Guarani, Minas Gerais, Brazil - August 20, 2019 - Rural school bus in Guarani, State of Minas Gerais, Brazil.
De Ronaldo Almeida

United Nations Educational, Scientific and Cultural Organization

International Institute for Educational Planning

Geospatial data in educational planning

IIEP Development Unit

#IIEPdev

United Nations
Educational, Scientific and
Cultural Organization

International Institute
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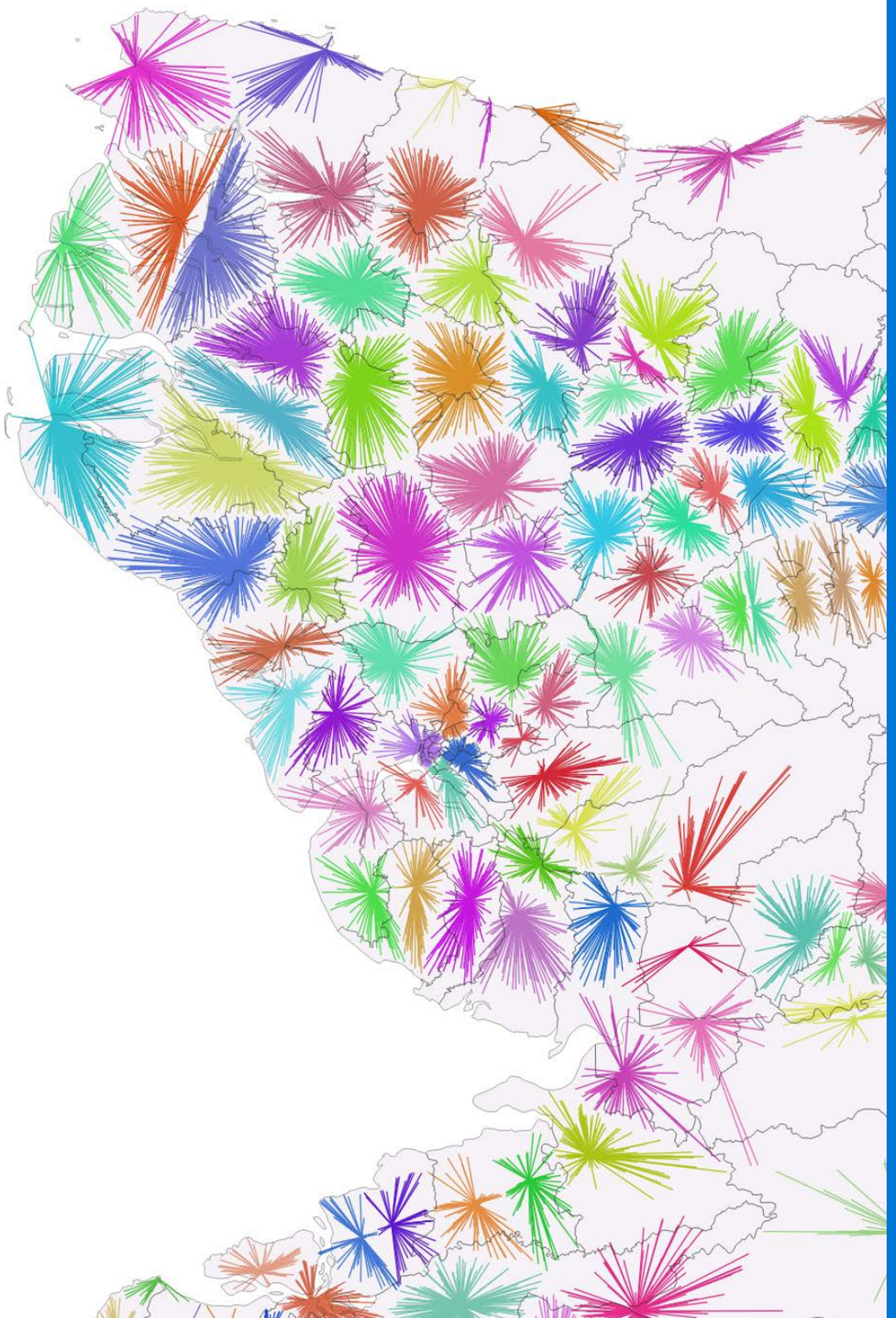
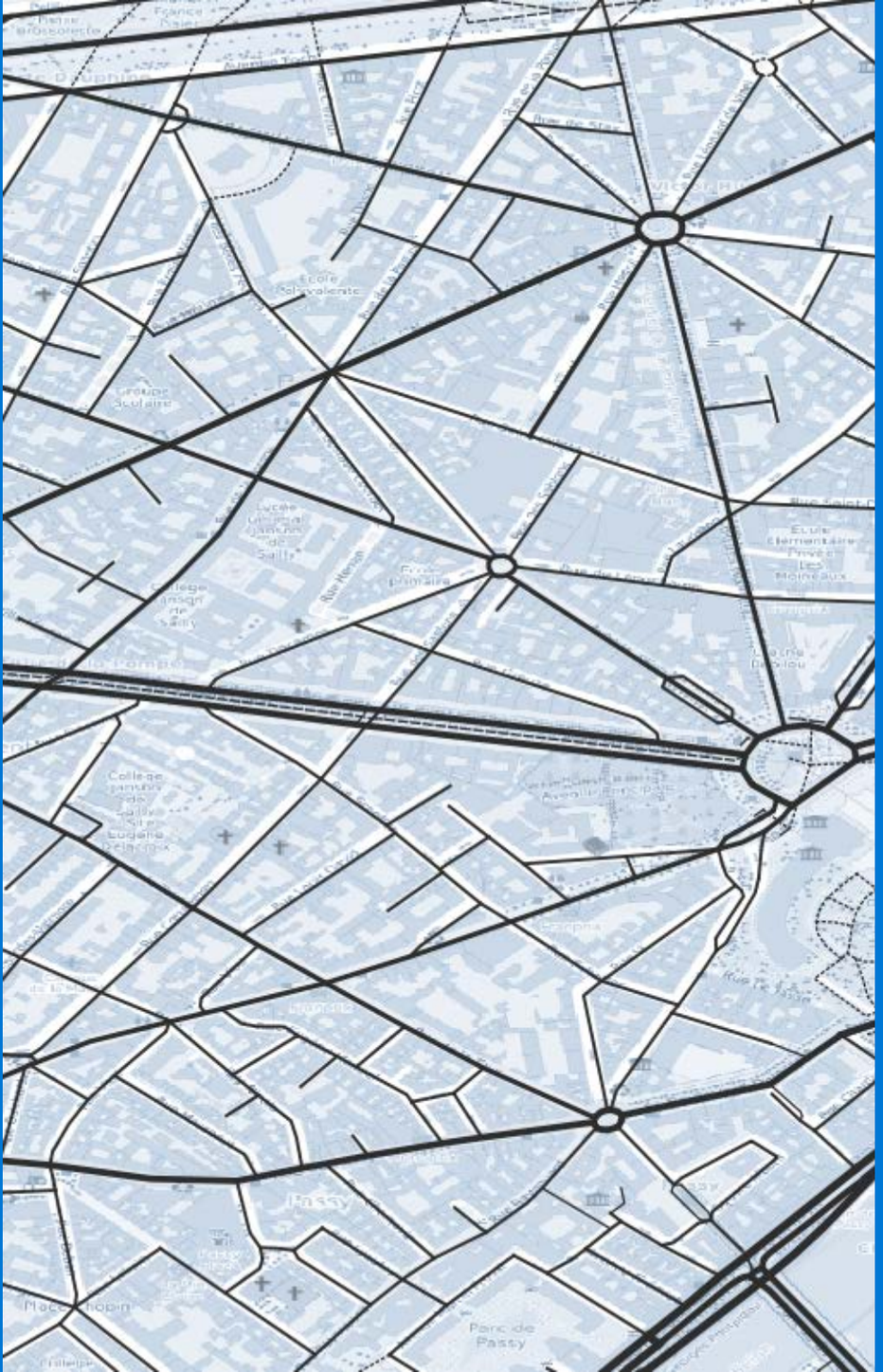
Our objectives

1. Improve EDplanning through the development of tools and methodologies
2. Serve as foresight forum and lab for experimentation
3. Explore unusual data sources, and methods
4. Engage with non-traditional partners



Why use geospatial data in educational planning?

