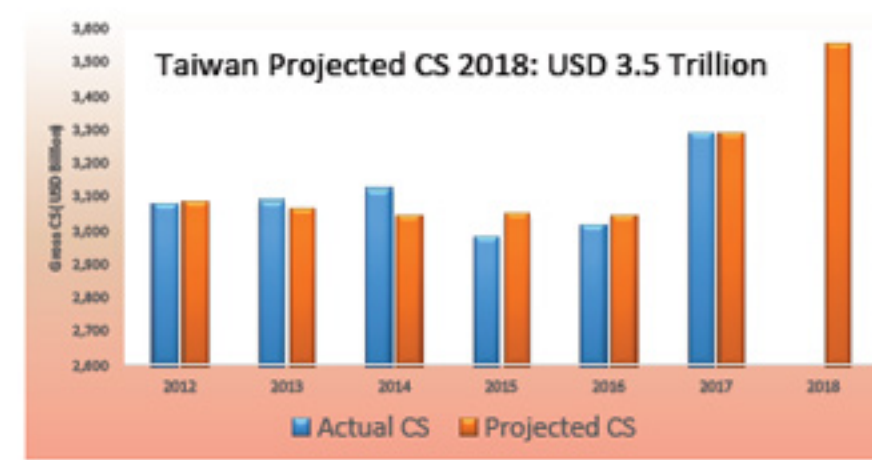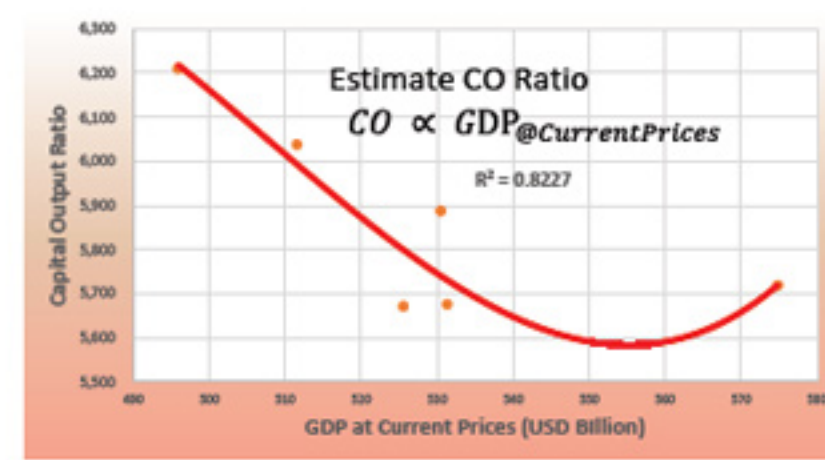# Capital Stock Methodology – Top-down Approach for Taiwan

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National Capital Stock

- Protection gap or Underinsurance in Asia is one of the biggest concerns for (re)insurance sector. To address the protection gap we need to first estimate the economic exposure. The total economic exposure in a region gives an estimate of the insurable exposure
- To estimate the economic exposure, NatCatDAX (NCD) has adopted Top-Down Approach. The objective is to start with a proxy for exposure should ideally have the following attributes:
  - Cover fixed assets such as buildings, structures as well as machinery and equipment, which are typically the subject of insurance coverage
  - Measured based on stock concept, i.e. accounts for all existing fixed assets at a single point in time
  - Valued based on replacement cost
- Capital Stock (CS) may not be the most ideal since it is based on perpetual inventory method (PIM) and not actual census. But it is closest to the representation of exposure against other national statistics like gross domestic product (GDP) and gross fixed capital formation (GFCF)
- CS provides a snapshot of the value of all productive fixed assets at a particular point in time.
- Gross CS at Current Prices (CS) = Gross Produced Assets from Taiwan National Statistics

Estimate CO Ratio
$CO \propto GDP_{@CurrentPrices}$
$R^2 = 0.8227$

Taiwan Projected CS 2018: USD 3.5 Trillion
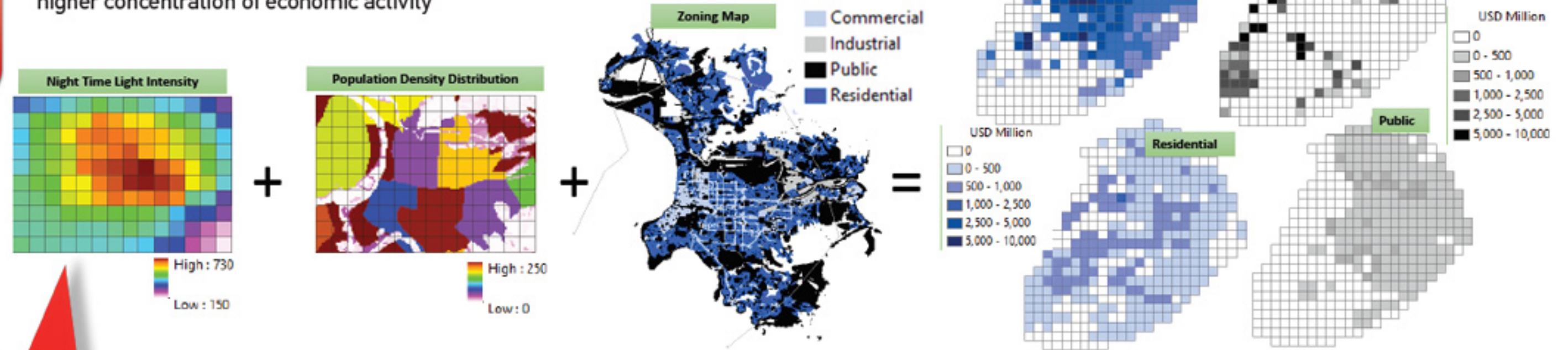Actual CS | Projected CS

