Spatialized school-age populations estimates for planning educational resources

Amélie A. Gagnon

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International Institute for Educational Planning

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Amélie A. Gagnon
@AmelieAGagnon

Germán Vargas Mesa
@GermanV_IIEP

Carolina Albán Conto
@carolinaalbanc

Fernanda Luna
@fiuluna

Victor Zannou

Gildas Adjovi

Tuamanaia Foimapafisi

Yeonju An

“ Planning educational services requires spatialised population estimates at the micro-level, by single years of age

Why?

- Education statistics are calculated on specific ages and groups

- School district boundaries are often different than administrative subdivisions

Up to now, data were:

- Either available by single years of age at an aggregated geographic level

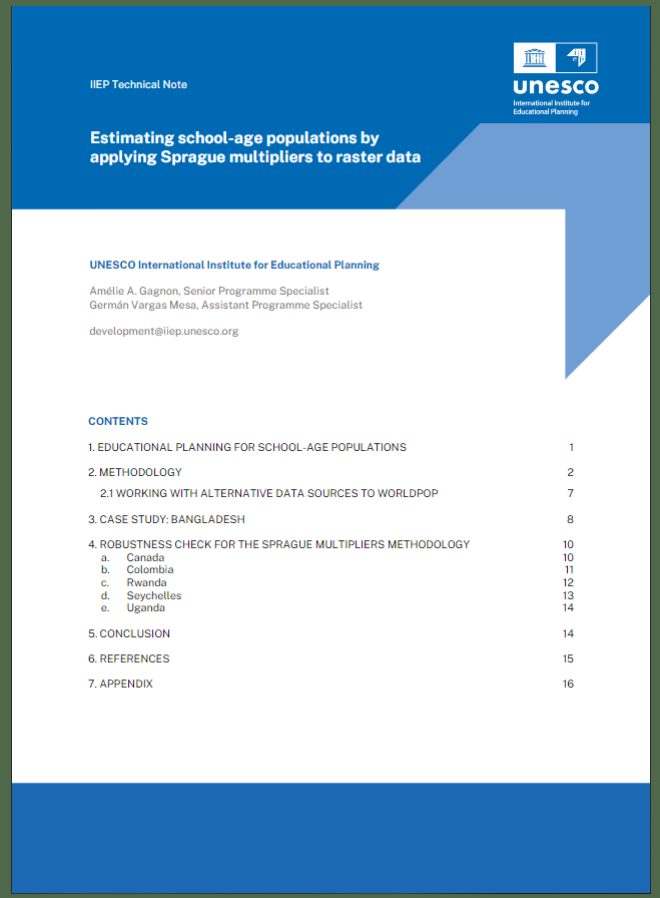
- Or spatialized at 100sq meter but in 5-year intervals

Estimating school-age populations by applying Sprague multipliers to raster data

Full paper:
https://at.iiep.unesco.org/SSAP

Plugin:
Sprague for school age populations

github.com/iiepdev
/Spatialized-school-age-populations



IIEP Technical Note

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Estimating school-age populations by applying Sprague multipliers to raster data

UNESCO International Institute for Educational Planning

Amélie A. Gagnon, Senior Programme Specialist
Germán Vargas Mesa, Assistant Programme Specialist

development@iiep.unesco.org

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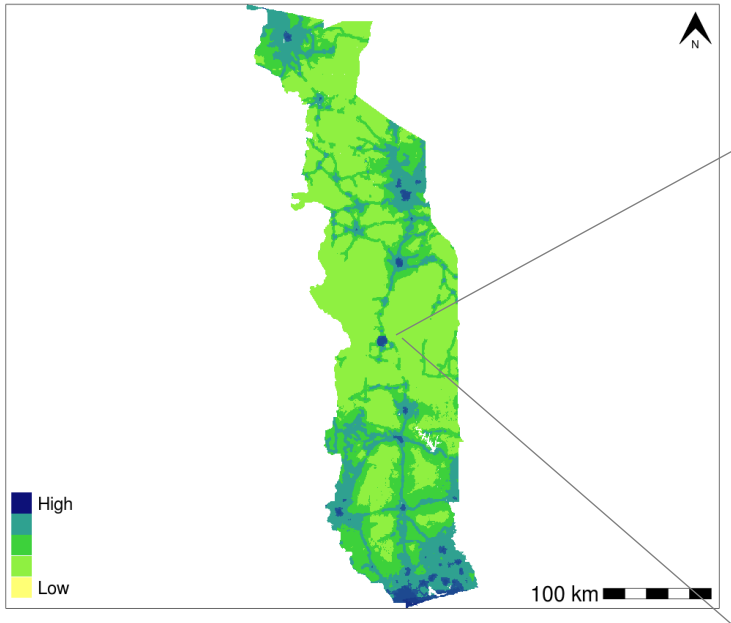
Togo 100m Age structures

