FIG WORKING WEEK 2019

22–26 April, Hanoi, Vietnam

"Geospatial Information for a Smarter Life and Environmental Resilience"

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Historical Analysis of Road Infrastructure Accessibility in Colombia

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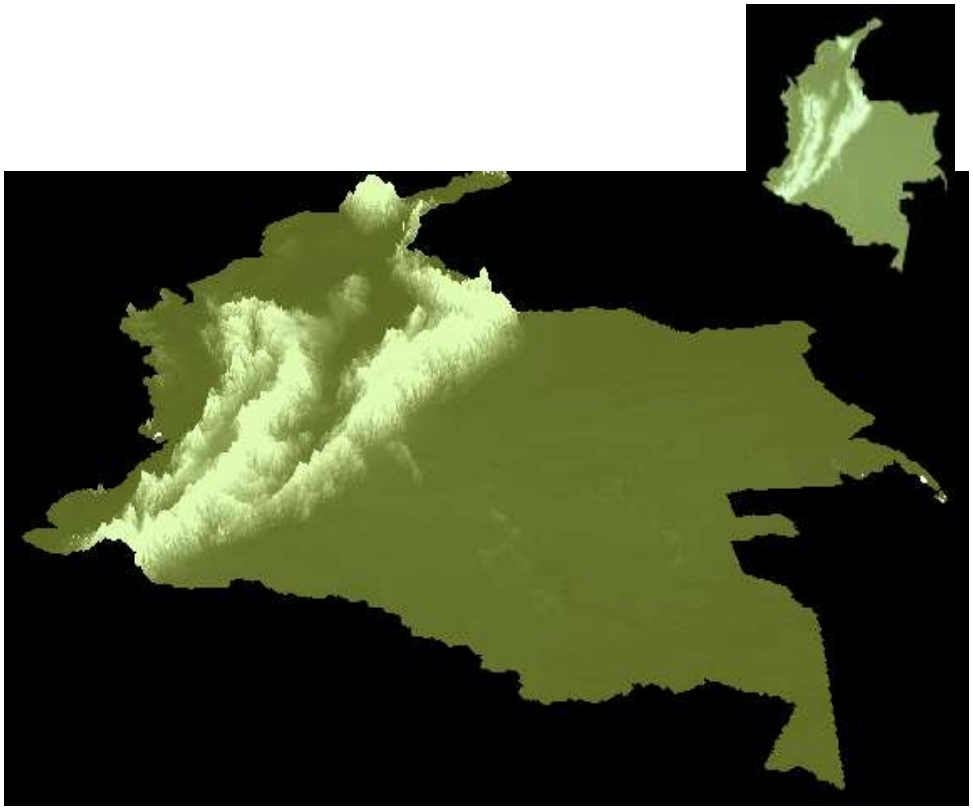
Colombia

