Risk analysis: Estimating and illustrating human exposure to flood hazards

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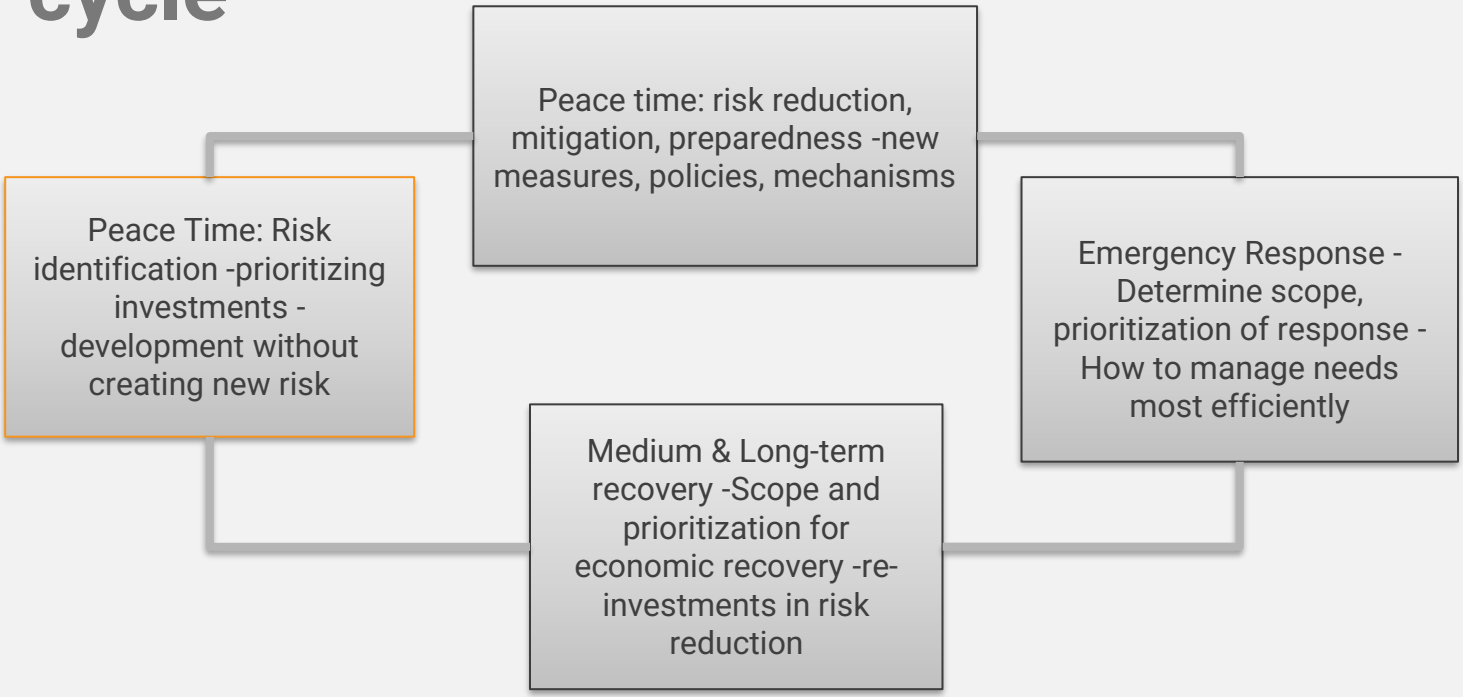
Outline

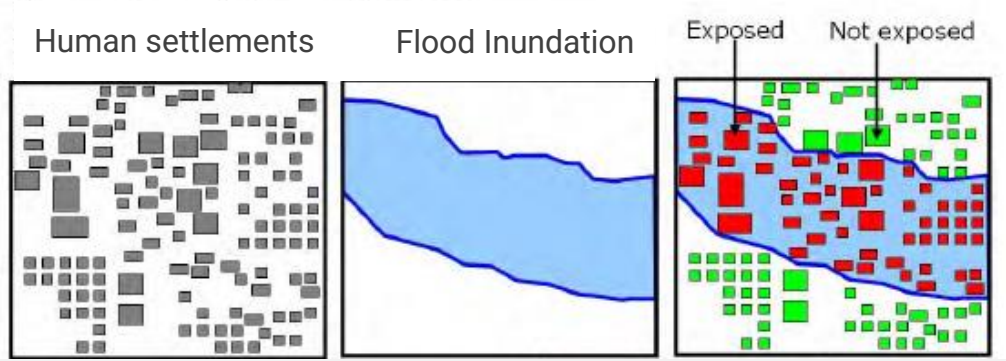
- Risk analysis in the disaster management cycle
- Tool for Producing Population Exposed to Flood hazard maps and statistics
- Towards a disaster-related statistics information system: Ongoing research
- Questions and Answers

