

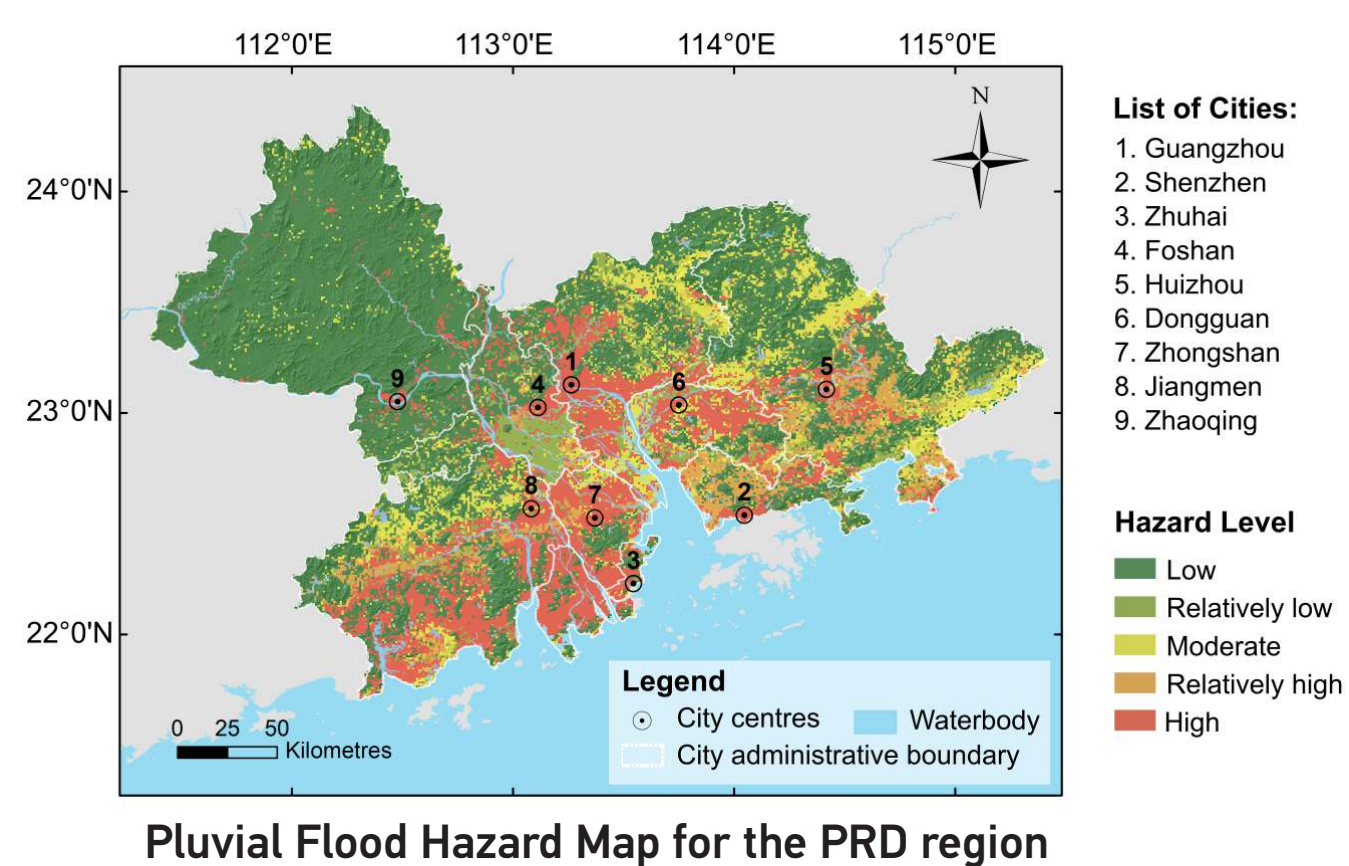
# Evaluation of Natural Catastrophe Impact on the Pearl River Delta (PRD) Region - Flood Risk

## Flood Disasters in the PRD Region

- Historically, the key factors contributing to major flood events in the PRD region are flooding of the upstream river reaches, intense rainfall within the PRD, high astronomical tides and storm surges.
- The long-term annual mean precipitation in Guangdong province ranges over 1,600-2,600 mm, 85% of which occurs during April to September.
- Extensive protective measures have been built over the last two decades to protect the PRD cities against riverine floods. However, surface water flooding has become more frequent in recent years due to rapid urbanization and aging urban drainage systems.
- Climate change (e.g., sea level rise, change in tropical cyclone frequency and intensity), combined with economic and population growth will continue to impact the PRD region.
- This project aims to develop a flood risk ranking for the cities in the PRD region.