1. Location is a crucial component of educational planning
2. Geospatial information provides insights that were up to now impossible to gather
3. Decision-making is better informed with geospatial information



Plan for today

1. Overview of several projects that are ready for publication or for pilot
2. Deeper dive into 3 specific projects with our technical partners
3. Some Hackathon results
4. Forum: Q&A, ideas, and invitations for collaboration

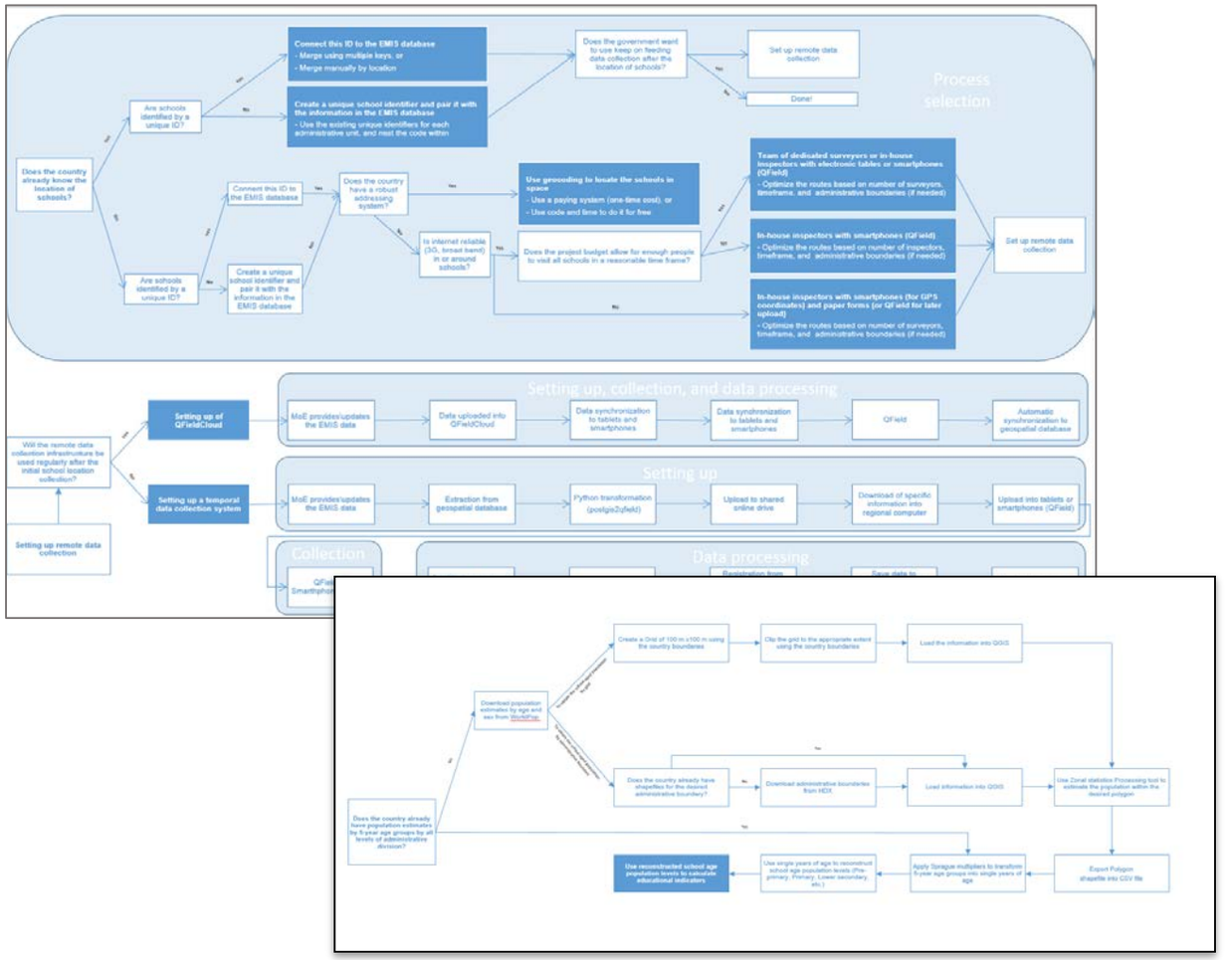
Overview of key tools and activities

1. Flowchart for school mappings
2. Automatized Atlas and Reports
3. Estimating local school-age populations
4. Geographically-weighted regressions
5. Background papers
6. Training offer

Technical flowcharts for mapping school locations

Some countries have none or partial school maps.

Part of our technical cooperation offer is to support ministries to prepare the work and implement it together, regardless of the system currently in place.