Estimated total number of people per grid-cell at a resolution of (3 arc seconds approximately 100m at the equator)



WorldPop (www.worldpop.org – School of Geography and Environmental Science, University of Southampton; Department of Geography and Geosciences, University of Louisville; Département de Géographie, Université de Namur) and Center for International Earth Science Information Network (CIESIN), Columbia University (2018). Global High Resolution Population Denominators Project – Funded by the Bill and Melinda Gates Foundation (OPP1134076). https://dx.doi.org/10.5258/SOTON/WP00646

United Nations | Second Administrative Level Boundaries
Geospatial Information Section & Statistics Division

80 +
...
35-39
30-34
25-29
20-24
15-19
10-14
05-09
00-04

Explanation ov a New Formula for Interpolation. By T. B. Sprague, M.A., *Manager ov the Scottish Equitable Life Assurance Society.*

When a series ov quantitys proceed by a regular law, ther is no difficulty in interpolating between each ajacent two ov them any number ov terms with any desired degree ov accuracy. The methods to be adopted for this purpos hav been described in varios original and reprinted papers containd in the *Jurnl ov the Institute ov Actuarys*: (see, for instance, Mr. Woolhouse's paper *On Interpolation, Summation, etc.*, xi, 61, 301, and xii, 136; Mr. Gray's paper *On the Construction ov Tabls by the Method ov Differences*, xiii, 61, 149, 293, and xiv, 307; and the translations ov M. Maurice's Essay on Interpolation, xiv, 1; and ov Briggs's explanation ov his Method ov Quintisection, xiv, 73). We somtimes, however, hav to interpolate between quantitys which do not accuratly follo any law. For instance, we may hav calculated premiums for every quinquennial age, and wish to obtain the premiums for the intermediat ages by interpolation. In this case, it wil somtimes happen that the ordinary formulas ov interpolation do not giv satisfactory results, unles we take a very large number ov differences, and then the amount ov labor is offen more than the result is worth. In my paper *On the Value ov Anuitys payabl half-yearly, quarterly, etc.*, I indicated briefly a method ov interpolation which I tho't miht

