

# COUNTRY EXPOSURE MODEL

Review main statistic of a exposure model and create summaries for a given Country.

/home/risk/venvs/py38w/lib/python3.8/site-packages/geopandas/\_compat.py:111: UserWarning: The Shapely GEOS version (3.9.1-CAPI-1.14.2) is incompatible with the GEOS version PyGEOS was compiled with (3.10.1-CAPI-1.16.0). Conversions between both will be slow.  
warnings.warn(

```
# Parameters
country = "Japan"
```

Exposure files:  
Exposure\_Com\_Japan.csv  
Exposure\_Ind\_Japan.csv  
Exposure\_Res\_Japan.csv

## Sanity checks and formats

## Exposure at National level

### Summary by occupancy type

|           | OCCUPANTS | BUILDINGS | COST_USD    | BUILDINGS_% | COST_USD_% |
|-----------|-----------|-----------|-------------|-------------|------------|
| OCCUPANCY |           |           |             |             |            |
| Res       | 127.1M    | 34,014.0K | \$16,567.2B | 96.70%      | 73.53%     |
| Ind       | 0.0M      | 407.4K    | \$2,483.2B  | 1.16%       | 11.02%     |
| Com       | 0.0M      | 752.2K    | \$3,480.1B  | 2.14%       | 15.45%     |

### Other metrics to consider

|           | AREA_SQM | COST_BUILDING_USD | AVG_BUILDING_AREA_SQM | AVG_COST_PER_AREA_USD |
|-----------|----------|-------------------|-----------------------|-----------------------|
| OCCUPANCY |          |                   |                       |                       |
| Total     | 7,891.7M | \$11,658.0B       | 224                   | \$2,855               |
| Res       | 6,104.1M | \$8,924.7B        | 179                   | \$2,714               |
| Ind       | 657.3M   | \$993.3B          | 1,613                 | \$3,778               |
| Com       | 1,130.4M | \$1,740.0B        | 1,503                 | \$3,079               |