Regional Capital Stock

- Each regional has its own economic strategy depending on the resources and the capital available, so each admin region focuses on industrial or commercial sectors
- Manufacturing Sector is the major contributor of Capital Stock in Taiwan. New Taipei City, Taichung City and Chonghua County are Manufacturing Hubs
- CS contributions in Taipei City are majorly coming from: Wholesale and Retail Trade; Information and Communication; Financial & Insurance Activities and Real Estate

CS Taiwan — Commercial, Industrial, Residential, Public

CS Taipei City
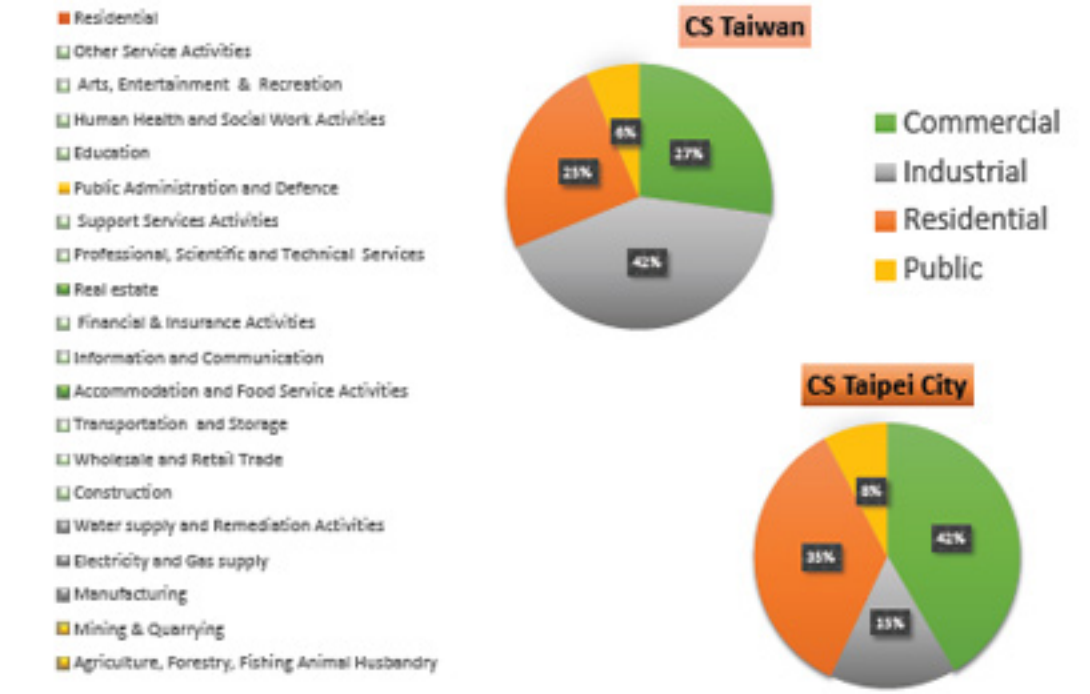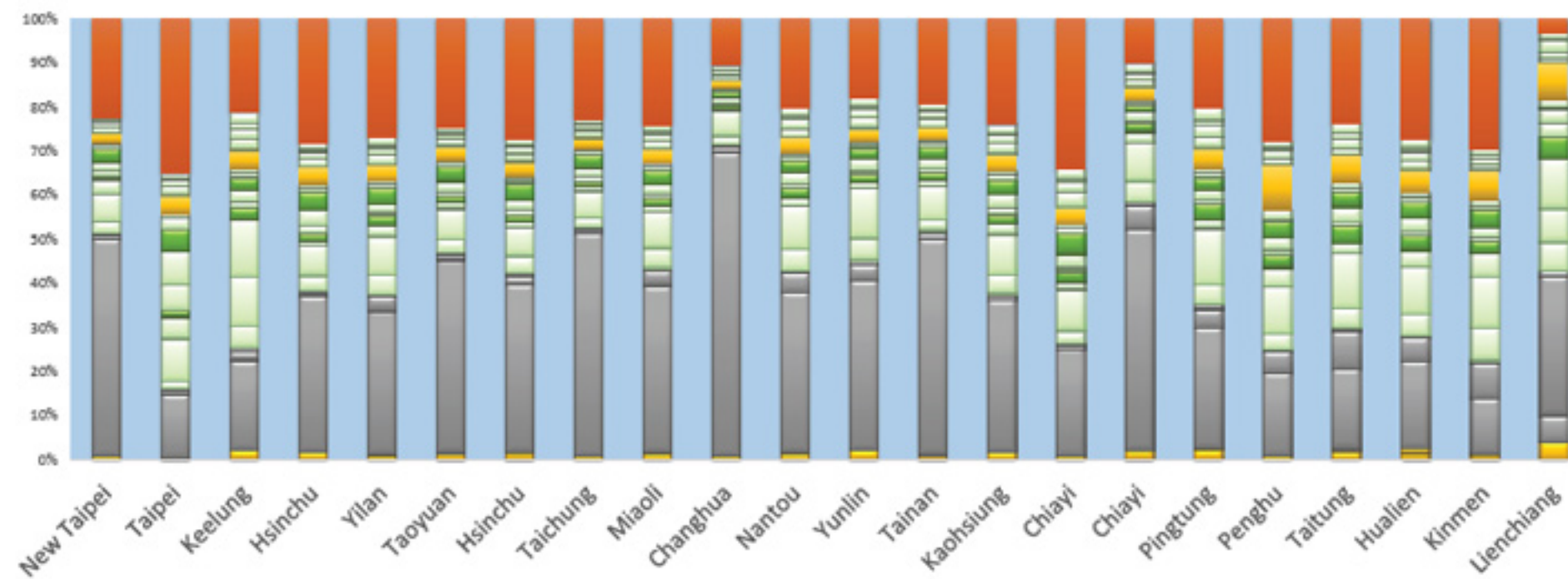
Grid Level Capital Stock