39 38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0

24 23 21 20 19 — **Tertiary** 19-24 yo

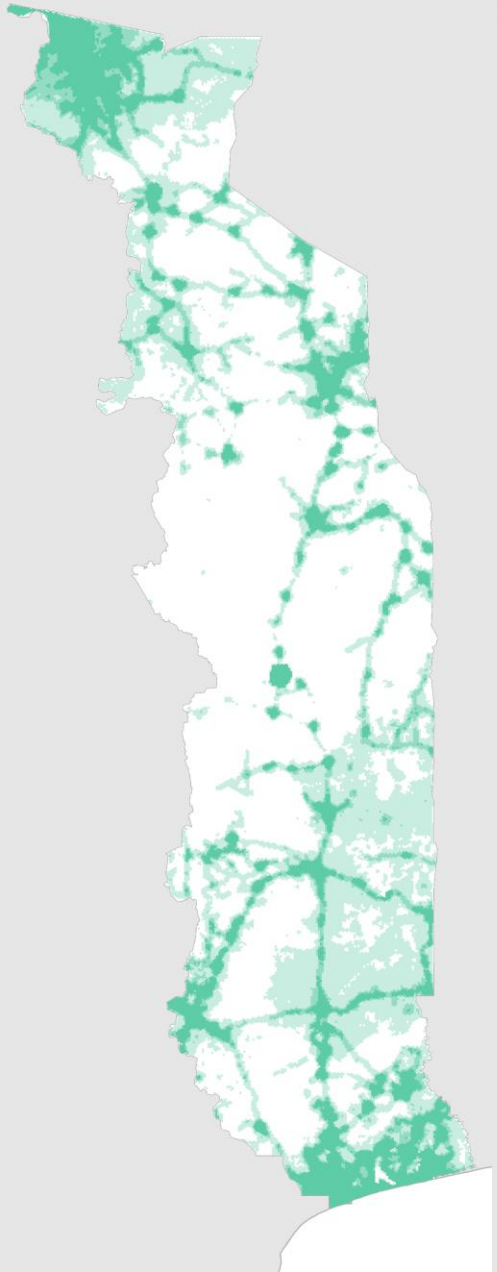
18 17 16 — **Upper Secondary** 16-18 yo

15 14 13 12 — **Lower Secondary** 12-15 yo

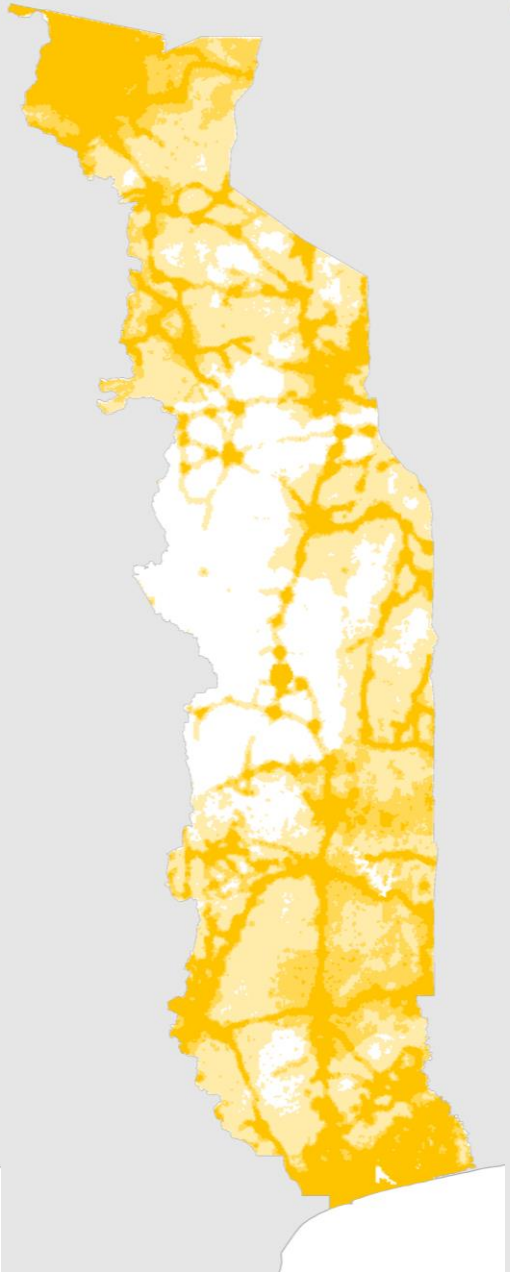
11 10 9 8 7 6 — **Primary** 6-11 yo

5 4 3 — **Preprimary** 4-5 yo

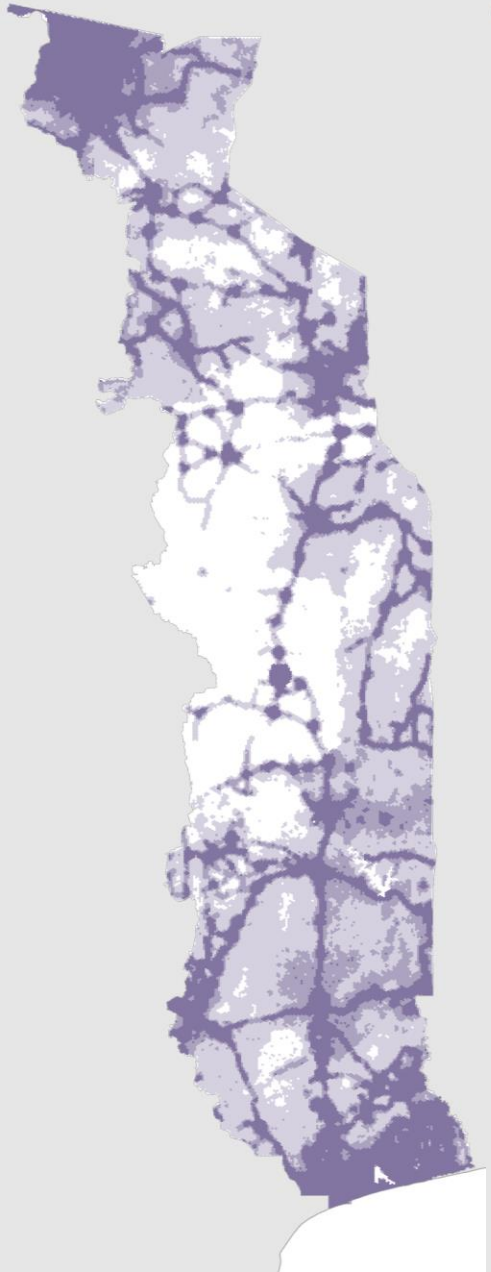
Preprimary
school-age population



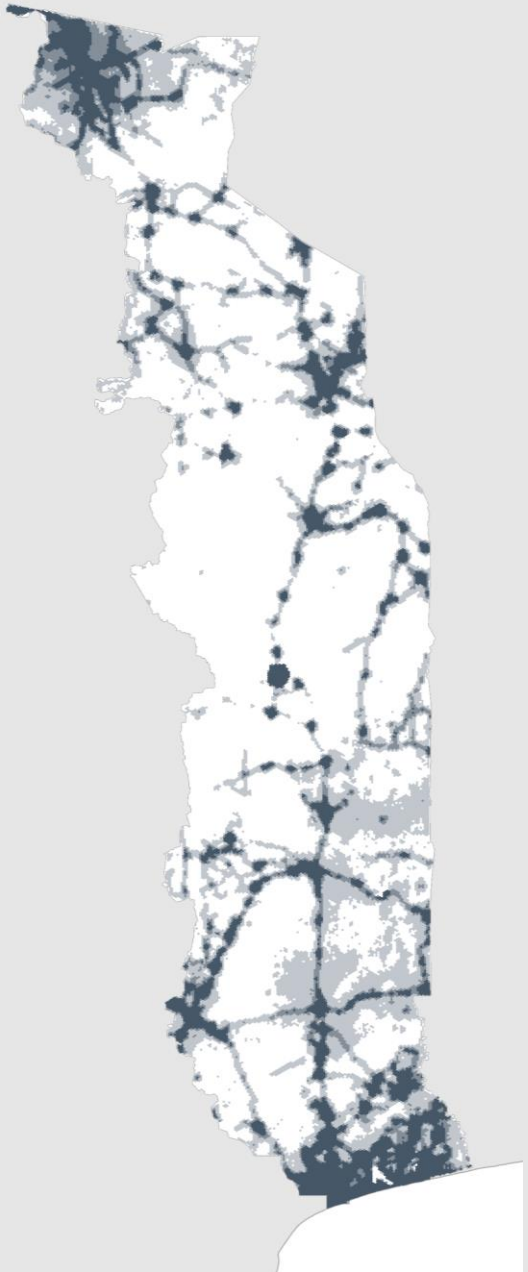
Primary
school-age population



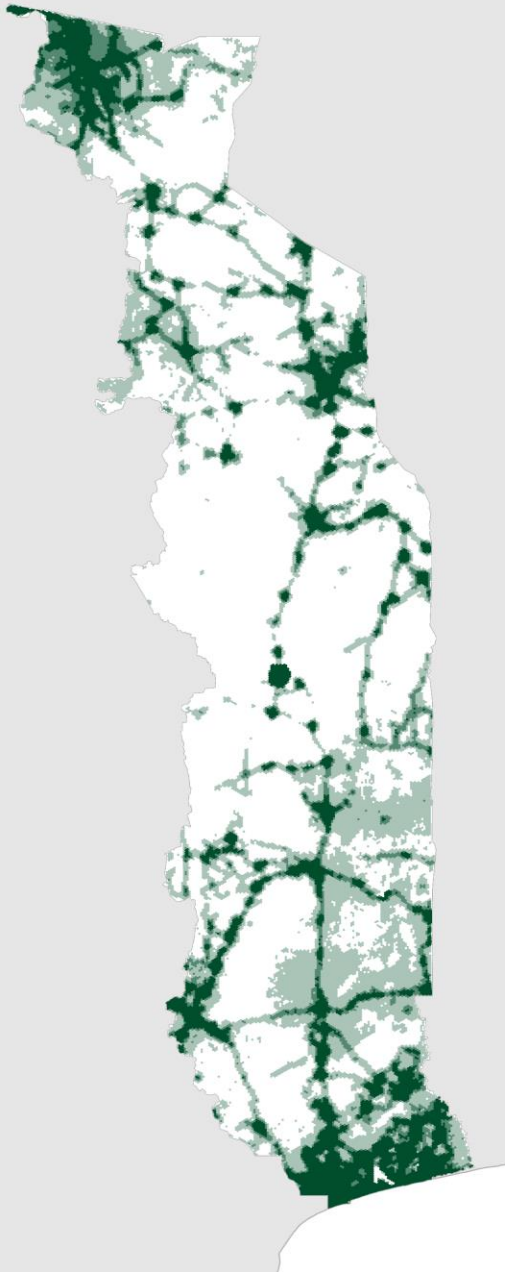
Lower-secondary
school-age population



Upper-secondary
school-age population



Tertiary
school-age population



Isochrone-based catchment areas for educational planning

Full paper, with GISPO:
https://at.iiep.unesco.org/travel-time

Plugin manager:
Catchment

github.com/iiepdev
/school-catchment-plugin

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Isochrone-based catchment areas for educational planning

UNESCO International Institute for Educational Planning

Amélie A. Gagnon, Senior Programme Specialist
Germán Vargas Mesa, Assistant Programme Specialist

development@iiep.unesco.org

GISPO Finland Ltd.