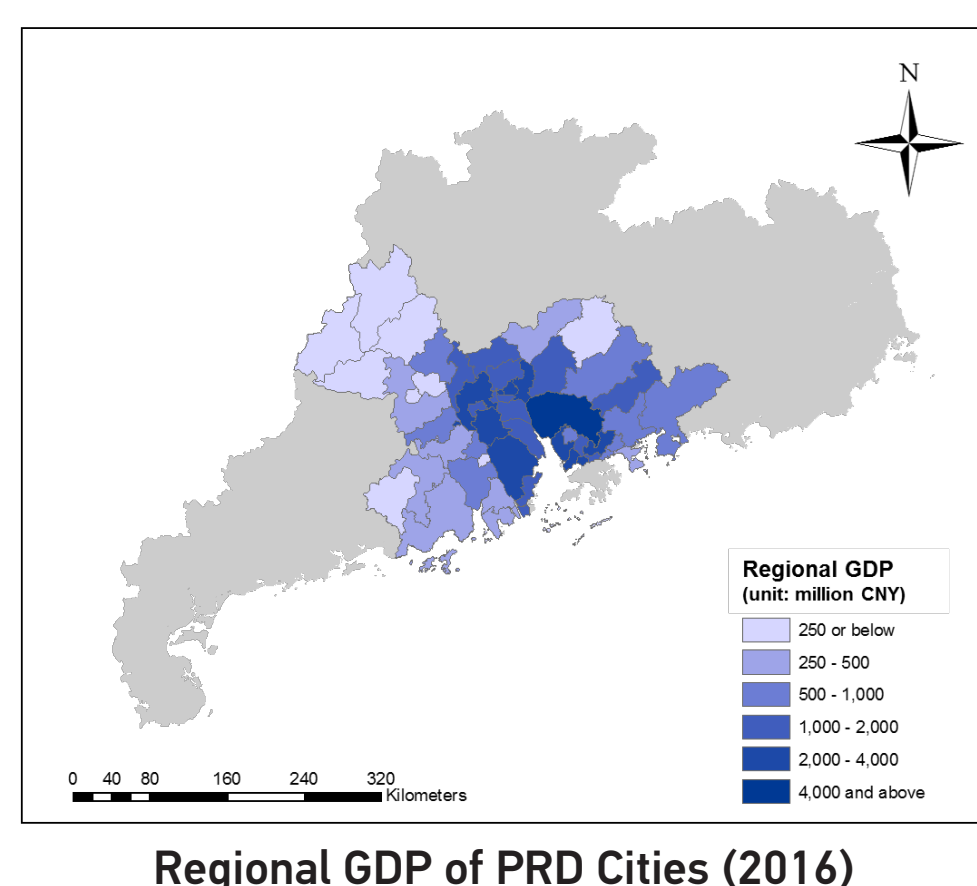
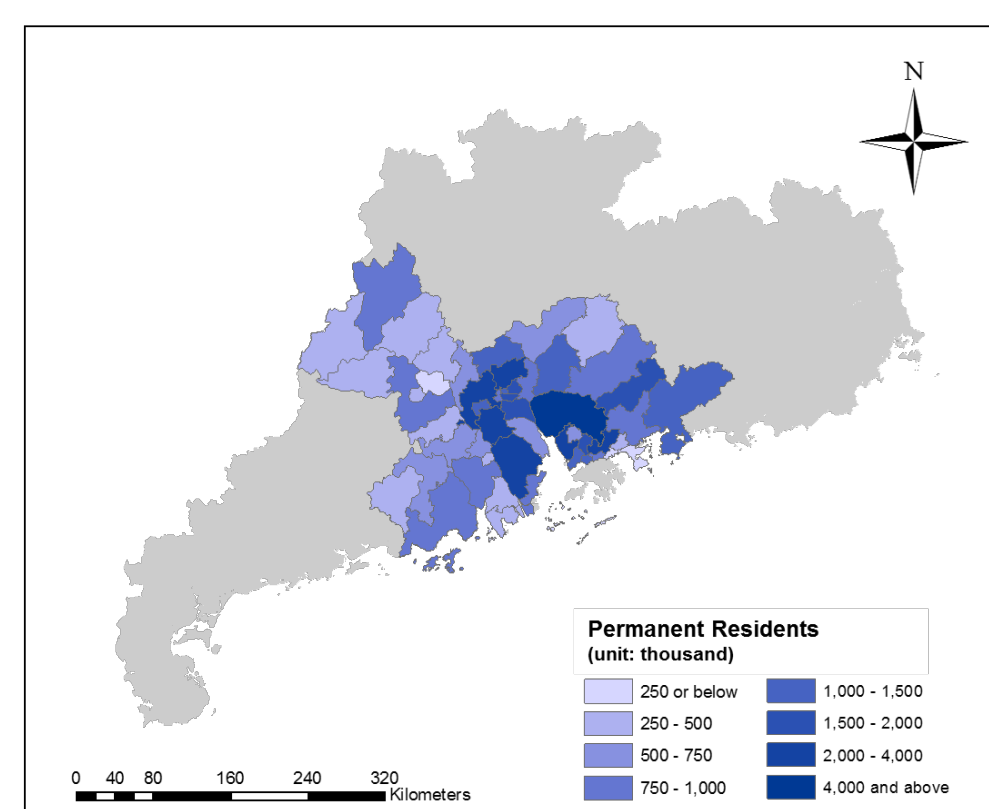
## Flood Risk Evaluation and Ranking