- Zoning Map is crucial to understand the spatial distribution of various Lines of Business
- Night Time Light (NTL) is proportional to the high economic development
- PD indicates the influence of Human Activity across a country. Higher the density indicates higher concentration of economic activity

Night Time Light Intensity — High: 730, Low: 150

Population Density Distribution — High: 250, Low: 0

Zoning Map — Commercial, Industrial, Public, Residential

Commercial | Industrial | Residential | Public

USD Million: 0 / 0 - 500 / 500 - 1,000 / 1,000 - 2,500 / 2,500 - 5,000 / 5,000 - 10,000

Building Value

- Using high resolution satellite imagery and photogrammetry software, NCD has developed geometry of each Building: Building Footprint and Height
- Building Characteristics like occupancy types, construction class, building age and number of stories are derived
- Building Occupancy, Total Floor Area (TFA) and Construction Cost are applied to estimate the benchmark Building Value
- TFA in a grid by occupancy class helps in disaggregating the CS for each grid and occupancy to estimate CS Building Value
- Comparing Building Value from Construction Costs (CC Arcadis) and CS help in estimating the Economic Exposure
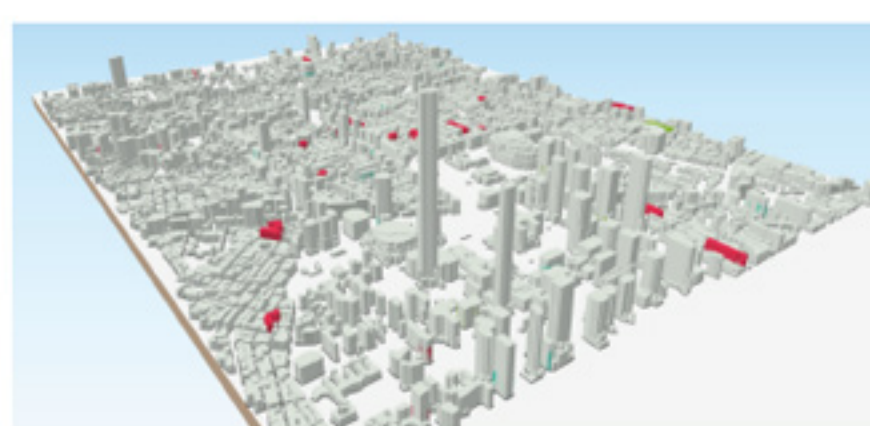
Number of Buildings	7,300	8,256	1,658	3,632	20,846
Deviation (CS-CC)/CC	Com	Res	Pub	Mix	All
< -2.0	0%	0%	0%	0%	0%
-2 to -1	0%	0%	0%	0%	0%
-1 to -0.5	6%	6%	15%	6%	7%
-0.5 to 0.5	85%	83%	67%	82%	82%
0.5 to 1.0	9%	9%	13%	12%	10%
1.0 to 2.0	1%	2%	5%	0%	2%
>2.0	0%	0%	0%	0%	0%

For more than 80% of the Building, Building Value from CS = +/-0.5 * Building Replacement Value from CC Arcadis

CS | CC Arcadis