Risk analysis in the disaster management cycle



Tool for Producing Population Exposed to Flood hazard maps and statistics

- ESCAP Tool:
  - Generates map of population exposed to flood hazard.
  - Estimates population exposed to flood.



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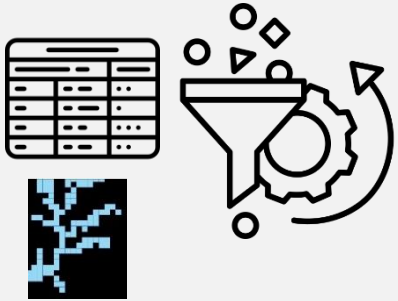
Overall Procedure of the Tool

Data Collection

Clean Data

Data Processing



Multiple data layers are needed to estimate population exposure

Flood Inundation

Population

Admin Layers

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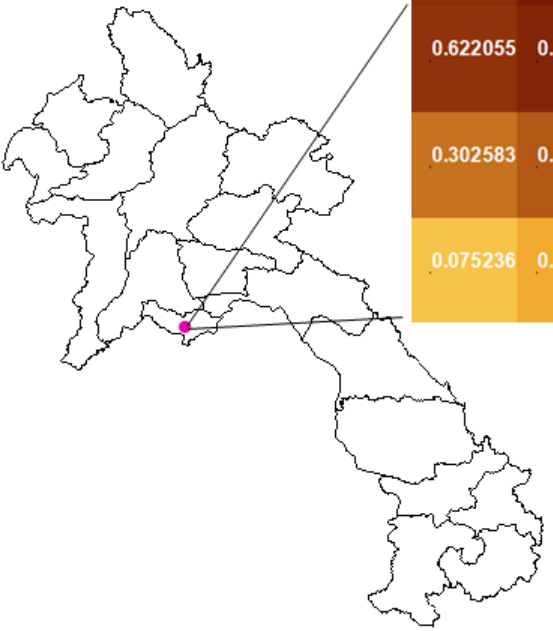
Data sources: Flood Hazard Data Set

Name	Data Source
NRT Global Flood Mapping	https://floodmap.modaps.eosdis.nasa.gov/
Aqueduct Floods Hazard Maps	https://www.wri.org/data/aqueduct-floods-hazard-maps
The Flood Observatory	https://floodobservatory.colorado.edu/
DFO: Asia Flood information	https://diluvium.colorado.edu/
Global Risk Data Platform	https://preview.grid.unep.ch

Sum of cell Values = 19.10299

Normalize= $\frac{Cell\ Value}{SUM\ of\ (Cell\ Value)}$

Lao People's Democratic Republic



0.261952	0.579444	0.809553	0.765176	0.512023	0.277739
0.39113	0.620166	0.820218	0.778936	0.540344	0.355444
0.638226	0.766208	0.882394	0.87251	0.746058	0.626976
0.622055	0.728795	0.834639	0.833813	0.727079	0.621036
0.302583	0.415486	0.55745	0.557393	0.415347	0.302466
0.075236	0.148756	0.249625	0.248541	0.145852	0.072345

0.013713	0.030333	0.042378	0.040055	0.026803	0.014539
0.020475	0.032464	0.042937	0.040776	0.028286	0.018607
0.03341	0.040109	0.046191	0.045674	0.039055	0.032821
0.032563	0.038151	0.043692	0.043648	0.038061	0.03251
0.01584	0.02175	0.029181	0.029178	0.021743	0.015833
0.003938	0.007787	0.013067	0.013011	0.007635	0.003787