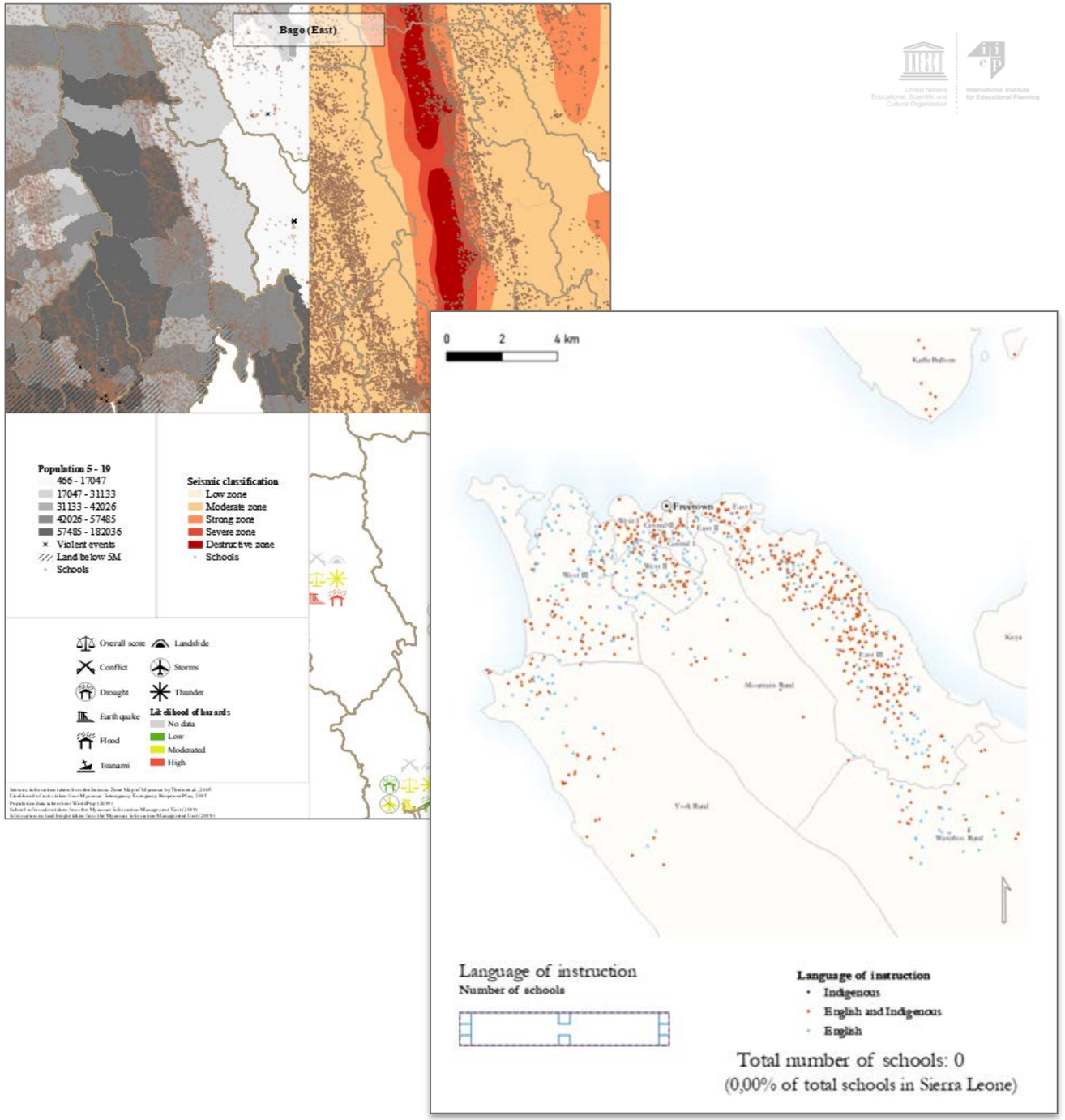


Automatized Atlases and Reports

Ministries of education produce high quality, up-to-date statistical yearbooks that reflect the performance of the education system over a school year.

The transformation of EMIS information into publishable reports can take a lot of time since it requires extracting countless tables, and generating charts and maps, not to mention producing analytical text.

The Dev team created a technical guide on the creation of these reports and Atlases using open-source software.

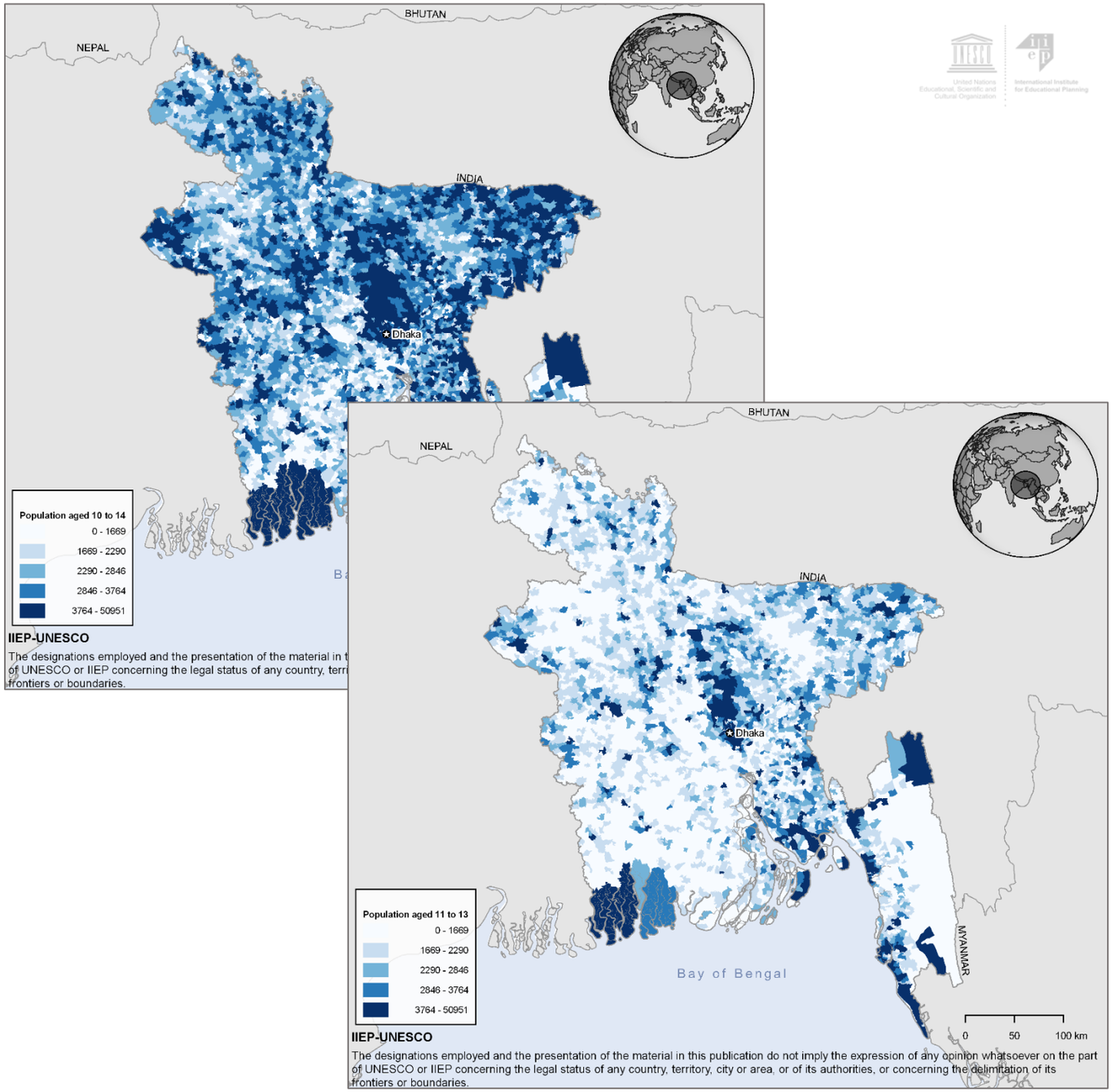


Local school-age populations

School age-population data is available for large administrative areas, not always allowing for responsive micro-planning.

Our new methodology allows for estimating the school-age population at the very local level (100m x 100m), when national data are not available.

We can now estimate the proportion of students of specific school-age that will be affected by policies.