## Exposure summary at Admin level 1

|           | COST_USD   | BUILDINGS | OCCUPANTS | COST_USD_% | BUILDINGS_% | OCCUPANTS_% |
|-----------|------------|-----------|-----------|------------|-------------|-------------|
| NAME_1    |            |           |           |            |             |             |
| Tokyo     | \$2,552.1B | 2,806.5K  | 13,515.3K | 11.33%     | 7.98%       | 10.63%      |
| Osaka     | \$1,907.4B | 1,965.8K  | 8,839.5K  | 8.47%      | 5.59%       | 6.96%       |
| Aichi     | \$1,475.8B | 1,918.6K  | 7,483.2K  | 6.55%      | 5.45%       | 5.89%       |
| Kanagawa  | \$1,330.6B | 2,121.7K  | 9,126.2K  | 5.91%      | 6.03%       | 7.18%       |
| Hyogo     | \$1,097.4B | 1,435.9K  | 5,534.8K  | 4.87%      | 4.08%       | 4.35%       |
| Saitama   | \$1,022.7B | 1,972.4K  | 7,266.5K  | 4.54%      | 5.61%       | 5.72%       |
| Chiba     | \$949.3B   | 1,652.8K  | 6,222.7K  | 4.21%      | 4.70%       | 4.90%       |
| Fukuoka   | \$839.2B   | 1,251.9K  | 5,101.6K  | 3.72%      | 3.56%       | 4.01%       |
| Hokkaido  | \$829.3B   | 1,619.6K  | 5,381.8K  | 3.68%      | 4.60%       | 4.23%       |
| Shizuoka  | \$678.3B   | 1,118.6K  | 3,700.3K  | 3.01%      | 3.18%       | 2.91%       |
| Hiroshima | \$502.8B   | 805.3K    | 2,844.0K  | 2.23%      | 2.29%       | 2.24%       |
| Ibaraki   | \$497.7B   | 916.3K    | 2,917.0K  | 2.21%      | 2.60%       | 2.30%       |
| Niigata   | \$474.8B   | 746.9K    | 2,304.2K  | 2.11%      | 2.12%       | 1.81%       |
| Nagano    | \$413.0B   | 696.5K    | 2,098.8K  | 1.83%      | 1.98%       | 1.65%       |
| Kyoto     | \$411.4B   | 758.2K    | 2,610.4K  | 1.83%      | 2.16%       | 2.05%       |
| Gifu      | \$388.7B   | 640.8K    | 2,032.0K  | 1.73%      | 1.82%       | 1.60%       |
| Tochigi   | \$371.4B   | 636.2K    | 1,974.3K  | 1.65%      | 1.81%       | 1.55%       |
| Miyagi    | \$369.5B   | 658.0K    | 2,333.9K  | 1.64%      | 1.87%       | 1.84%       |
| Gumma     | \$353.7B   | 655.6K    | 1,973.1K  | 1.57%      | 1.86%       | 1.55%       |
| Mie       | \$352.5B   | 608.7K    | 1,815.9K  | 1.56%      | 1.73%       | 1.43%       |
| Okayama   | \$346.8B   | 612.0K    | 1,921.5K  | 1.54%      | 1.74%       | 1.51%       |
| Fukushima | \$317.0B   | 582.2K    | 1,914.0K  | 1.41%      | 1.66%       | 1.51%       |
| Shiga     | \$282.4B   | 416.3K    | 1,412.9K  | 1.25%      | 1.18%       | 1.11%       |
| Kumamoto  | \$272.7B   | 532.9K    | 1,786.2K  | 1.21%      | 1.52%       | 1.41%       |
| Toyama    | \$270.5B   | 345.6K    | 1,066.3K  | 1.20%      | 0.98%       | 0.84%       |
| Kagoshima | \$266.0B   | 575.5K    | 1,648.2K  | 1.18%      | 1.64%       | 1.30%       |
| Yamaguchi | \$264.3B   | 479.3K    | 1,404.7K  | 1.17%      | 1.36%       | 1.11%       |
| Ehime     | \$252.5B   | 465.4K    | 1,385.3K  | 1.12%      | 1.32%       | 1.09%       |
| Aomori    | \$242.9B   | 450.2K    | 1,308.3K  | 1.08%      | 1.28%       | 1.03%       |
| Nagasaki  | \$238.2B   | 434.4K    | 1,377.1K  | 1.06%      | 1.23%       | 1.08%       |
| Ishikawa  | \$231.3B   | 373.7K    | 1,154.0K  | 1.03%      | 1.06%       | 0.91%       |
| Iwate     | \$229.0B   | 402.9K    | 1,279.6K  | 1.02%      | 1.15%       | 1.01%       |
| Yamagata  | \$210.9B   | 352.6K    | 1,123.9K  | 0.94%      | 1.00%       | 0.88%       |
| Nara      | \$208.5B   | 408.2K    | 1,364.3K  | 0.93%      | 1.16%       | 1.07%       |
| Oita      | \$208.2B   | 361.9K    | 1,166.4K  | 0.92%      | 1.03%       | 0.92%       |
| Kagawa    | \$201.0B   | 317.7K    | 976.3K    | 0.89%      | 0.90%       | 0.77%       |
| Akita     | \$197.8B   | 356.4K    | 1,023.1K  | 0.88%      | 1.01%       | 0.81%       |
| Miyazaki  | \$185.2B   | 378.8K    | 1,104.1K  | 0.82%      | 1.08%       | 0.87%       |
| Okinawa   | \$184.8B   | 315.4K    | 1,433.5K  | 0.82%      | 0.90%       | 1.13%       |
| Wakayama  | \$166.7B   | 337.9K    | 963.6K    | 0.74%      | 0.96%       | 0.76%       |
| Fukui     | \$162.7B   | 242.2K    | 786.8K    | 0.72%      | 0.69%       | 0.62%       |
| Yamanashi | \$148.0B   | 281.2K    | 834.9K    | 0.66%      | 0.80%       | 0.66%       |
| Saga      | \$147.1B   | 251.1K    | 832.8K    | 0.65%      | 0.71%       | 0.66%       |
| Shimane   | \$132.9B   | 224.6K    | 694.3K    | 0.59%      | 0.64%       | 0.55%       |
| Tokushima | \$132.0B   | 249.4K    | 755.8K    | 0.59%      | 0.71%       | 0.59%       |
| Kochi     | \$111.5B   | 258.0K    | 728.3K    | 0.49%      | 0.73%       | 0.57%       |
| Tottori   | \$102.1B   | 181.6K    | 573.4K    | 0.45%      | 0.52%       | 0.45%       |