Riku Oja
Santtu Pyykkönen
Topi Tjukanov

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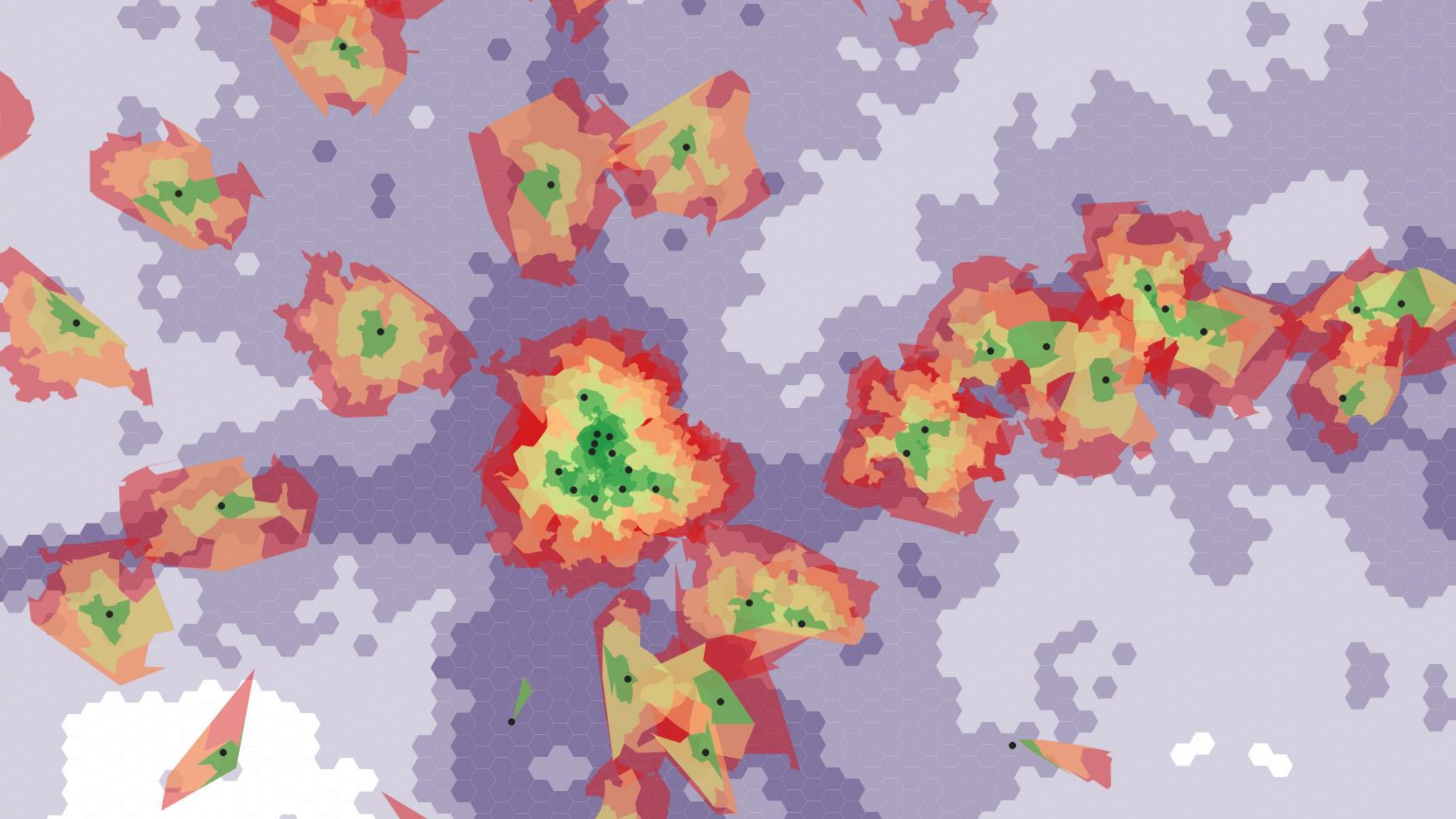


School-age populations exposed to natural hazards: An approach to triangulate internally displaced population estimates

Full paper:
https://at.iiep.unesco.org/2022-GRIDbg

School-age populations exposed to natural hazards

An approach to triangulate internally displaced population estimates[1]

Amélie A. Gagnon
Germán Vargas Mesa
UNESCO International Institute for Educational Planning
development@iiep.unesco.org

Summary

Estimating the school-age population to be serviced by national education systems is the cornerstone of any educational planning process. Nonetheless, this is also one of the trickiest exercises, as population estimates by relevant age and sex breakdowns are not necessarily disseminated by the national statistical offices as often and granularly as they would be needed by the ministry of education, and other stakeholders. In disaster-prone areas, locating school-age populations exposed to natural hazards means that educational and emergency services can be deployed in the most efficient manner to reach them, and helps anticipate displacement.

The approach proposed here aims at combining spatialized school-age population estimates with data derived from satellite imagery (or with indices created from earth science data, earth observation, climate, etc.) produced during or right after a natural event, to estimate age and sex-disaggregated displacement exposure.

This background paper is prepared in the context of the 2022 IDMC GRID report, and the methodology presented should be of interest to all planners and managers in ministries of education, humanitarian organizations, and development partners, and anyone eager to better identify the school-age populations exposed to natural hazards, and better plan responses for potentially displaced students. Finally, the methodology presented here can be used to triangulate the estimates produced by other methodologies with regards to educational provision, especially those produced by direct observation or key informants.