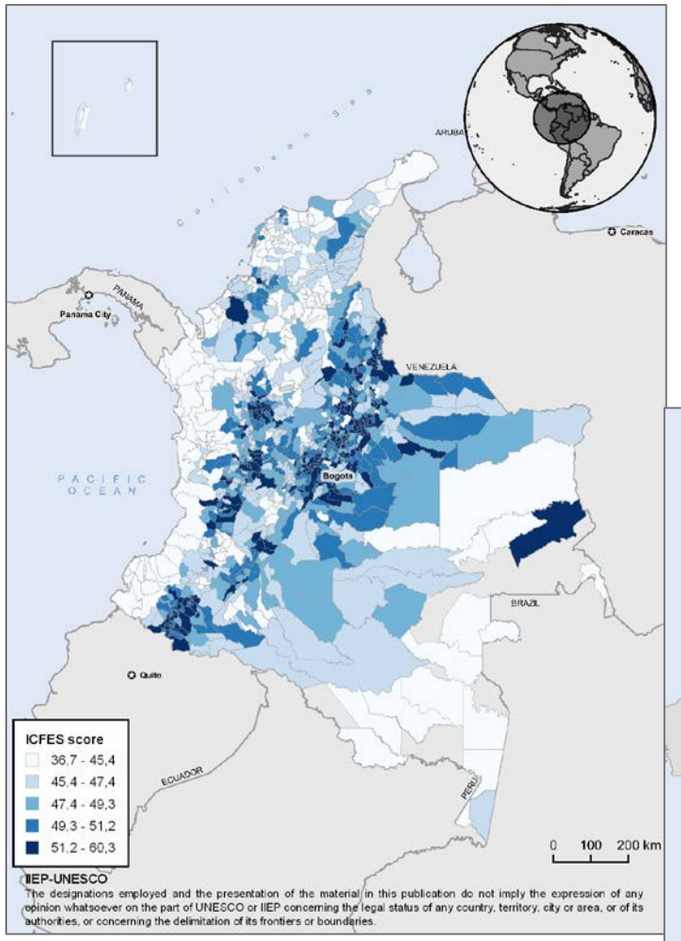


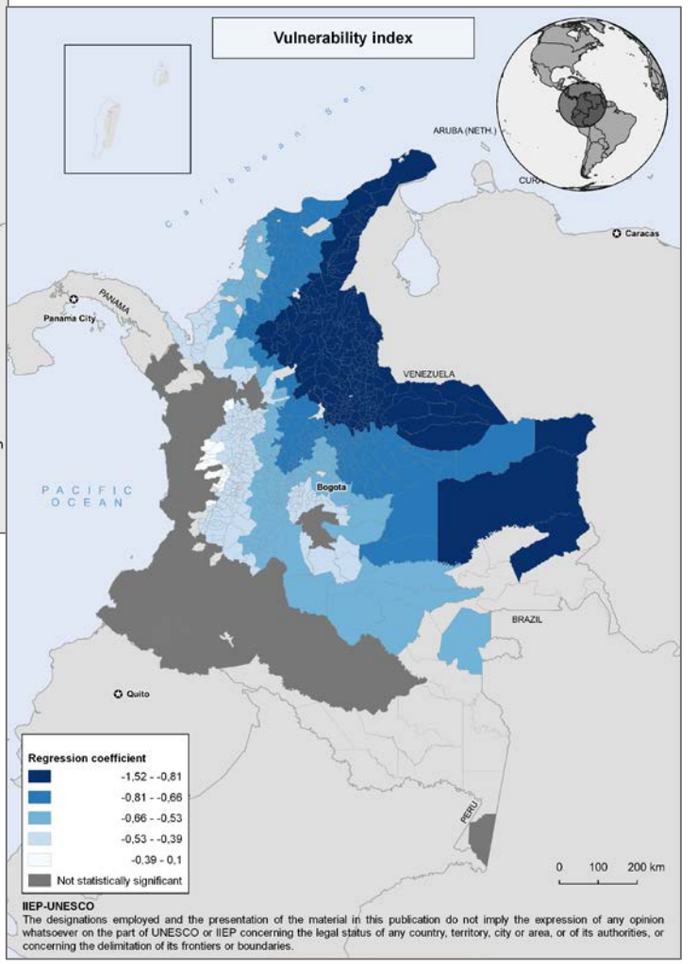
Geographically-weighted regressions

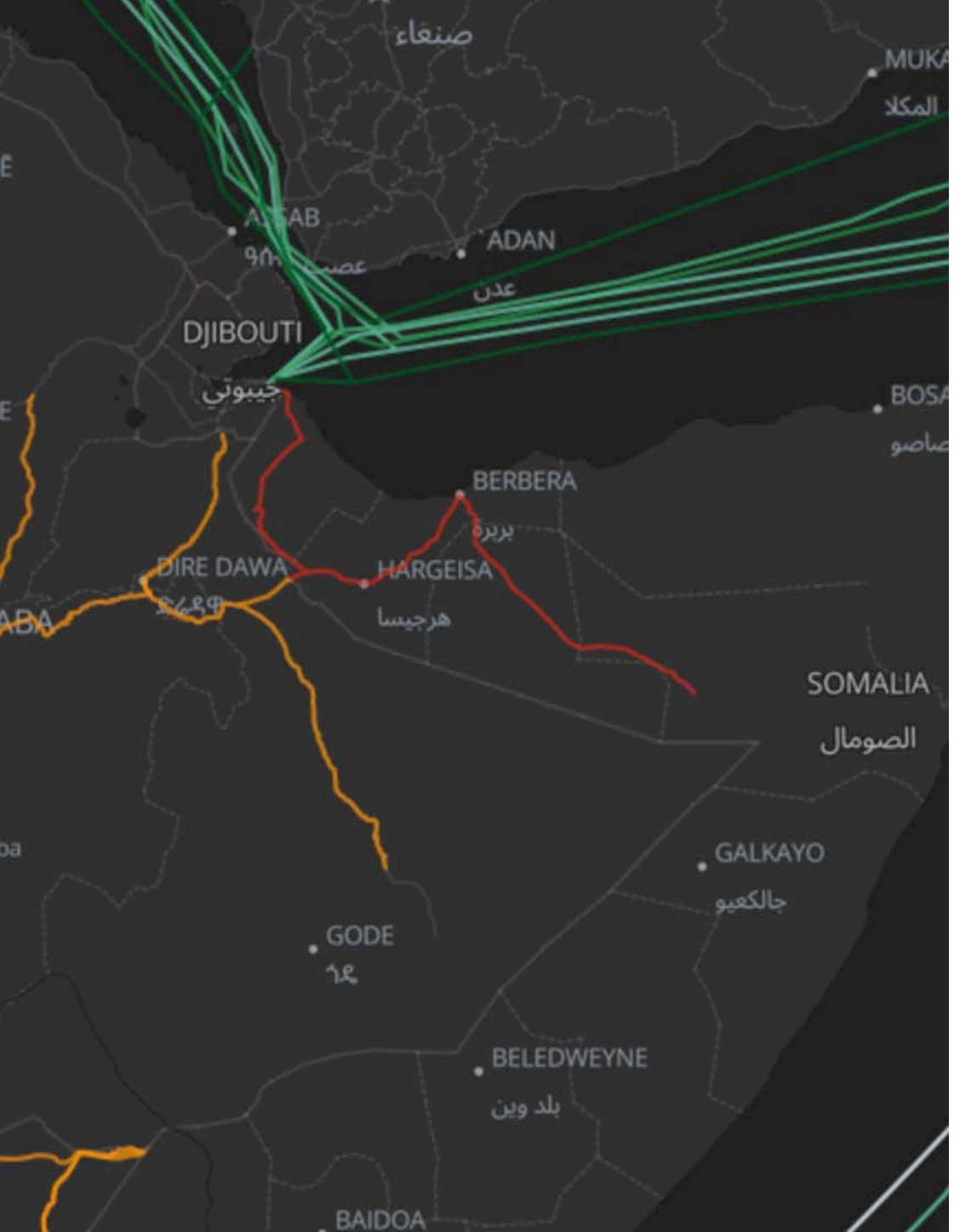
Multiple confounding variables and complex interactions doesn't always make it easy to understand the relation between variables.

These relations are mediated by the characteristics of a particular location, and the characteristics of those locations around it.

We can use GWR to know where are variable more strongly correlated with others, thus informing policy-making.