## Exposure by simplified taxonomy

Adding `MACRO\_TAXO` column

|            | COST_USD   | BUILDINGS | OCCUPANTS | COST_USD_% | BUILDINGS_% | OCCUPANTS_% |
|------------|------------|-----------|-----------|------------|-------------|-------------|
| MACRO_TAXO |            |           |           |            |             |             |
| W          | \$9,672.4B | 28,198.7K | 75,799.4K | 42.93%     | 80.17%      | 59.64%      |
| S          | \$7,915.9B | 4,354.7K  | 30,260.9K | 35.13%     | 12.38%      | 23.81%      |
| RC         | \$4,883.6B | 2,492.6K  | 20,594.8K | 21.68%     | 7.09%       | 16.20%      |
| M          | \$47.3B    | 115.2K    | 408.7K    | 0.21%      | 0.33%       | 0.32%       |
| OT         | \$11.3B    | 12.4K     | 31.1K     | 0.05%      | 0.04%       | 0.02%       |

## Exposure by taxonomy

Showing only taxonomies that represent 90% of the total `COST\_USD`

|            |                            | COST_USD   | BUILDINGS | COST_USD_% | BUILDINGS_% |
|------------|----------------------------|------------|-----------|------------|-------------|
| MACRO_TAXO | TAXONOMY                   |            |           |            |             |
|            | W+WHE/LPB+DUH/H:2/FII/RES  | \$3,151.8B | 9,651,146 | 15.58%     | 28.44%      |
|            | W+WHE/LPB+DUM/H:2/RES      | \$1,686.4B | 4,803,962 | 8.34%      | 14.16%      |
| W          | W+WHE/LPB+DUH/H:2/RES      | \$1,627.9B | 4,694,989 | 8.05%      | 13.84%      |
|            | W+WHE/LPB+DUM/H:2/FII/RES  | \$1,346.9B | 4,102,466 | 6.66%      | 12.09%      |
|            | W+WHE/LPB+DUM/H:1/RES      | \$649.0B   | 1,956,911 | 3.21%      | 5.77%       |
|            | SRC/DUH/HBET:11-14/RES     | \$600.9B   | 31,373    | 2.97%      | 0.09%       |
|            | SRC/DUH/HBET:8-10/RES      | \$457.0B   | 32,111    | 2.26%      | 0.09%       |
| S          | S+SR/LFBR+DUH/H:2/RES      | \$441.2B   | 1,344,170 | 2.18%      | 3.96%       |
|            | S+SR/LFBR+DUH/HEX:2/COM    | \$420.9B   | 157,523   | 2.08%      | 0.46%       |
|            | S+SR/LFBR+DUH/HEX:1/COM    | \$414.3B   | 158,119   | 2.05%      | 0.47%       |
| RC         | CR/DUH/H:3/RES             | \$368.6B   | 444,192   | 1.82%      | 1.31%       |
|            | SRC/DUH/HBET:6-7/RES       | \$328.5B   | 47,293    | 1.62%      | 0.14%       |
| S          | SRC/DUH/HBET:6;9/COM       | \$314.6B   | 14,436    | 1.56%      | 0.04%       |
| W          | W+WHE/LPB+DUH/H:1/RES      | \$308.5B   | 954,476   | 1.53%      | 2.81%       |
| RC         | CR/DUH/H:2/RES             | \$296.7B   | 650,786   | 1.47%      | 1.92%       |
|            | SRC/DUH/HBET:15-/RES       | \$296.2B   | 7,999     | 1.46%      | 0.02%       |
|            | S+SR/LFBR+DUH/HEX:2/IND    | \$294.9B   | 73,075    | 1.46%      | 0.22%       |
| S          | SRC/DUH/H:3/RES            | \$286.2B   | 295,760   | 1.41%      | 0.87%       |
|            | S+SR/LFBR+DUH/HEX:1/IND    | \$277.1B   | 80,616    | 1.37%      | 0.24%       |
|            | CR/DUH/HBET:6-7/RES        | \$276.4B   | 47,293    | 1.37%      | 0.14%       |
|            | CR/DUH/H:4/RES             | \$275.5B   | 105,973   | 1.36%      | 0.31%       |
|            | CR/DUH/H:5/RES             | \$268.2B   | 82,906    | 1.33%      | 0.24%       |
| RC         | CR/DUH/HBET:8-10/RES       | \$253.2B   | 21,440    | 1.25%      | 0.06%       |
|            | CR/DUH/HBET:4;5/COM        | \$250.1B   | 28,450    | 1.24%      | 0.08%       |