Population

*

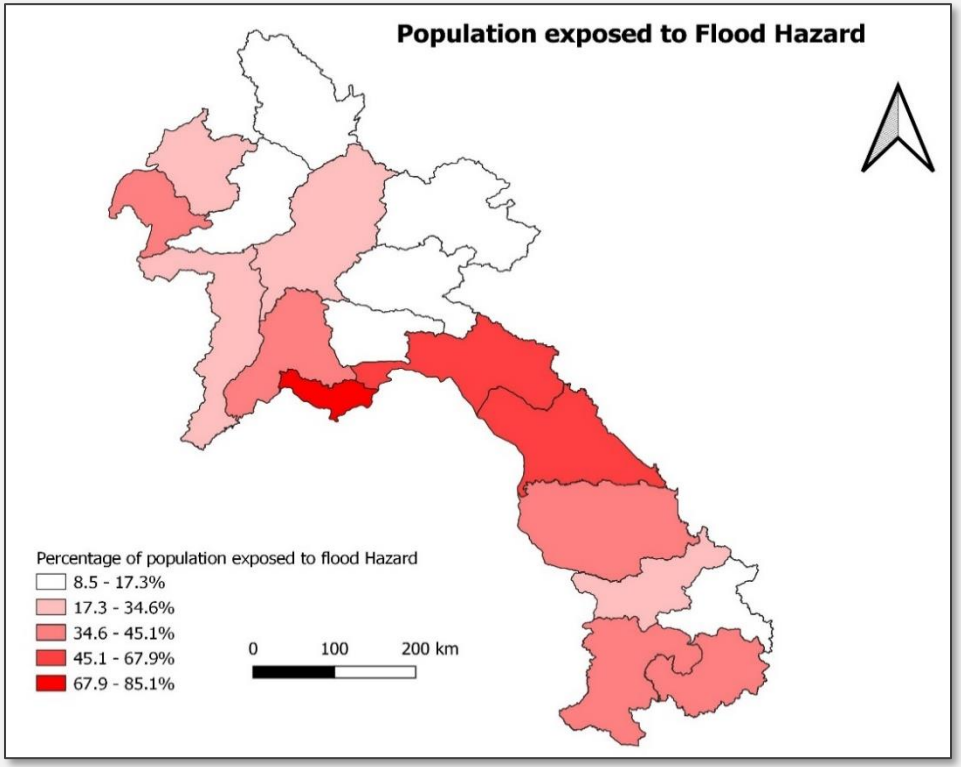
Example Input = 1000

Population Distribution raster

13.71262	30.33263	42.37834	40.0553	26.80329	14.53903
20.47481	32.46434	42.93663	40.77561	28.28583	18.60672
33.40974	40.10932	46.19141	45.674	39.05451	32.82083
32.56323	38.15083	43.69154	43.6483	38.06101	32.50988
15.83956	21.74979	29.1813	29.17831	21.74251	15.83344
3.938441	7.787053	13.06733	13.01058	7.635035	3.787103

Total Population from distributed to pixcels= 1000

Population Exposed to Flood Hazard Map



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Statistical Information

Province	Population	Population Affected	Percentage of Population Affected
Attapeu	257,699	113,853	44.1
Bokeo	203,468	85,169	41.8
Bolikhamxai	314,957	200,121	63.5
Champasack	752,683	297,182	39.4
Houaphan	310,979	38,043	12.2
Khammouan	433,569	294,634	67.9
Louangnamtha	199,091	53,357	26.8
Louangphabang	467,157	161,715	34.6
Oudomxai	345,424	60,041	17.3
Phongsaly	193,149	28,795	14.9
Salavan	442,230	123,959	28
Savannakhet	1,070,031	483,547	45.1
Sekong	129,399	11,711	9.05
Vientiane	462,139	191,174	41.3
Vientiane Capital	850,633	724,522	85.1
Xaignabouly	423,492	116,664	27.5
Xaisomboon	107,927	14,743	13.6
Xiengkhouang	267,182	22,658	8.48

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R-shiny facilitates visualization and dashboard development

Using R-Shiny* https://shiny.rstudio.com/

R-Shiny: R-package that facilitates data integration, user interaction and visualizing