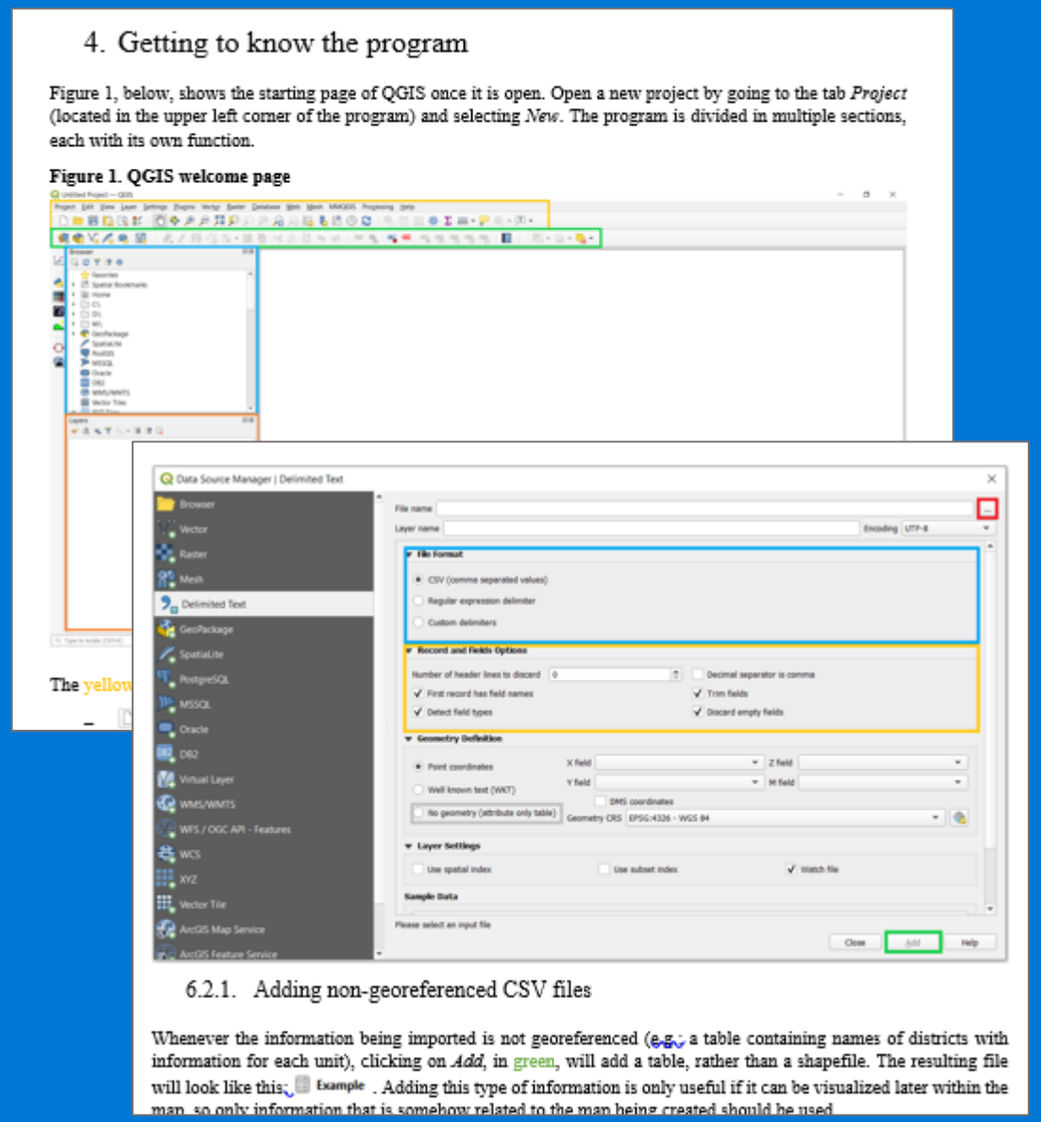




Background papers

Ethics and the use of geospatial information for educational planning.

Mapping **existing radio, TV, cellular and internet networks** to asses potential connectivity of the education system to alternative delivery modes.



4. Getting to know the program

Figure 1, below, shows the starting page of QGIS once it is open. Open a new project by going to the tab *Project* (located in the upper left corner of the program) and selecting *New*. The program is divided in multiple sections, each with its own function.

Figure 1. QGIS welcome page

6.2.1. Adding non-georeferenced CSV files

Whenever the information being imported is not georeferenced (e.g. a table containing names of districts with information for each unit), clicking on *Add*, in green, will add a table, rather than a shapefile. The resulting file will look like this: Example . Adding this type of information is only useful if it can be visualized later within the map, so only information that is somehow related to the map being created should be used

Our training offer

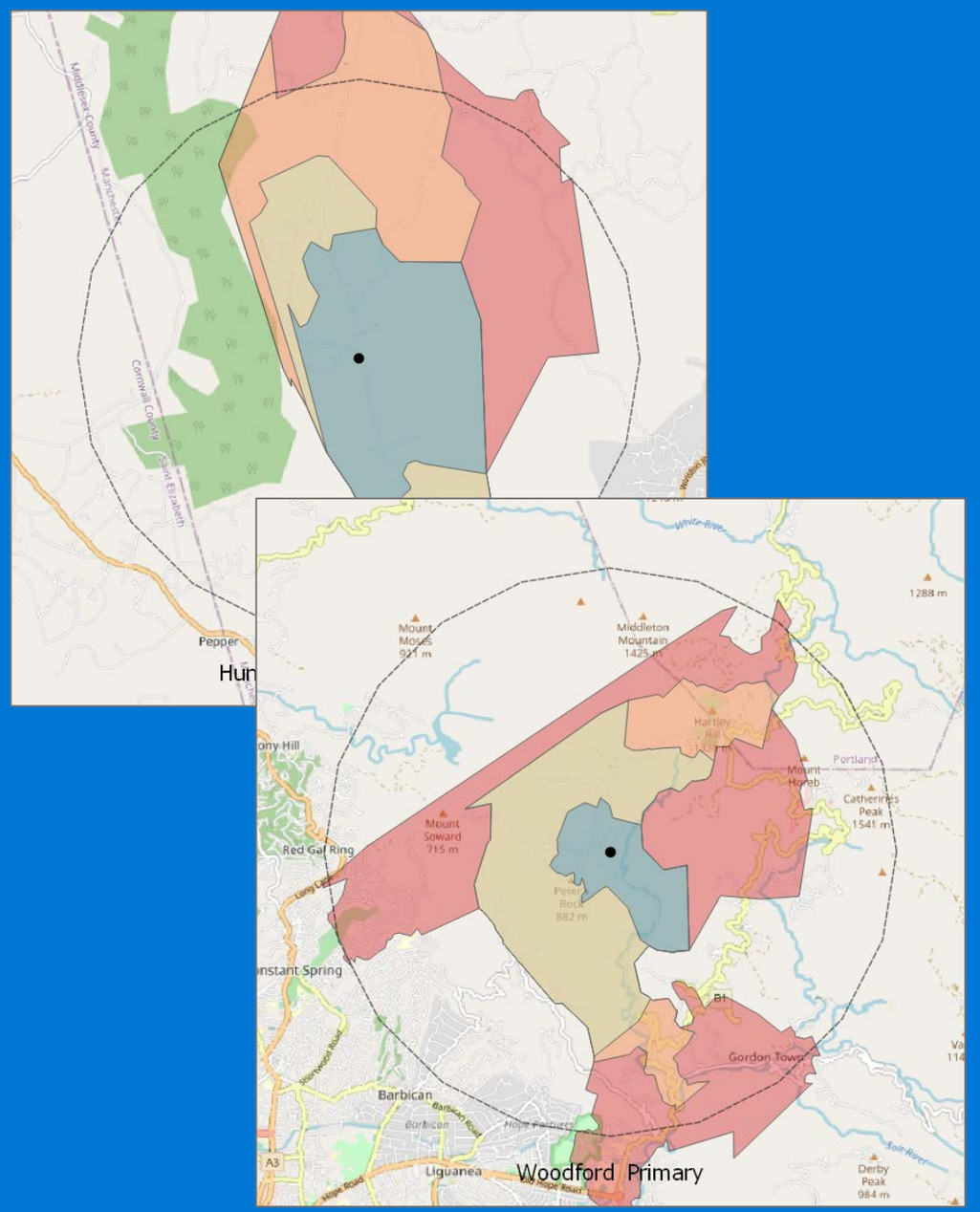
Self-paced QGIS training manual, with follow-along examples using openly available data.

A QGIS module embedded in the IIEP specialized course on school mapping and micro-planning

Customized training, i.e. a learning cycle that would focus on using geospatial data to assess equity of access to education.

Deeper dive on 3 of our favourite tools

1. Isochrones for catchment areas
2. Suitability and risk analysis for educational facilities
3. Rethinking inspection circuits



Isochrones for catchment areas: how far children live from school?