Area 1.141 e6 km²

2017:
Population: 49,057 e6 Habs
Roads 2017: 2070,112 km/e6 Habs

1938:
Population: 8,695 e6 Habs
Roads: 1969,618 km/e6 Habs

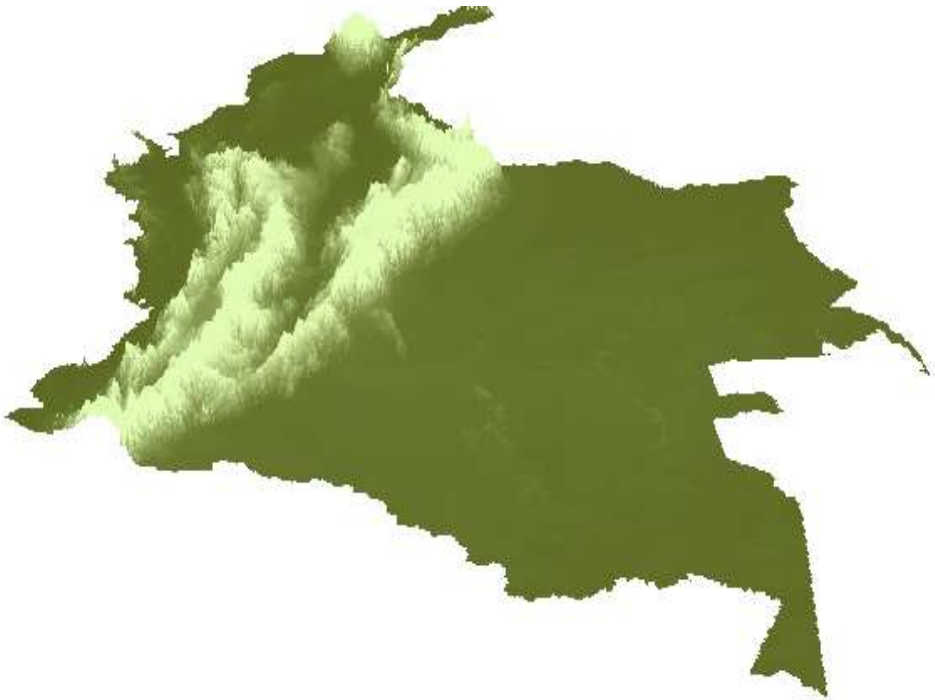


Developing an Accessibility Indicator

- **National road network historical data**
- **Cost Factor (Displacement cost)**
  - Elevation
  - Land Cover
- **Accessibility as distance**
- **Accessibility indicator**
- **Conclusions**

Historical Roads' Maps to Historical Geographic Data

Elevation Cost Factor

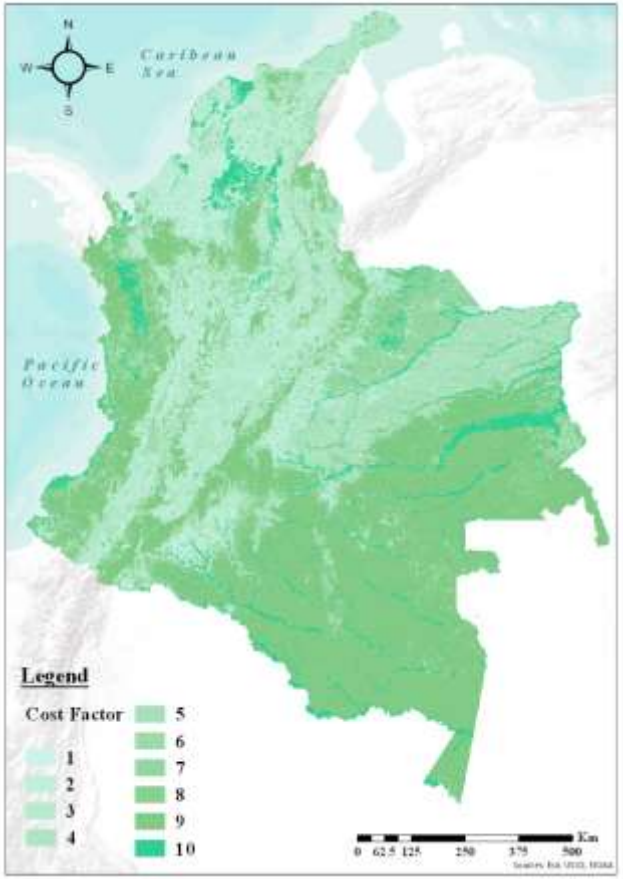


Cost

Land Cover Cost Factor

- CORINE Land Cover Classification System
  - 91 categories
  - Cost Factor 1 – 10

e.g.
Airports: 10
Rivers (50m): 10
Roads: 1
Continuous urban fabric: 1



Displacement Cost

SLOPE
COST FACTOR **(SC)**
(1 – 10)

LAND COVER
COST FACTOR **(LCC)**
(1 – 10)

Total Cost Factor (TCF) (1,5 – 15)