R Studio®

shinyapps.io

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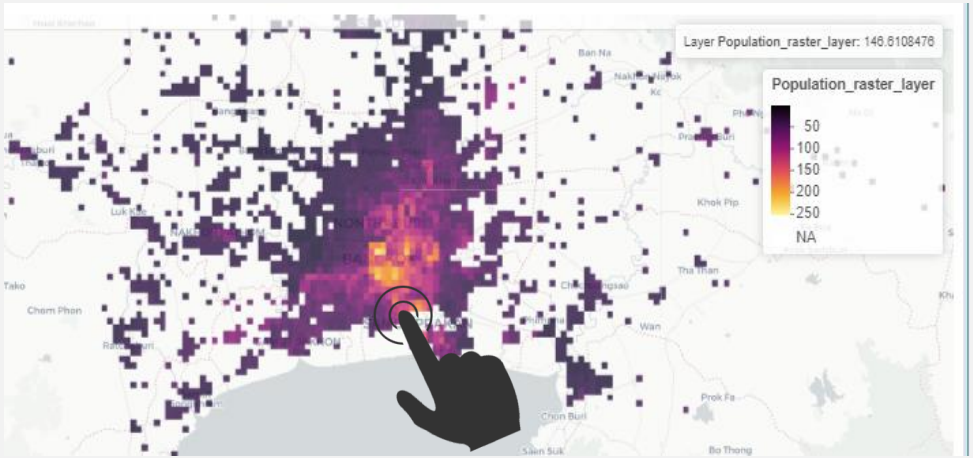
Population Exposed