Introduction

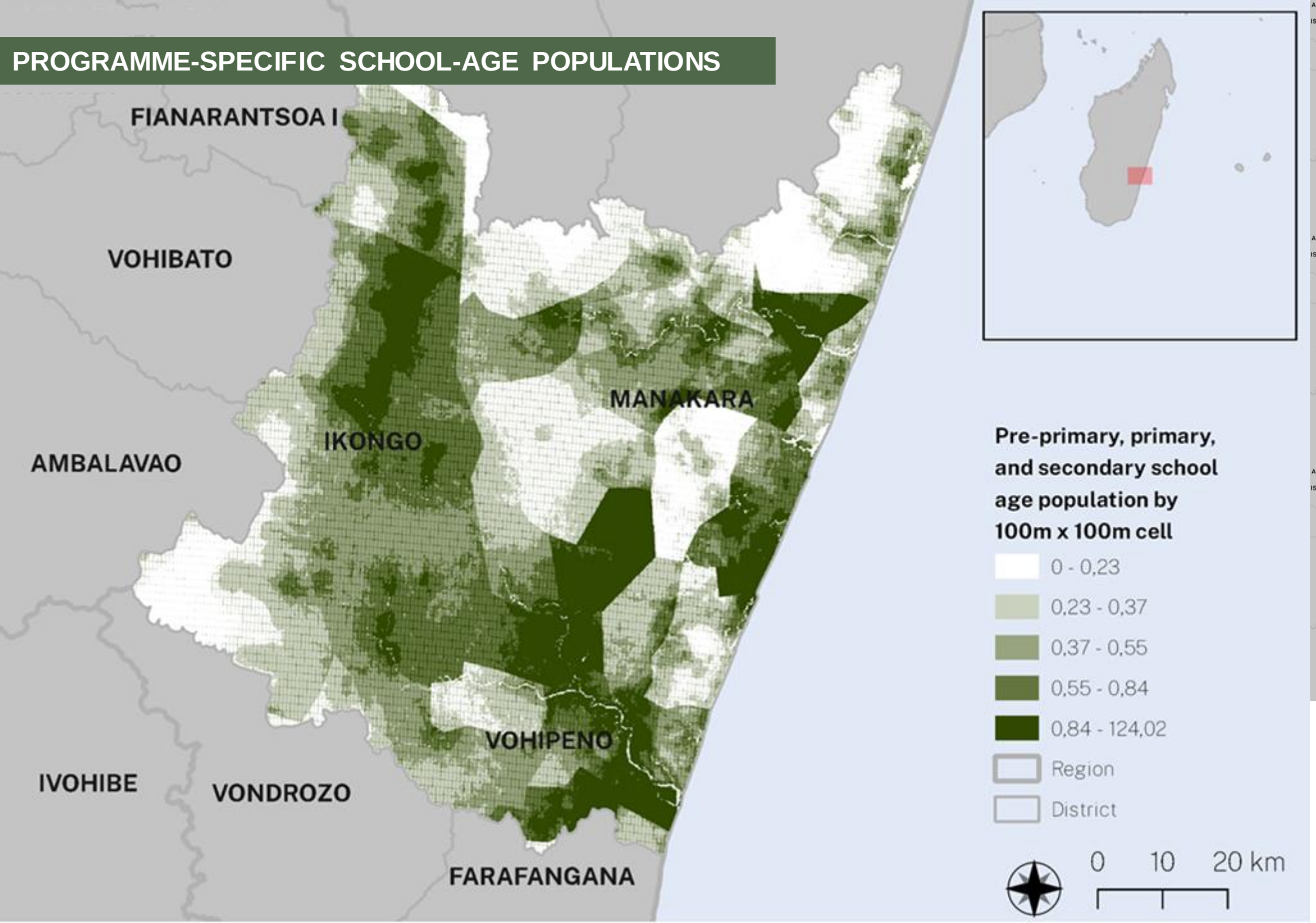
In October 2021, IIEP published a methodology to produce school-age population estimates for any territory or area, any educational level, and for any year since year 2000 (Gagnon and Vargas Mesa, 2021). This contribution is crucial in educational planning because it is the first global and standardized tool that combines existing open source data and open access statistical literature to resolve the typical unavailability of population estimates by single years of age at the super local level[2], thus allowing the reconstruction of any school-age group that match any geographic area, administrative or not. Therefore, educational planners or managers can now calculate sub-national education indicators based on population data, such as enrolment rates, as long as enrolment data is available at the same scale (e.g. province, district, catchment area, etc.).