Children and youth that need to walk 30, 60, or 120 minutes to school have very different learning experiences.

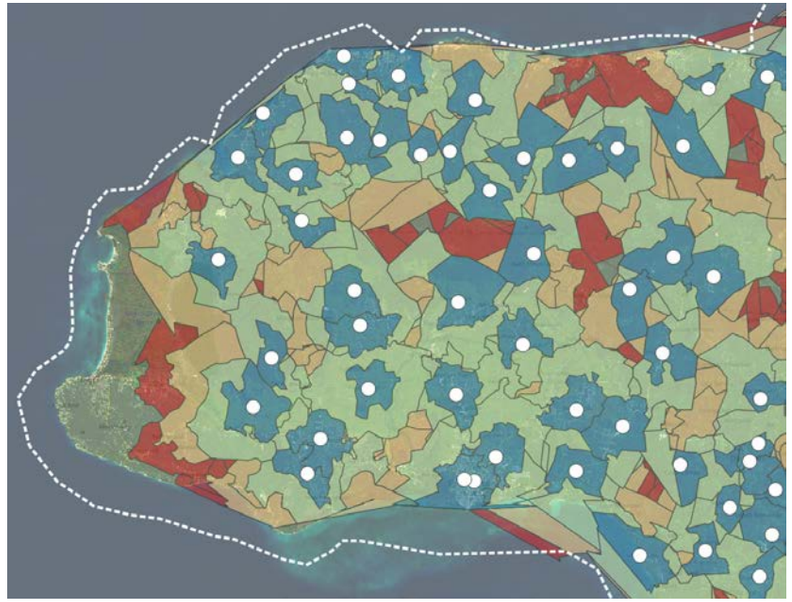
This methodology can estimate the time learners take to walk to school every day. Implications for school location, transportation, teaching and non-teaching staff deployment and incentives.

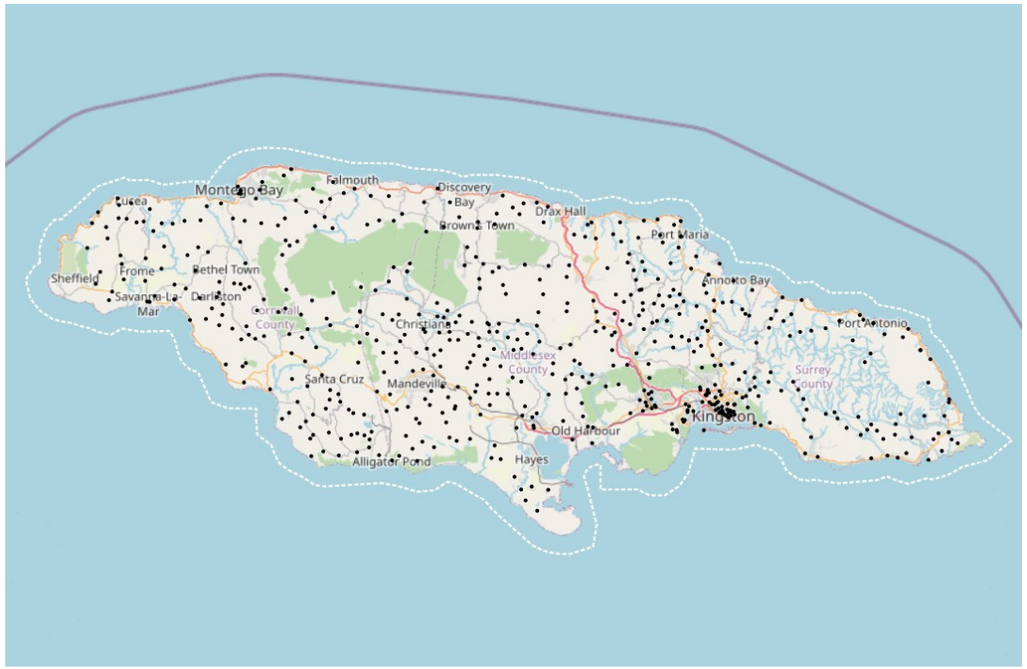
Isochrones for catchment areas: how far children live from school?

Several open-source tools exist that can be used to create isochrones.

Two main data components: school locations and vector road network (OpenStreetMap). Better the data quality, better the results.

GraphHopper was used to create the isochrones and further analysis (share of school aged population covered) was done in QGIS.

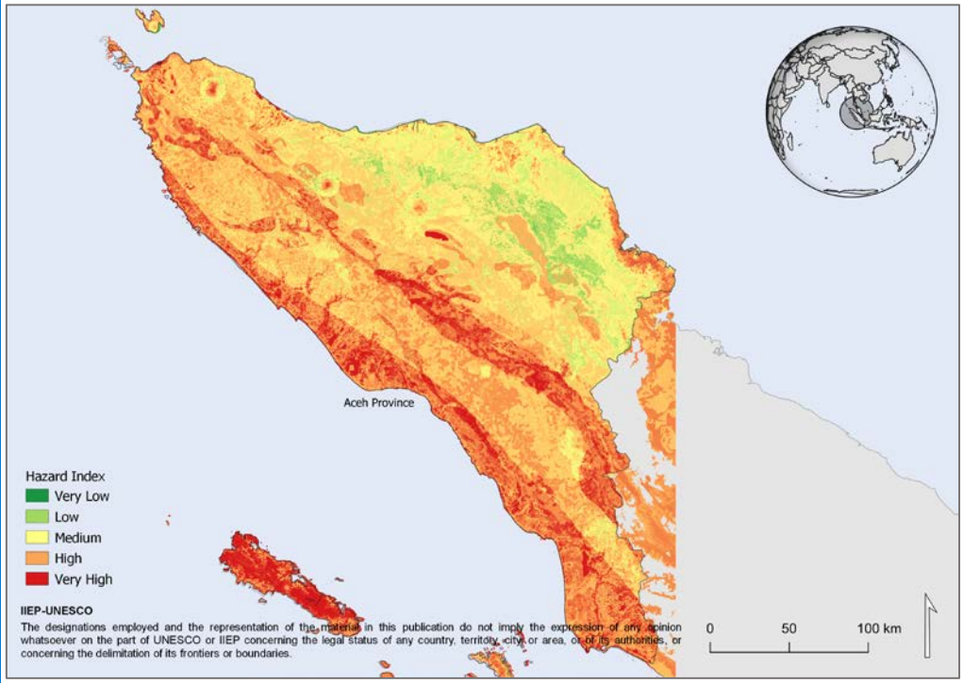




Geospatial risk assessment for existing educational facilities

Using national or free open source data allows for mapping different natural hazards and potential risks on the education system.

The first step what we are looking into for this project is the exposure of existing schools to different risks and in this case study natural hazard risks.



