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 S
hapely GEOS version (3.9.1-CAPI-1.14.2) is incompatible with the GEOS version PyGEOS was compil
ed with (3.10.1-CAPI-1.16.0). Conversions between both will be slow.
  warnings.warn(
```

```
# Parameters
country = "South_Africa"
```

```
Exposure files:
   Exposure_Com_South_Africa.csv
   Exposure_Ind_South_Africa.csv
   Exposure_Res_South_Africa.csv
```

Sanity checks and formats

South_Africa

```
   Exposure/Exposure/Exposure_Com_South_Africa.csv
   Exposure/Exposure/Exposure_Ind_South_Africa.csv
   Exposure/Exposure/Exposure_Res_South_Africa.csv
   Occupants / Dwellings = 3.1
   Reference avg household size (2019) = 3.28
   Population (exposure / UN_2021) = 0.99
   Exposure models  OK
```

Exposure at National level

Summary by occupancy type

OCCUPANCY	OCCUPANTS	BUILDINGS	COST_USD	BUILDINGS_%	COST_USD_%
Res	59.3M	17,357.2K	$628.2B	94.33%	80.61%
Ind	0.0M	291.0K	$46.4B	1.58%	5.95%
Com	0.0M	751.9K	$104.7B	4.09%	13.44%

Other metrics to consider

OCCUPANCY	AREA_SQM	COST_BUILDING_USD	AVG_BUILDING_AREA_SQM	AVG_COST_PER_AREA_USD
Total	1,719.0M	$606.9B	93	$453
Res	1,482.7M	$507.3B	85	$424
Ind	83.0M	$27.6B	285	$559
Com	153.3M	$72.1B	204	$683

Exposure summary at Admin level 1

NAME_1	COST_USD	BUILDINGS	OCCUPANTS	COST_USD_%	BUILDINGS_%	OCCUPANTS_%
Gauteng	$194.0B	4,843.1K	15,526.9K	24.90%	26.32%	26.18%
KwaZulu-Natal	$150.3B	3,365.8K	10,903.7K	19.28%	18.29%	18.39%
Western Cape	$95.2B	2,270.3K	7,293.7K	12.22%	12.34%	12.30%
Eastern Cape	$92.6B	2,109.5K	6,813.6K	11.88%	11.46%	11.49%
Limpopo	$79.2B	1,779.8K	5,781.3K	10.16%	9.67%	9.75%
Mpumalanga	$63.2B	1,475.4K	4,761.8K	8.11%	8.02%	8.03%
North West	$52.3B	1,267.7K	4,080.5K	6.71%	6.89%	6.88%
Free State	$35.3B	865.5K	2,779.3K	4.53%	4.70%	4.69%
Northern Cape	$17.3B	423.1K	1,356.8K	2.22%	2.30%	2.29%

Exposure by simplified taxonomy

```
   Adding `MACRO_TAXO` column
```

MACRO_TAXO	COST_USD	BUILDINGS	OCCUPANTS	COST_USD_%	BUILDINGS_%	OCCUPANTS_%
MUR	$389.5B	10,853.4K	32,799.9K	49.97%	58.99%	55.31%
MCF	$168.4B	2,814.1K	8,519.4K	21.61%	15.29%	14.37%
RC	$136.3B	701.2K	5,111.6K	17.49%	3.81%	8.62%
ADO/E	$41.6B	1,526.6K	5,384.3K	5.34%	8.30%	9.08%
OT	$18.6B	2,158.5K	6,668.8K	2.38%	11.73%	11.25%
S	$14.8B	72.8K	0.0K	1.90%	0.40%	0.00%
W	$10.2B	273.6K	813.8K	1.31%	1.49%	1.37%

Exposure by taxonomy