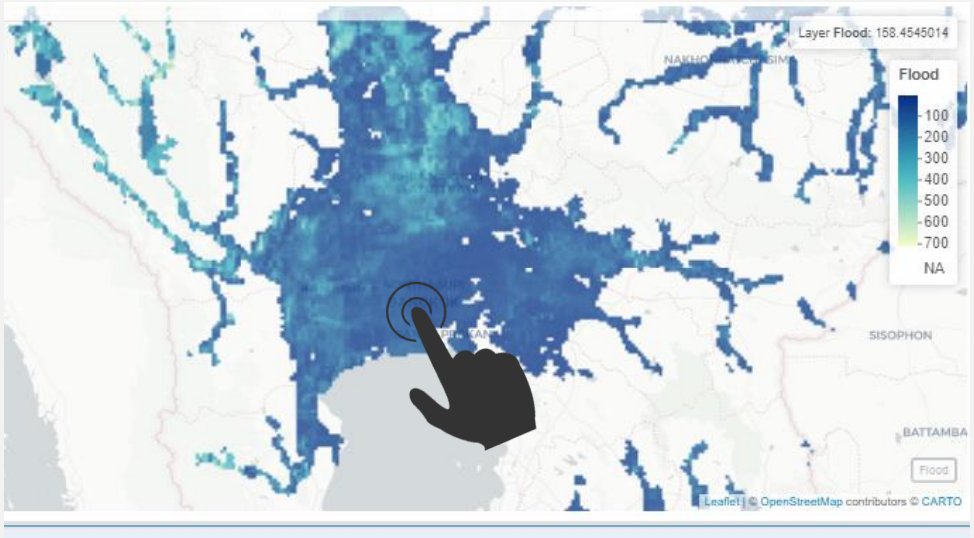
146

Flood Inundation

158

Click On Pixel





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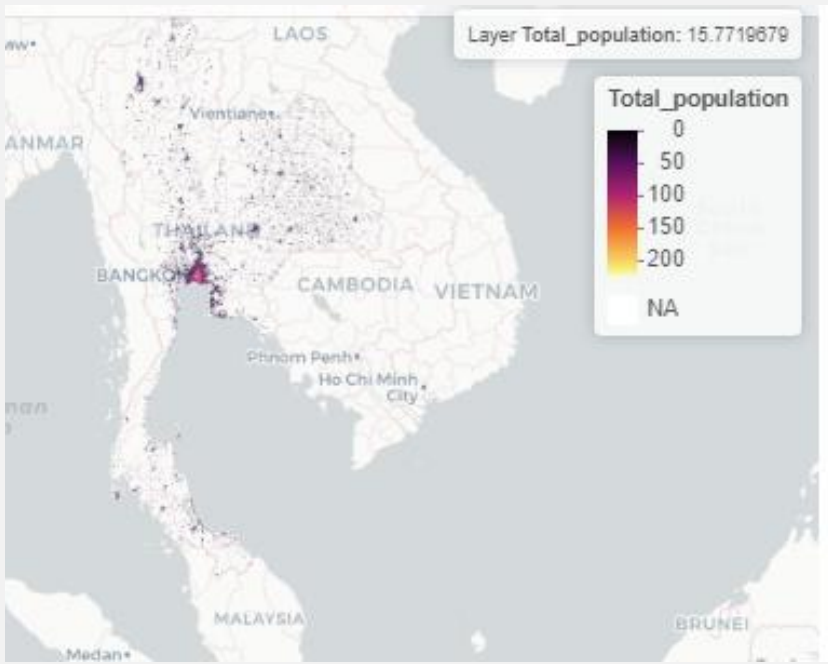

Total Land Cover

Total Population

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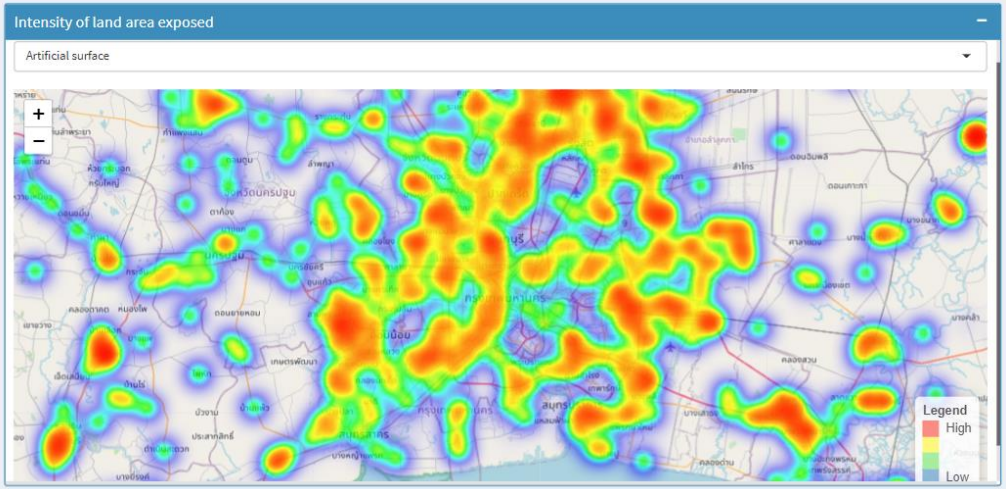
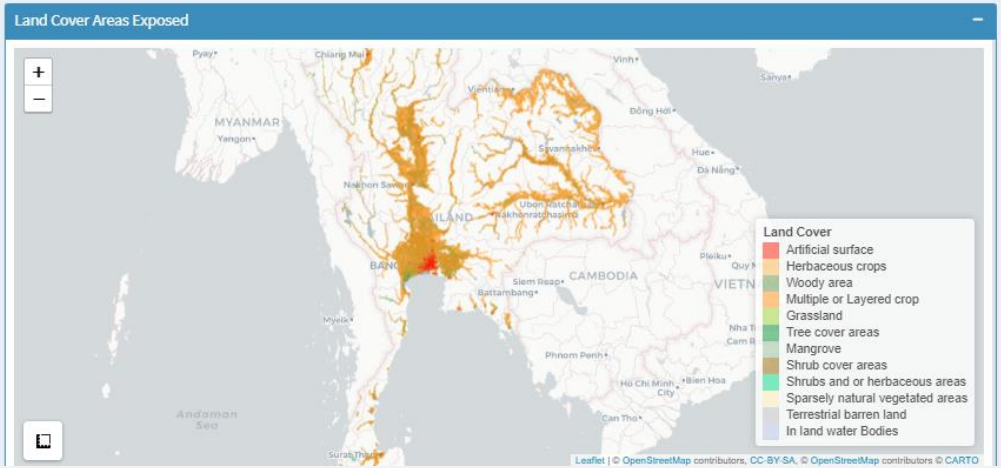
Intensity of Flood Exposed Locations