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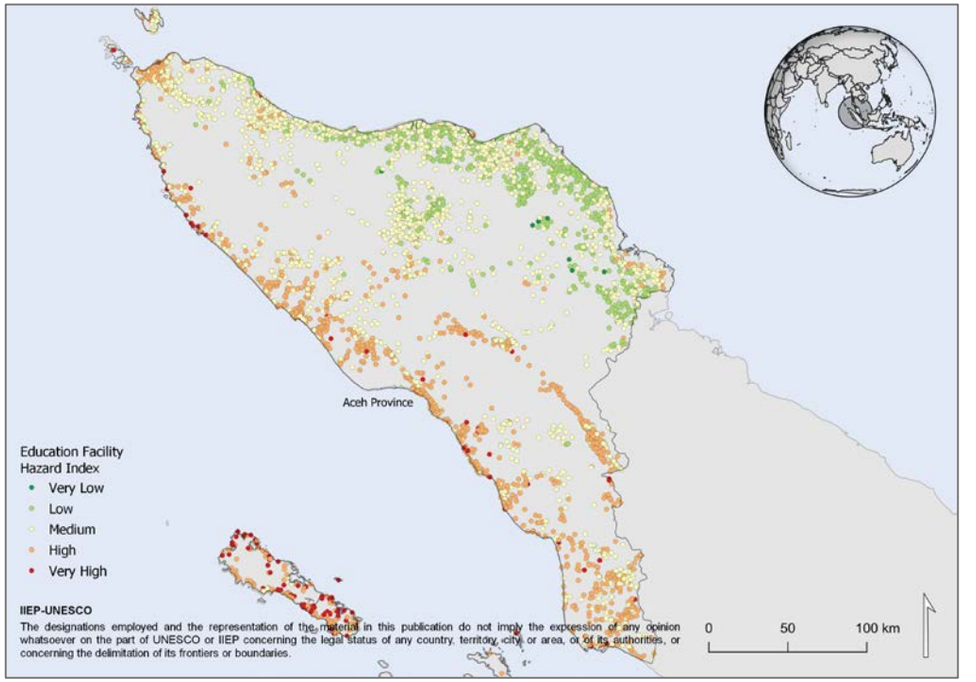
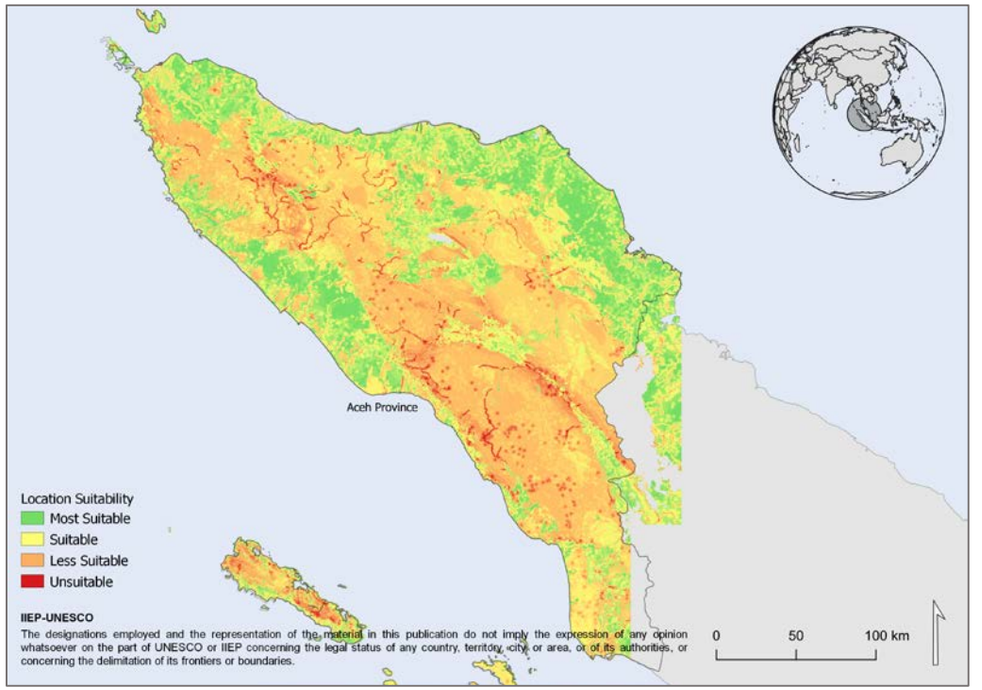


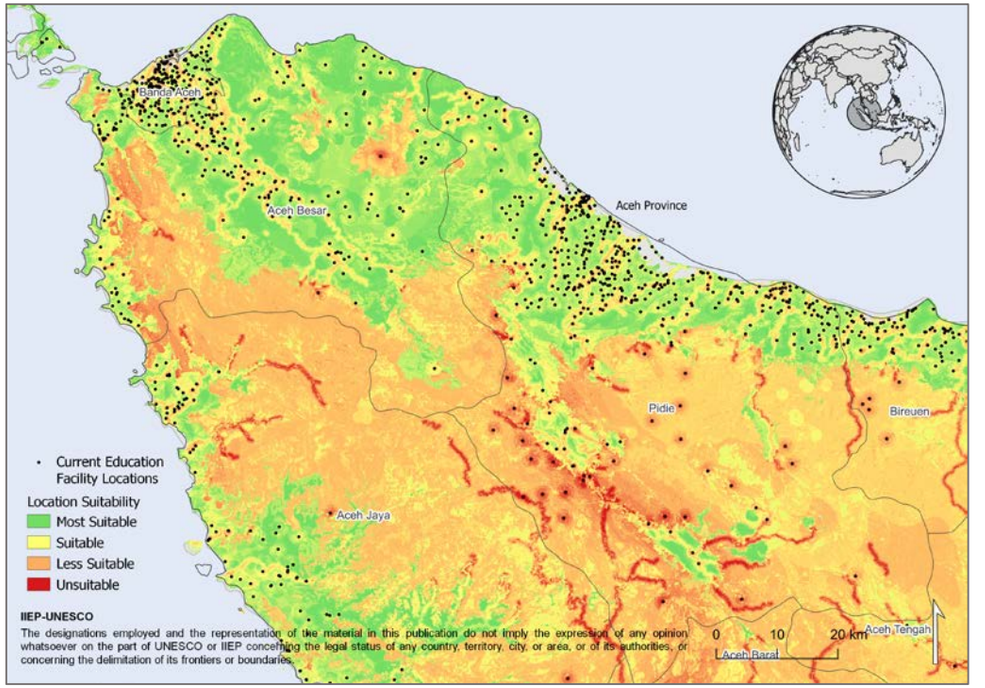
Multi-criteria decision analysis tool for suitability of land – for existing and future schools

The model is created using a suitability criteria analysis. Criteria within different categories are chosen to base the site suitability and are given a suitability score (between 1 – 4).

By undertaking a suitability analysis it allows for weighting of criteria and customization depending on the context.

The output is a suitability map which displays locations more or less suitable for building or relocating education facilities.