- GIS based fuzzy comprehension evaluation method is used.
- The study area covers the whole PRD region (area: approx. 54,800 km<sup>2</sup>) and includes spatial differences in critical rainfall intensities and drainage design standards across the region.
- Modelling and analyses for risk ranking is based on hazard, vulnerability and exposure indicators over 1 km grids.



## Development of Exposure Indicators

The PRD region is one of China's main economic centres, generating 11% of China's GDP and home to over 100 million inhabitants. A large portion of this high exposure density are located in the low-lying coastal zones and floodplains that are most vulnerable to flooding.

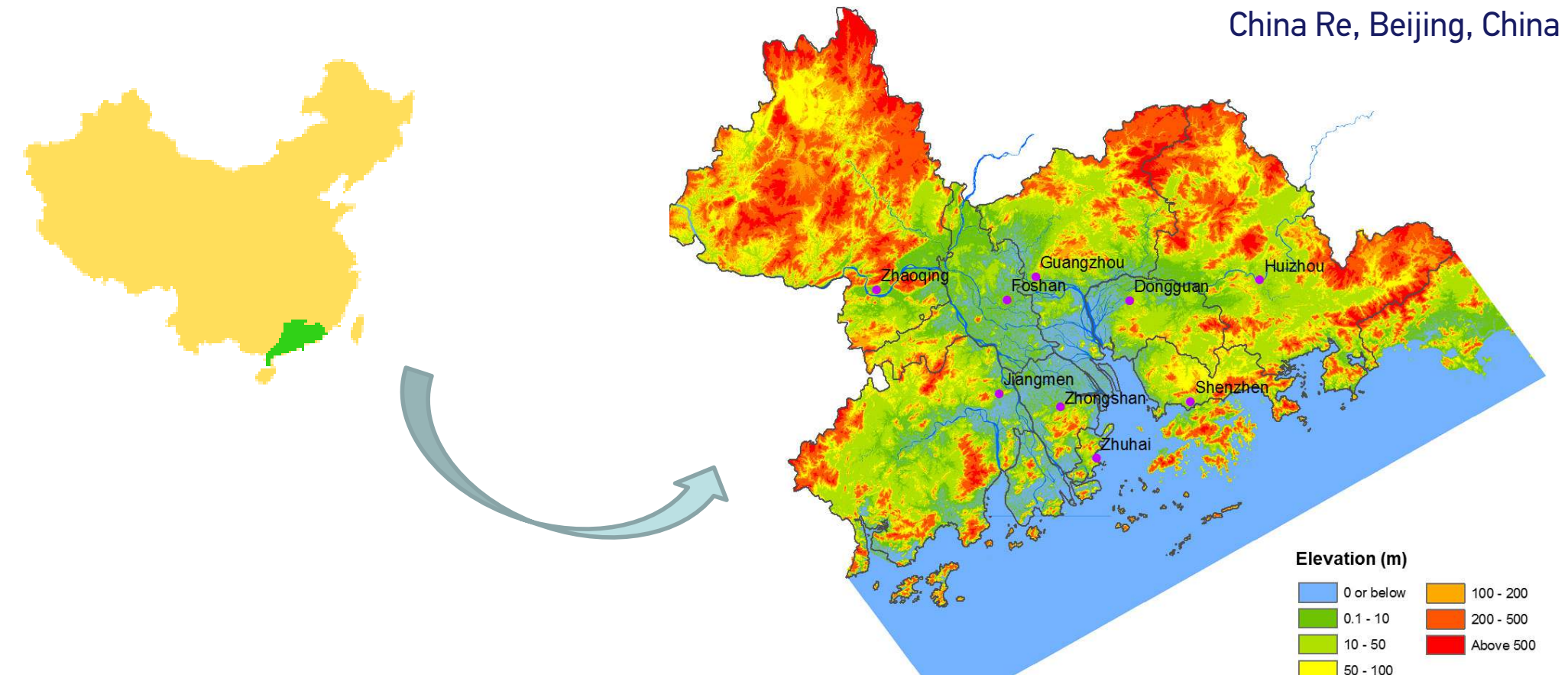


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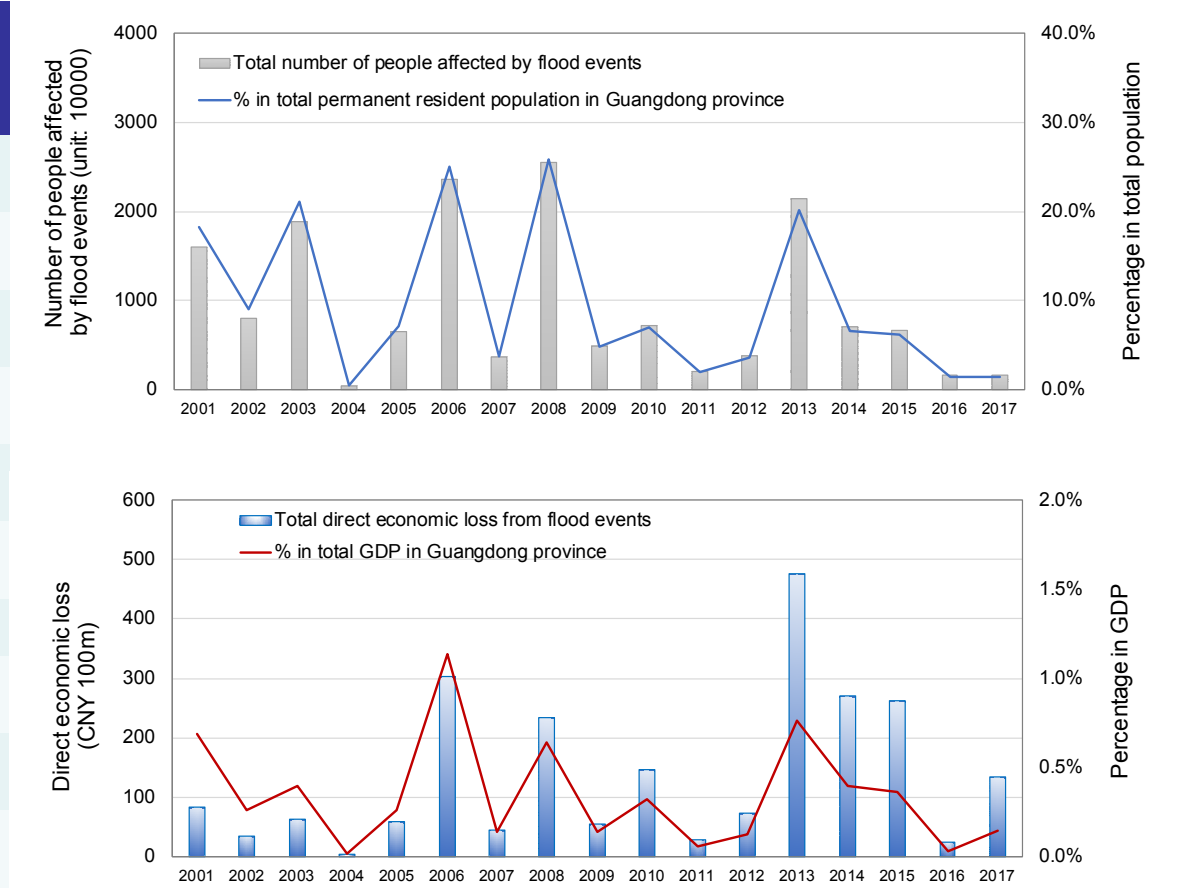