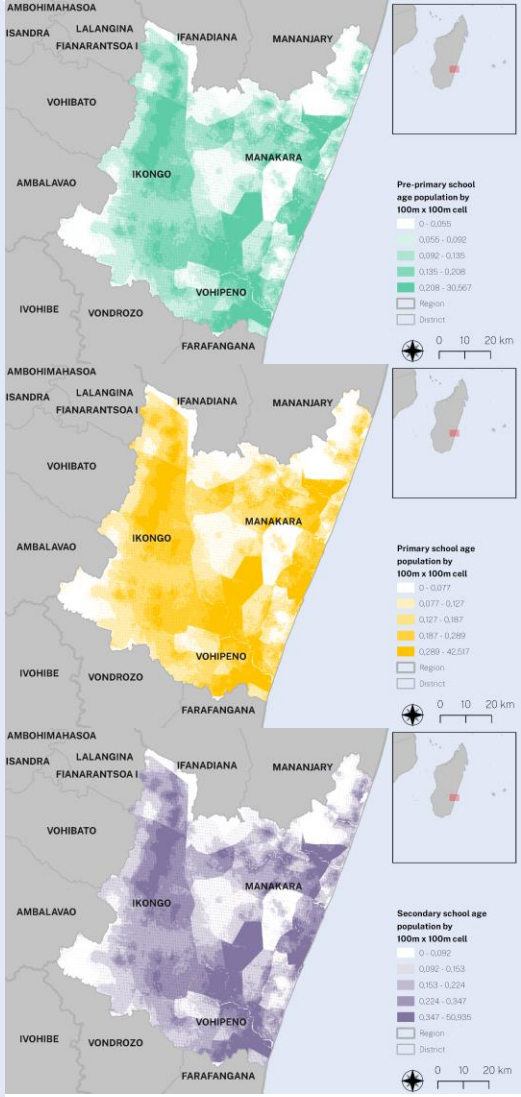
The current paper proposes an application of the original method to disaster settings, where analysts and responders need to estimate the volume of the school-age population exposed to natural hazards. The application proposed here is innovative because it is based on school-age population estimates generated prior to the occurrence of natural events (with full age and sex structures), and combined with the geospatial detection of natural hazards produced during a natural event (such as floods, droughts, lava flows, snow avalanches, etc.).

Several organizations have developed methods to estimate the number of displaced people, internal or refugees. These methods have several elements in common, the most important being temporality. All methods that we could survey produce population estimates *after* a crisis happens, which means that populations are already on the move at the time they are measured, rather than in their original place of residence.

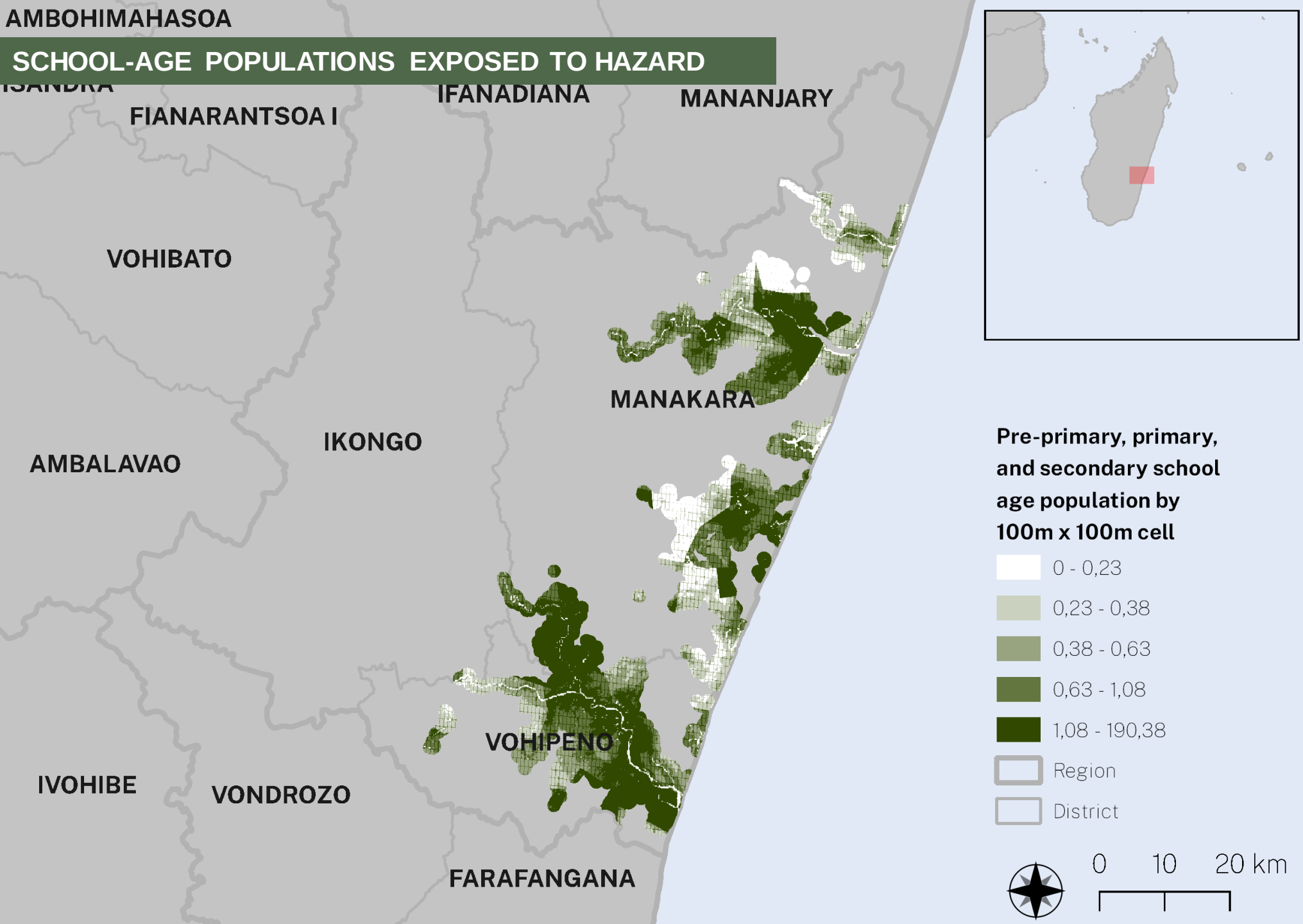
[1] The designations employed and the presentation of the materials in this paper and related repositories do not imply the expression of any opinion whatsoever from the UN, UNOSAT, UNESCO, or IIEP-UNESCO concerning the legal status of any country, territory, city, area, authorities, concerning the delimitation of frontiers or boundaries.
Authors would like to thank colleagues Ozge M. Ozcan, Blandine Ledoux, Leonora MacEwan, Jean Claude Ndabananiye, Sebastien Hine for their review and constructive feedback.
[2] The estimations can be produced for grids as small as 3 arcseconds, approximately 100 square meters at the equator. Authors recommend to use school-age population estimates at 1 sq. kilometre for large areas, and 100 sq. meter for smaller areas.