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Land Cover Area Exposed

	Classes_Names	Land_AreaSqkm	AreaSqKm_Affected	Land_Percentage	Percenage_Affected
1	Artificial surface	4302.09	2497.23	0.852001216304324	58.0469027844606
2	Herbaceous crops	242113.68	60241.95	47.9490549579195	24.8816795482188
3	Woody area	99.72	1.8	0.0197489037397793	1.80505415162455
4	Multiple or Layered crop	142615.8	31418.28	28.2441406535461	22.030013504815
5	Grassland	1825.56	947.25	0.361540400232567	51.8881877341747
6	Tree cover areas	81035.91	2704.68	16.0486400527018	3.33763142784477
7	Mangrove	3690.54	612.09	0.730887677575262	16.5853777495976
8	Shrub cover areas	20890.71	601.38	4.13727056604137	2.87869584135723
9	Shrubs and or herbaceous areas	140.67	44.55	0.0278587874957356	31.6698656429942
10	Sparsely natural vegetated areas	301.86	195.84	0.0597814288296208	64.8777579010137
11	Terrestrial barren land	0.99	0.72	0.000196063123770372	72.7272727272727

D:/Land_Shiny_App/Disaster - Shiny

http://127.0.0.1:7012 | Open in Browser | Republish

69799978
Total Population

35971844
Population Exposed

504939
Land_Area affected

103892
Total Flood inundation area SQKM

Land Cover Types

Herbaceous crops

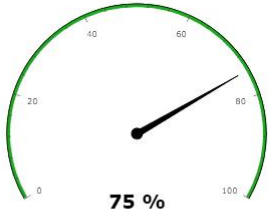
242113.68
Land Cover SqKm

47.95
Percentage of Land cover Area

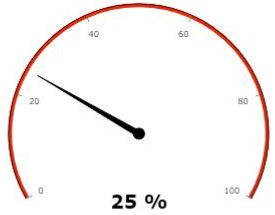
181871.73
Area in sqkm not Exposed

60241.95
Flood Exposed Area SqKm

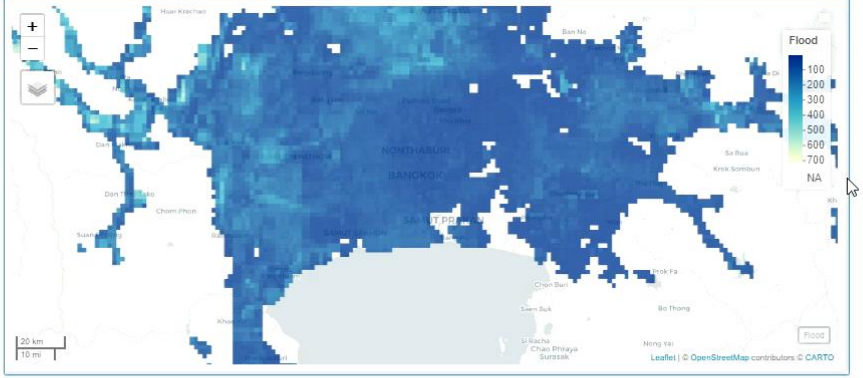
Percentage Area Not Exposed to flooding