## Historical Flood Loss Catalogue

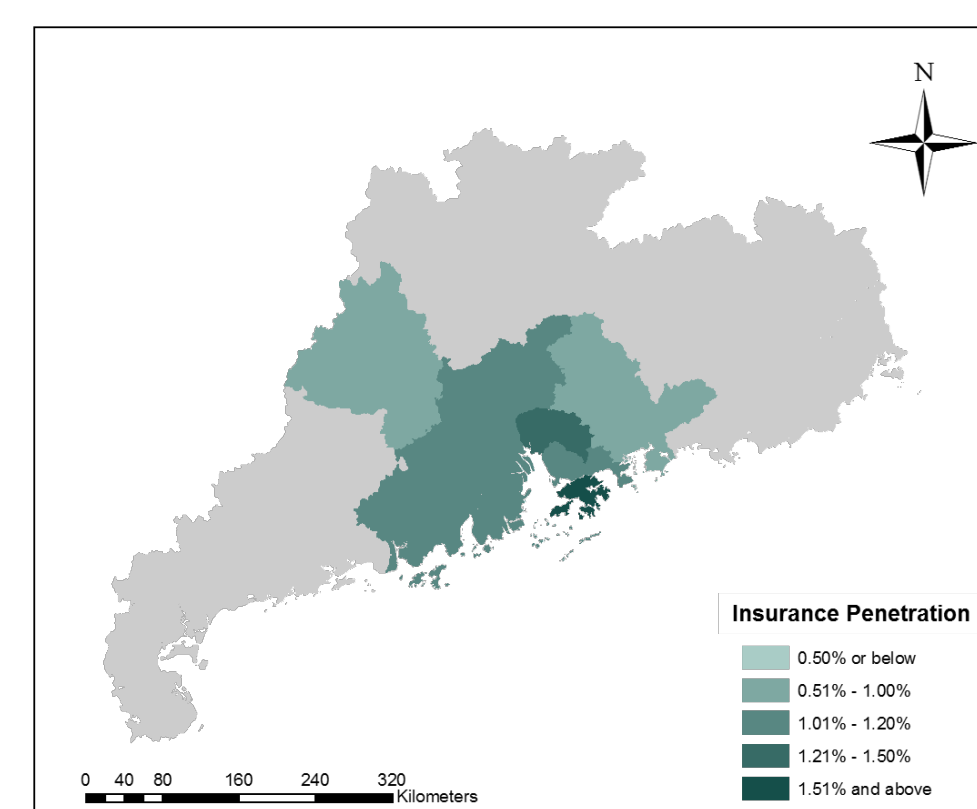
- Compilation of flood event catalogue for Guangdong province, which comprises major historical events from 1915-2000 and more detailed event database for 2001-2017.
- Reported annual average flood loss per regional GDP in Guangdong province is approximately 0.4% for 2011-2015.