PROGRAMME-SPECIFIC SCHOOL-AGE POPULATIONS





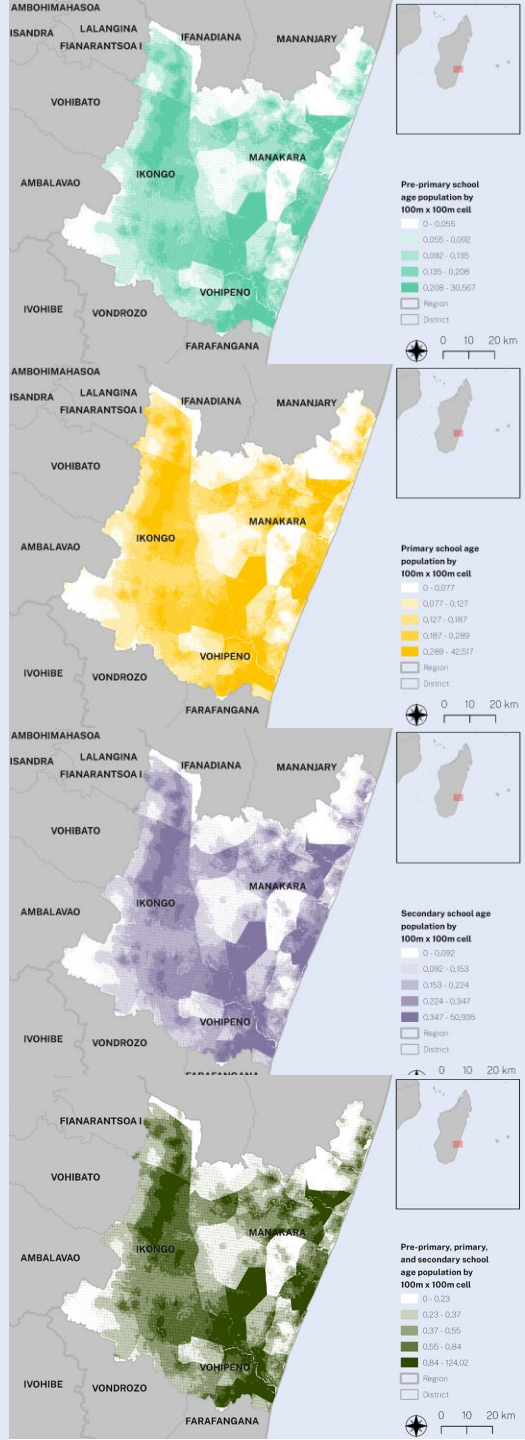
SCHOOL-AGE POPULATIONS EXPOSED TO HAZARD



Pre-primary, primary, and secondary school age population by 100m x 100m cell

- 0 - 0,23
- 0,23 - 0,38
- 0,38 - 0,63
- 0,63 - 1,08
- 1,08 - 190,38
- Region
- District

0 10 20 km



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International Institute for Educational Planning
@IIEP_UNESCO

Amélie A. Gagnon
Senior Programme Specialist (Development)
a.gagnon@iiep.unesco.org
@AmelieAGagnon

unesco

International Institute for Educational Planning

IIEP
7-9, rue Eugène Delacroix
75116 Paris, France
Tel: +33 (0) 1 45 03 77 00

http://www.iiep.unesco.org