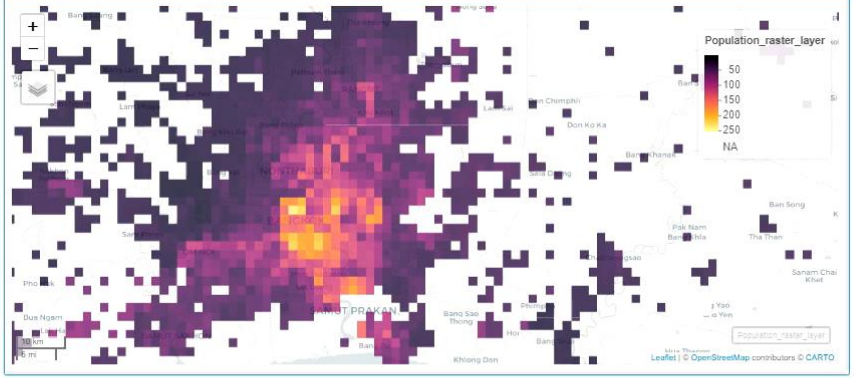
Percentage of area Exposed to flooding



Flood Inindation



Population Exposed to Flooding



Intensity of land area exposed

Herbaceous crops

Land Cover Areas Exposed

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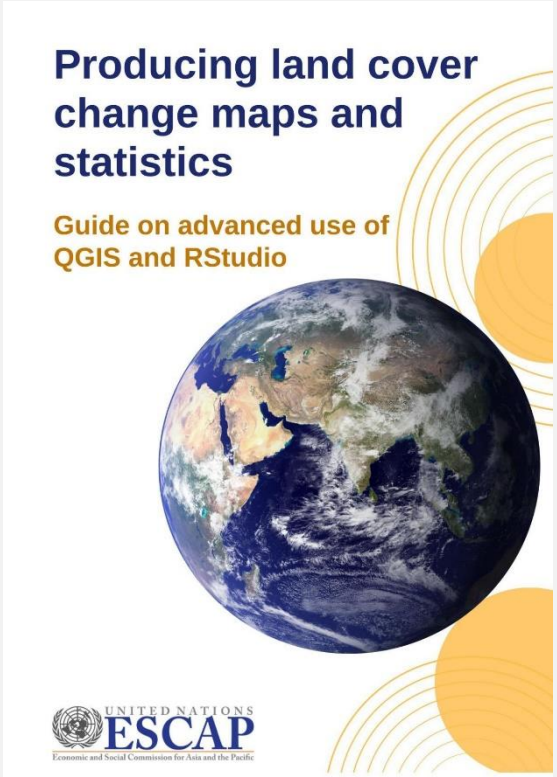
This guide shows you step-by-step how to create land cover change maps and statistics.

Available at:
https://www.unescap.org/resources/producing-land-cover-change-maps-and-statistics-step-step-guide-use-qgis-and-rstudio



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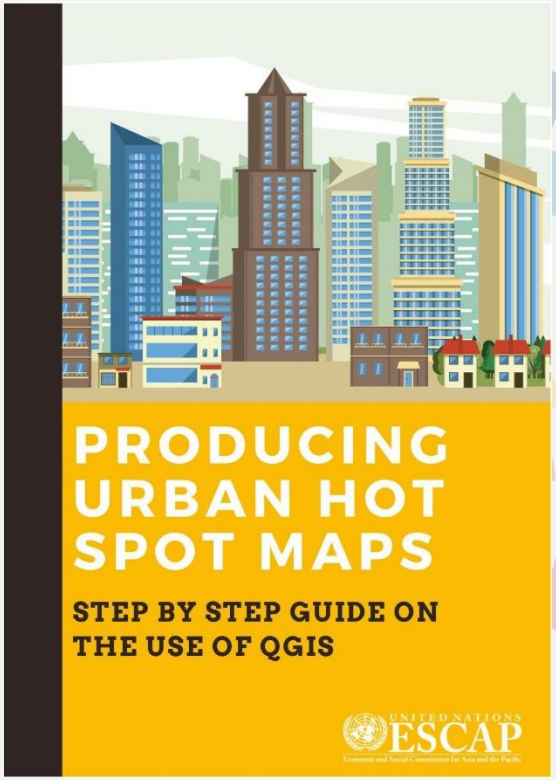

Step By Step Guide On the Use of QGIS

Available at:
https://www.unescap.org/kp/2021/producing-urban-hotspot-maps-step-step-guide-use-qgis

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Acknowledgement

This manual developed based on research by Jean-Louis Weber (Consultant) with Daniel Clarke (UNESCAP), Trevor Clifford (Consultant), and Gao Xian Peh (Consultant), with valuable feedback from the Disaster Management Agency of Indonesia (BNPB), the Dept. of Disaster Prevention and Mitigation (DDPM) of Thailand and the National Statistical Office (NSO) of Thailand

https://communities.unescap.org/system/files/poptoguf_manual_final1.pdf

ICT and Disaster Risk Reduction Division (IDD, ESCAP)

- The tool also benefited from insights provided in the
  - ❑ Asia-Pacific Disaster Report, YEAR (2019)

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