Institute of Catastrophe Risk Management

Building Attribute Ruleset for Taipei Building Stock

- Development of Economic Exposure Data (EED) for cities requires detailed characterization of building attributes such as building height, footprint area, occupancy, age, construction type and replacement cost
- Rulesets for such building attributes are developed for Taipei using building heights and footprint areas as inputs
- These rulesets will later be modified and used for three S.E. Asian cities of Jakarta, Manila and Bangkok using building heights and footprint areas extracted from high resolution satellite imagery in a sister project

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Study Area, Data Source and EED Ruleset

Taiwan Building Administration Data (TBAD) data used to develop rulesets (16,000 buildings over 30 km² for age; 7,000 over 2 test areas of 13 km² for other attributes). Test dataset comprised 2205 extracted building polygons.



Occupancy	TBAD dataset	Test dataset	Description	
Residential (1290, including mixed)	4,700	1,290 Apartment, house, villa, townhous etc.		
Commercial (851 plus 37 light industry)	2,200	851 plus 37 light industry	Shopping mall, theaters, restaurants, arenas, office building, banks, light industry, etc.	
Public (27)	100	27	School, government office, train station, gas station, hospital, activity center, museum, park, etc.	

EED ruleset	Reference sources	Ruleset	
Occupancy	Taipei Zoning map plus new ruleset for Mixed	Residential , Mixed, Commercial (includes light industry) and Public	
Num of storeys	Extracted building height, Taiwan building code /regulation	Inter-storey height of 3.3 m for residential; 3.6 m for others	
With / without basement	Taiwan building practice	Storey >= 5 has basement Storey < 5 w/o basement	
Age	TBAD Statistics	Age (year built) band as dependent on # storeys and occupancy	
Construction type	TBAD Statistics	B+RC, RC, SRC, Steel as set by age- band and occupancy	
Building Repl Value	Open issue	Calculated using Taipei reported 2014 construction cost tables	

Construction Type Building Age Bands set by Occupancy and Storey Height Construction Type for Commercial Buildings of Different Storeys Storey Height sets Construction Type Commercial 90% Num of Storey-Age of Commercial Bldg. in Taipei 30 KM2 area (TBAD) 40% 30% 546 Commercial Buildings with brick+reinforced concret 1~3 storeys 4~24 storeys ≥25 storeys height 5-storeys Brick + Reinforced Reinforced Steel Storey concrete Building count within the age range: 473/546 (87%) Age distribution of commercial buildings for 5 storeys age range: 30~50 yr (built over 1968~1988) 2 3 5 6~11 12 13 14 >=15 storeys storeys storeys storeys storey storeys Set age band by examining age **Building age Building age** (30^{50}) (30^{55}) (35^{55}) (40^{55}) (30^{50}) (20^{45}) (~35) distribution of bldgs of each (20^{50}) (~30) storey from TBAD statistics **Building year Building** year **Building** year Building age 1963~1983 1968~1988 1968~1998 1983~2018 1988~2018

Summary

- Project developed rulesets for ready evaluation of building attributes using height and footprint area extracted from satellite imagery as inputs
- Prediction accuracies exceeding 80% achieved
- Inherent variability exists when estimating building replacement cost by construction cost versus insured amount
- Developed ruleset for building attributes together with height and footprint area form a detailed Economic Exposure Dataset suitable for insurance applications.

Accuracy

Attributes		Correct count	Overall Accuracy
Num of stories	abs(dS) <= 1F	1800	81.6%
	abs(dS) <= 2F	2107	95.6%
	abs(dS) <= 3F	2166	98.2%
With / without basement		1800	81.6%
Occupancy		1841	83.5%
Construction type		1954	88.6%
Age band		1810	82.1%

Accuracy Check on 2205 extracted building polygons









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