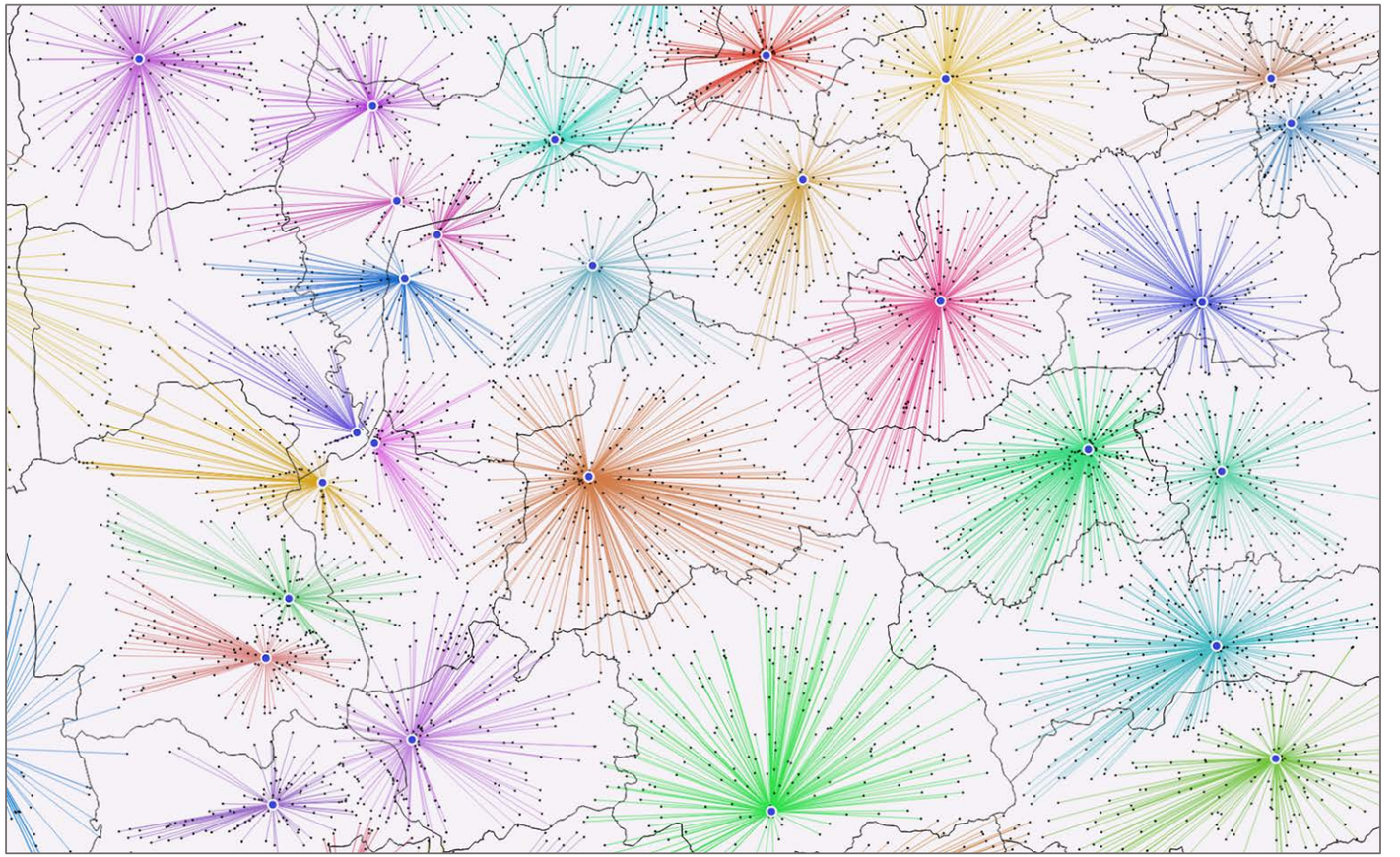




Optimizing inspection routes

In inspection-related literature, resources and access to schools are always mentioned as reasons for not being able to visit each and every school at the expected frequency.

What if we could design inspection systems from scratch, using geospatial data to draw the most optimized inspection routes?



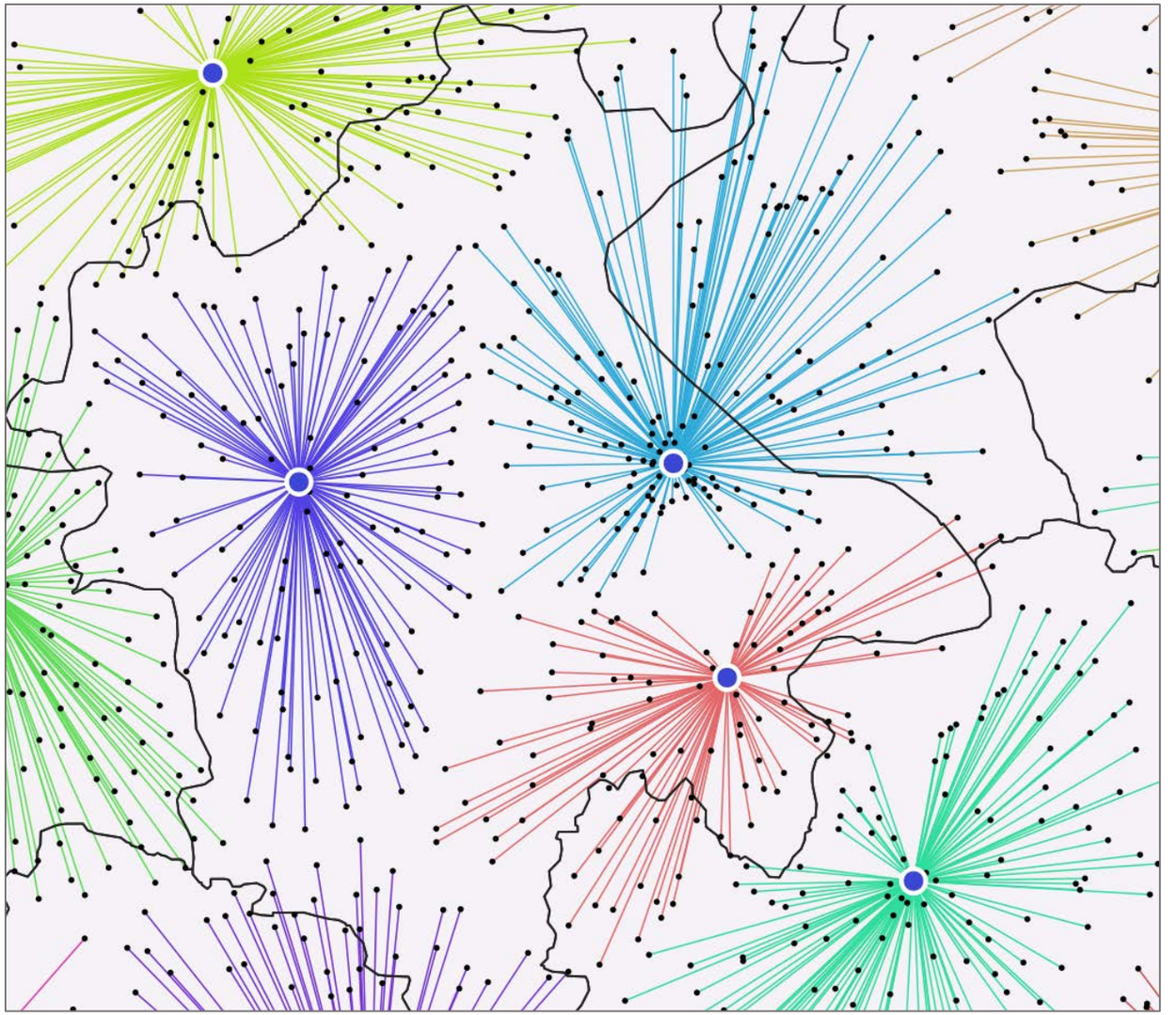
Optimizing inspection routes

Inspector route problem contains several geospatial problems:

- VRP (vehicle routing problem)
  - Fleet management approach
- Simple A to B routing
- Location allocation problem
- Minimum spanning tree analysis
- and some more!

Clustering schools and reallocating them between inspectors **can** bring a more optimized work process. When road network and multi-modal routing is added to the mix, the system can become very complex.

Different analysis methods were experimented mostly with QGIS.



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Which file(s) do you want to download?
Near Perfect Matches
1: Many Matches
No / Low Matches
Download file(s)
– OR –
Download all data in one file
Select province for detailed report
Filter by:
Student Gender
All
Female
Male
Standard of Living
Above Median
Below Median
Average outcome score: 73.04
Most Impactful Negative Factors
1. private school
2. student has repeated a year at some point
3. school director affiliated with mutual health
Most Impactful Positive Factors
1. community_infrastructure
drugs
ALL SECTIONS IN REPORT
sport
organization
litterature
science
illegal
exams
insight
date
Kilrush Youthreach Centre Adult Learning Centre
Cooraclare Road Kilrush Clare
09/06/2011 Clare | Whole School Evaluation Post Primary
An Roinn Oideachais agus Scileanna Department of Education and Skills
Coláiste Ailigh, Cnoc na Móna, Leitir Ceanainn,
Co. Donegal
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in answers to questionnaires they completed as part of the

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