```
   Showing only taxonomies that represent 90% of the total `COST_USD`
```

MACRO_TAXO	TAXONOMY	COST_USD	BUILDINGS	COST_USD_%	BUILDINGS_%
MUR	MUR+CL/LWAL+CDN/H:2/RES	$64,268.3M	1,672,195	9.18%	9.54%
MCF	MCF/LWAL+CDL/H:2/RES	$61,494.1M	1,058,831	8.78%	6.04%
MUR	MUR+STDRE/LWAL+CDN/H:2/RES	$47,628.8M	1,239,250	6.80%	7.07%
	MUR+CB/LWAL+CDN/H:2/RES	$47,394.9M	1,233,164	6.77%	7.03%
RC	CR/LFINF+CDL/HBET:4-7/RES	$45,286.7M	55,579	6.47%	0.32%
MUR	MUR+CL/LWAL+CDN/H:1/RES	$39,025.0M	1,715,072	5.57%	9.78%
MCF	MCF/LWAL+CDL/H:1/RES	$37,340.4M	1,085,981	5.33%	6.19%
MUR	MUR+STDRE/LWAL+CDN/H:1/RES	$28,921.1M	1,271,027	4.13%	7.25%
	MUR+CB/LWAL+CDN/H:1/RES	$28,779.1M	1,264,785	4.11%	7.21%
ADO/E	MUR+ADO/LWAL+CDN/H:2/RES	$18,527.3M	531,685	2.65%	3.03%
OT	ME+MEO/LWAL+CDN/H:1/RES	$17,747.5M	2,064,628	2.54%	11.78%
MCF	MCF/LWAL+CDL/HBET:3-6/RES	$17,163.3M	30,166	2.45%	0.17%
MUR	MUR+STRUB/LWAL+CDN/H:2/RES	$16,347.6M	531,685	2.34%	3.03%
MCF	MCF/LWAL+CDM/H:2/RES	$13,486.0M	232,210	1.93%	1.32%
RC	CR/LFINF+CDL/H:3/RES	$13,049.9M	155,903	1.86%	0.89%
	CR/LFINF+CDL/HBET:8+/RES	$12,736.9M	12,506	1.82%	0.07%
ADO/E	MUR+ADO/LWAL+CDN/H:1/RES	$11,250.1M	545,318	1.61%	3.11%
MUR	MUR+STRUB/LWAL+CDN/H:1/RES	$9,926.6M	545,318	1.42%	3.11%
RC	CR/LFINF+CDM/HBET:4-7/RES	$9,813.9M	12,044	1.40%	0.07%
MUR	MUR+CL/LWAL+CDN/H:2/COM	$9,318.7M	57,535	1.33%	0.33%
	MUR+CL/LWAL+CDN/H:1/COM	$9,075.9M	115,076	1.30%	0.66%
RC	CR/LFINF+CDL/HBET:4-7/COM	$8,512.7M	8,225	1.22%	0.05%
MUR	MUR+CL/LWAL+CDN/H:3/RES	$8,311.4M	140,667	1.19%	0.80%
MCF	MCF/LWAL+CDM/H:1/RES	$8,189.0M	238,163	1.17%	1.36%
	MCF/LWAL+CDL/H:2/COM	$7,200.9M	33,347	1.03%	0.19%
RC	CR/LFINF+CDL/H:2/RES	$7,081.3M	130,059	1.01%	0.74%
MCF	MCF/LWAL+CDL/H:1/COM	$7,013.2M	66,690	1.00%	0.38%
	MUR+CB/LWAL+CDN/H:2/COM	$6,822.5M	42,125	0.97%	0.24%
	MUR+CB/LWAL+CDN/H:1/COM	$6,644.7M	84,249	0.95%	0.48%
	MUR+CLBLH/LWAL+CDN/H:2/RES	$6,517.1M	169,568	0.93%	0.97%
MUR	MUR+STDRE/LWAL+CDN/H:2/COM	$6,408.2M	39,566	0.92%	0.23%
	MUR+STDRE/LWAL+CDN/H:1/COM	$6,241.2M	79,133	0.89%	0.45%
	MUR+STDRE/LWAL+CDN/H:3/RES	$6,159.5M	104,248	0.88%	0.59%
	MUR+CB/LWAL+CDN/H:3/RES	$6,129.3M	103,735	0.88%	0.59%
ADO/E	E+ETO/LWAL+CDN/H:1/RES	$5,855.6M	340,600	0.84%	1.94%
RC	CR/LFINF+CDL/HBET:8+/COM	$4,741.0M	1,232	0.68%	0.01%
	CR/LFINF+CDL/H:1/RES	$4,299.9M	133,391	0.61%	0.76%
S	S/LFM+CDL/H:1/IND	$4,276.2M	27,263	0.61%	0.16%
MUR	MUR+CL/LWAL+CDN/H:1/IND	$4,258.0M	42,776	0.61%	0.24%
	MUR+CLBLH/LWAL+CDN/H:1/RES	$3,957.3M	173,917	0.57%	0.99%
RC	CR/LWAL+CDL/HBET:4-7/RES	$3,872.1M	4,752	0.55%	0.03%
MCF	MCF/LWAL+CDM/HBET:3-6/RES	$3,764.0M	6,616	0.54%	0.04%
	MCF/LWAL+CDL/H:1/IND	$3,234.9M	22,499	0.46%	0.13%
S	S/LFM+CDL/H:2/IND	$3,109.9M	9,086	0.44%	0.05%
MUR	MUR+CL/LWAL+CDN/H:2/IND	$3,096.7M	14,260	0.44%	0.08%
W	W/LWAL+CDL/H:2/RES	$2,932.4M	62,512	0.42%	0.36%
ADO/E	MUR+ADO/LWAL+CDN/H:2/COM	$2,859.5M	22,070	0.41%	0.13%