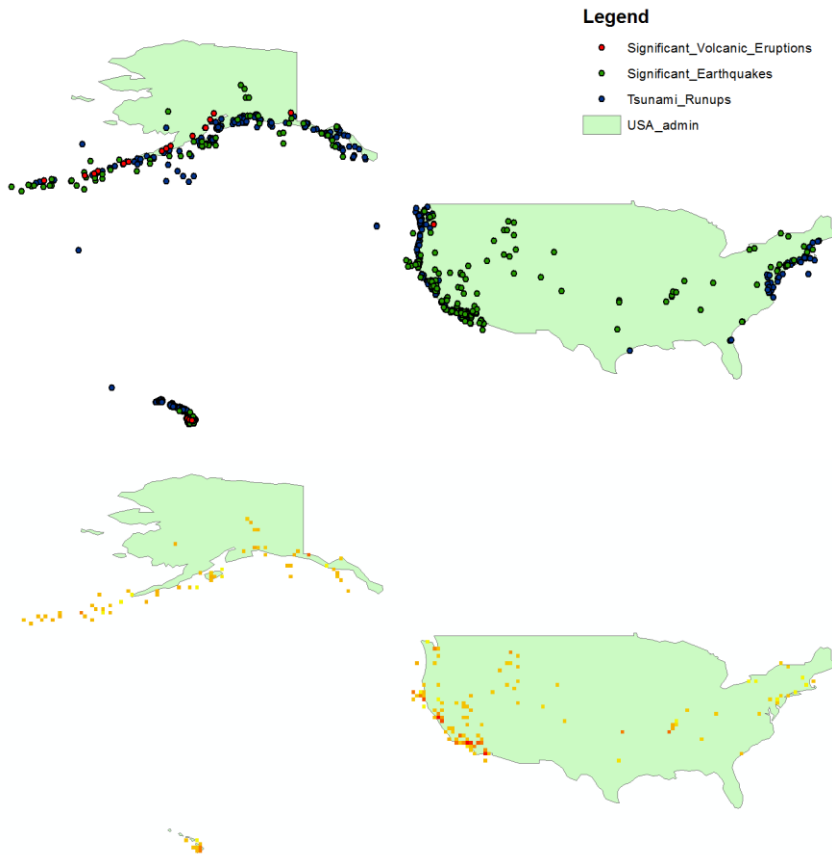
4. Risk Assessment Strategies

- Combination of probability and expected loss
- Expected loss = vulnerability (left out in this thesis)
- Historical events as basis
- Threat matrix with frequency and intensity (created on basis of found data)
- Individual hazard maps combined to multi-hazard map
- Normally: Experts set weighting factors
- In my thesis: user sets weighting factors

5. Data Acquisition

- Needed: complete historical events with intensity and time information + location
- Found and used datasets:
 - Significant Earthquakes
 - Significant Volcanic Eruptions
 - Tsunamis Runups Database
- Source: National Geophysical Data Center

6. Data Processing



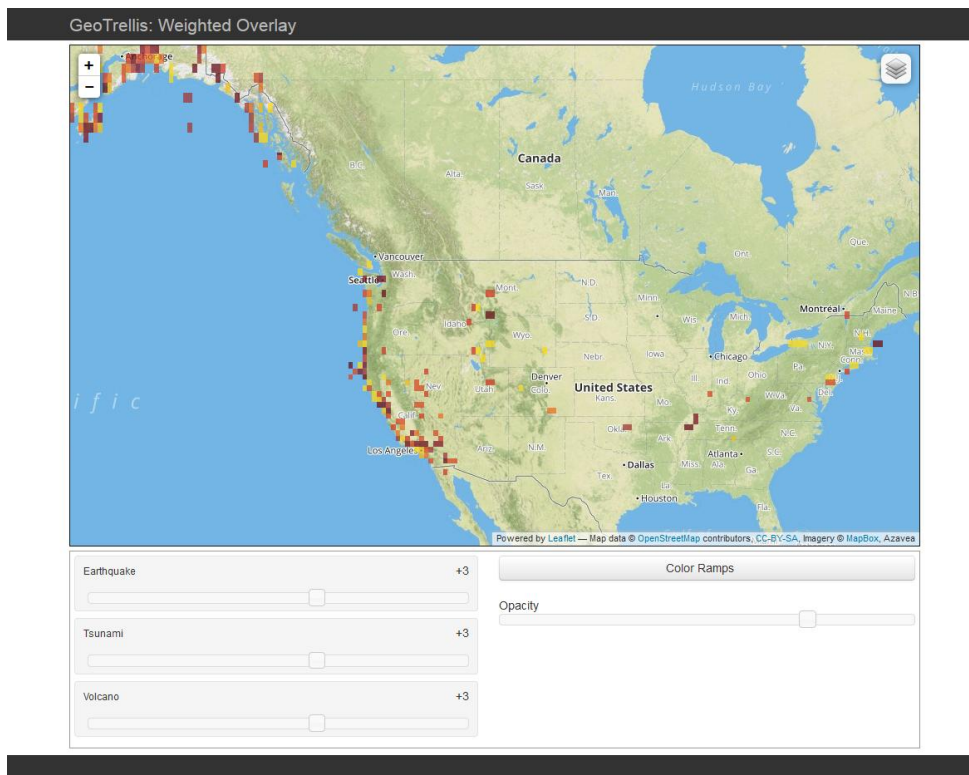
- Cleaning datasets of unnecessary information
- Creation of point shapefiles
- Splitting shapefiles in intensity classes
- Raster creation (with constant raster)
- Applying threat-matrices to raster files
- Adding raster files of same hazard type to individual hazard maps

6. GeoTrellis Web Application

GeoTrellis (by Azavea):

- Geographic data processing engine for high performance applications
- Simple Built Tool (sbt) as basis
- Real-time geospatial analysis in interactive web applications
- Weighted overlay, cropping/warping, Map Algebra operations, rendering operations, vector to raster operations, fast batch processing

7. GeoTrellis Web Application



- Raster files in Azavea Raster Grid Format (ARG)
- User interaction by choosing weighting factors
- Real-time calculated weighted overlay
- <http://141.30.137.195:8888/>

8. Summary

1. Natural Hazards in USA:
 - Earthquakes, Volcanoes, Extreme wind events, Landslides, Floods, Tsunamis, Wildfires
2. Risk Assessment with Threat Matrices
3. Data: Earthquakes, Volcanoes, Tsunamis
4. Data Processing (Point Shapefile, Raster, Hazard Map)
5. GeoTrellis Web Application with real-time user interaction

Sources

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