|            | CR/DUM/H:5/RES             | \$245.4B   | 74,622    | 1.21%      | 0.22%       |
|            | CR/DUH/HEX:3/IND           | \$241.5B   | 19,295    | 1.19%      | 0.06%       |
|            | SRC/DUH/H:4/RES            | \$217.8B   | 70,624    | 1.08%      | 0.21%       |
| S          | SRC/DUH/H:5/RES            | \$213.5B   | 55,298    | 1.06%      | 0.16%       |
|            | SRC/DUH/H:2/RES            | \$210.0B   | 422,587   | 1.04%      | 1.25%       |
| RC         | CR/DUH/HBET:4;5/IND        | \$201.8B   | 12,605    | 1.00%      | 0.04%       |
| W          | W+WHE/LPB+DUH/H:1/FII/RES  | \$200.3B   | 654,674   | 0.99%      | 1.93%       |
| S          | SRC/DUM/H:5/RES            | \$194.7B   | 49,697    | 0.96%      | 0.15%       |
|            | CR/DUM/H:2/RES             | \$175.6B   | 397,348   | 0.87%      | 1.17%       |
| RC         | CR/DUH/HEX:3/COM           | \$170.3B   | 26,368    | 0.84%      | 0.08%       |
| S          | SRC/DUM/HBET:11-14/RES     | \$170.1B   | 8,218     | 0.84%      | 0.02%       |
| W          | W+WHE/LPB+DUM/H:1/FII/RES  | \$165.7B   | 525,503   | 0.82%      | 1.55%       |
| RC         | CR/DUM/HEX:3/IND           | \$157.6B   | 12,124    | 0.78%      | 0.04%       |
|            | S+SR/LFBR+DUH/H:3/RES      | \$148.0B   | 313,105   | 0.73%      | 0.92%       |
| S          | SRC/DUH/HBET:10;15/COM     | \$144.7B   | 3,803     | 0.72%      | 0.01%       |
|            | SRC/DUH/HBET:4;5/COM       | \$143.1B   | 9,637     | 0.71%      | 0.03%       |
| RC         | CR/DUH/HEX:2/COM           | \$140.2B   | 31,608    | 0.69%      | 0.09%       |
|            | S+SR/LFBR+DUH/HEX:3/COM    | \$138.2B   | 40,800    | 0.68%      | 0.12%       |
| S          | S+SR/LFBR+DUM/H:2/RES      | \$137.3B   | 398,812   | 0.68%      | 1.18%       |
| W          | W+WHE/LPB+DUH/H:3/FII/RES  | \$137.3B   | 439,320   | 0.68%      | 1.29%       |
|            | CR/DUM/H:4/RES             | \$131.1B   | 50,037    | 0.65%      | 0.15%       |
| RC         | CR/DUH/HBET:6;9/COM        | \$130.4B   | 9,521     | 0.64%      | 0.03%       |
|            | CR/DUM/HBET:4;5/IND        | \$130.0B   | 7,708     | 0.64%      | 0.02%       |
| S          | S+SR/LFBR+DUH/HBET:4;5/COM | \$126.7B   | 16,245    | 0.63%      | 0.05%       |
|            | CR/DUH/HBET:11-14/RES      | \$123.5B   | 7,880     | 0.61%      | 0.02%       |
| RC         | CR/DUM/H:3/RES             | \$117.3B   | 150,956   | 0.58%      | 0.44%       |
|            | CR/DUH/HEX:2/IND           | \$108.8B   | 20,195    | 0.54%      | 0.06%       |
|            | SRC/DUM/H:4/RES            | \$103.8B   | 33,361    | 0.51%      | 0.10%       |
| S          | SRC/DUH/HEX:2/COM          | \$99.4B    | 18,036    | 0.49%      | 0.05%       |
|            | SRC/DUM/HBET:8-10/RES      | \$96.4B    | 6,620     | 0.48%      | 0.02%       |
|            | SRC/DUM/H:3/RES            | \$93.8B    | 100,281   | 0.46%      | 0.30%       |
| RC         | CR/DUM/HBET:4;5/COM        | \$93.1B    | 11,889    | 0.46%      | 0.04%       |
|            | W+WHE/LPB+DUH/HBET:1-3/IND | \$88.4B    | 34,439    | 0.44%      | 0.10%       |
| W          | W+WHE/LPB+DUH/HBET:1-3/COM | \$87.0B    | 46,328    | 0.43%      | 0.14%       |
|            | SRC/DUM/HBET:6-7/RES       | \$86.5B    | 11,869    | 0.43%      | 0.03%       |
| S          | S+SR/LFBR+DUM/HEX:2/COM    | \$86.4B    | 32,370    | 0.43%      | 0.10%       |
|            | S+SR/LFBR+DUM/HEX:2/IND    | \$82.9B    | 19,369    | 0.41%      | 0.06%       |