Ranking	Year	Flood Event	Total Direct Economic Loss* (billion CNY)
1	2015	Typhoon Mujigae (1522)	23.8
2	2013	Typhoon Usagi (1319)	23.1
3	2013	Typhoon Utor (1311)	16.7
4	2006	Severe Tropical Storm Bilis (0604)	15.2
5	2014	Typhoon Rammasun (1409)	13
6	2017	Typhoon Hato (1713)	11.9
7	2008	Typhoon Hagupit(0814)	11.4
8	2014	Typhoon Kalmaegi (1415)	8.2
9	2006	Typhoon Prapiroon (0606)	7.0
10	2008	Dragon Boat Wet Season (May)	6.5

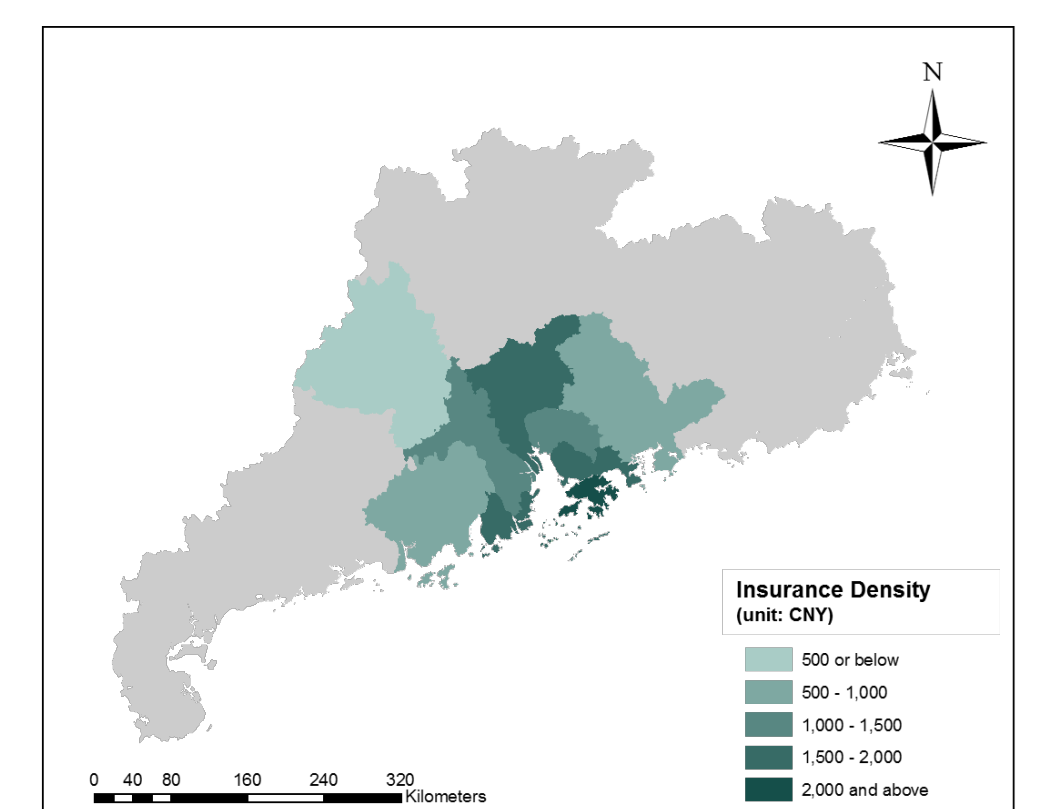
\*Note: all monetary loss are the original values reported in their respective year of occurrence.  
Source: Statistical Yearbooks 2001-2017



## Regional Insurance Penetration



**Insurance Penetration in the PRD Region (2015)**  
Insurance penetration is the percentage of insurance premium (in \$) to GDP (in \$)  
Data courtesy: China Reinsurance P&C



**Insurance Density in the PRD Region (2015)**  
Insurance density is the ratio of insurance premium (in \$) to total population.