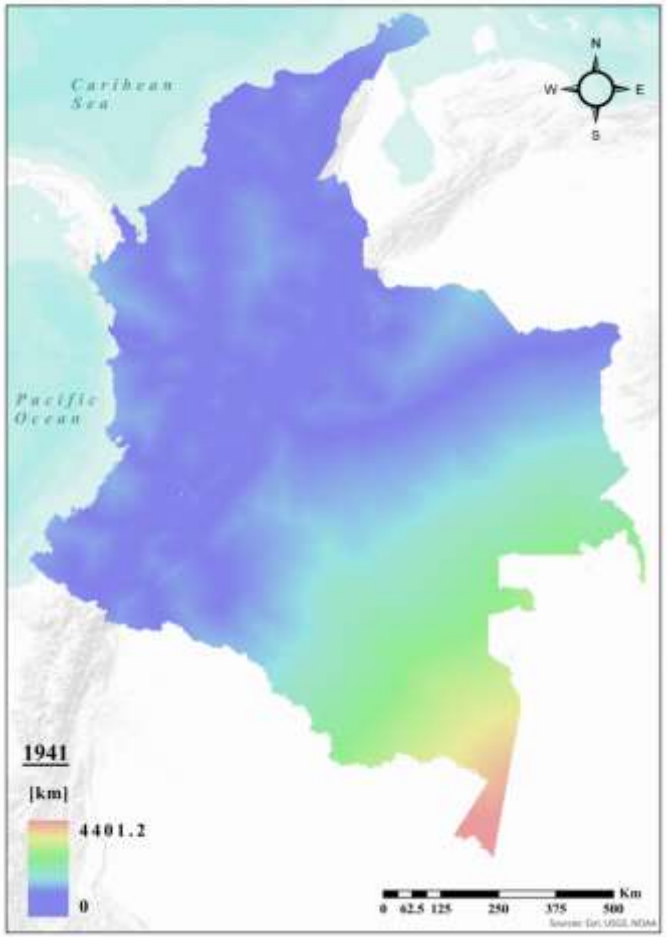
TCF= SC+0,5LCC

Accessibility as distance

Path distance creates a raster in which each cell stores the accumulative cost distance to the source at lower cost.

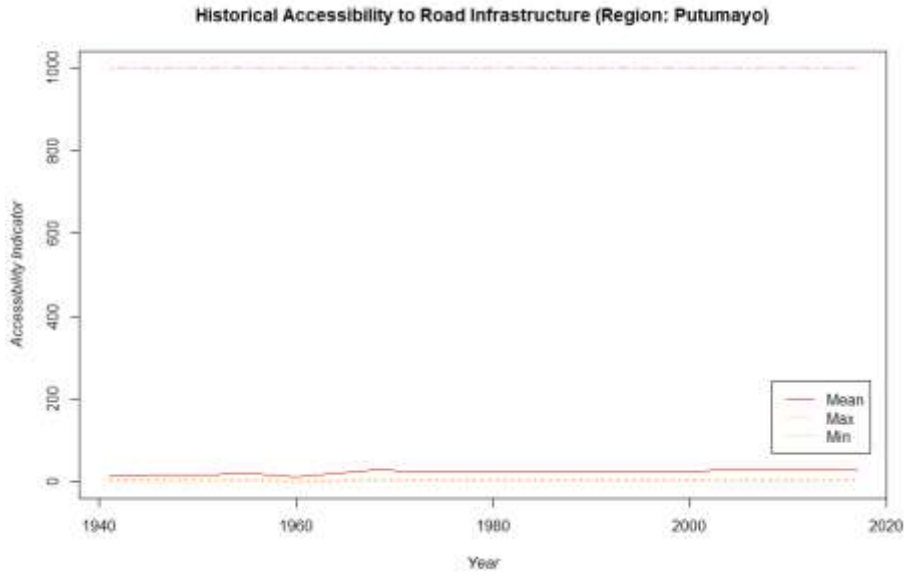
Cost distance between two cells (a, b) is calculated as the product of the surface distance between the two nodes and the average cost between them.

$$\text{Cost distance}_{ab} = \text{Surface distance}_{ab} * \frac{\text{Cost}_a + \text{Cost}_b}{2}$$



$$\textbf{Accessibility indicator}\ [-] = \begin{cases} \dfrac{1000\ [\text{km}]}{\text{path distance}\ [\text{km}]}, & \text{path distance} > 1\ \text{km} \\ 1000, & \text{path distance} \leq 1\ \text{km} \end{cases},$$

$(0.23 - 1000)$



Conclusions

- Although there is a positive trend on the growth of accessibility in Colombia, some regions have had an stagnation on the development of road infrastructure.

- To analyze nationwide accessibility, it's necessary to execute an study that considers other transportation modes, since roads are not the main connectivity source for the southern regions of the country.

- Lack of historical data on determinant factors like Land cover, represent a source of error for the accessibility indicator of this study.