FIG WORKING WEEK 2025
AND Locate25 THE NATIONAL GEOSPATIAL CONFERENCE
Collaboration, Innovation and Resilience: Championing a Digital Generation
FIG Geospatial Council of Australia
Brisbane, Australia 6–10 April

STAR RATING FOR SCHOOLS

Big Data Screening and Feature Extraction

AI&Me: Using big data, imagery and AI to drive change and create safer environments for children around schools in Vietnam.

ANDITI

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SUSTAINABLE DEVELOPMENT GOALS

- Approximately 20 people will die on the world's roads during this presentation
- By the end of the day, 30-35 people will be killed in traffic accidents in Vietnam alone
- 5 of those will be aged 6 – 18 years old
- Traffic accidents are the leading cause of death in this age group

The Proposal

- iRAP has partnered with AIPF, Anditi and Zagreb University to address this issue
- The project has received funding of 2 million USD via Google.org
- The purpose is to create a digital tool to harness the power of Big Data and AI, providing government with country wide evaluations of road infrastructure
- Ultimately, the project works towards providing all school children a 3 star or safer journey to school

School Star Rating

A metric for pedestrian safety within school zones globally.

The ultimate goal is to provide local authorities with actionable insights that will enable them to implement effective measures to reduce fatalities and severe injuries on roads.

LEVEL 1
Identify
highest risk provinces

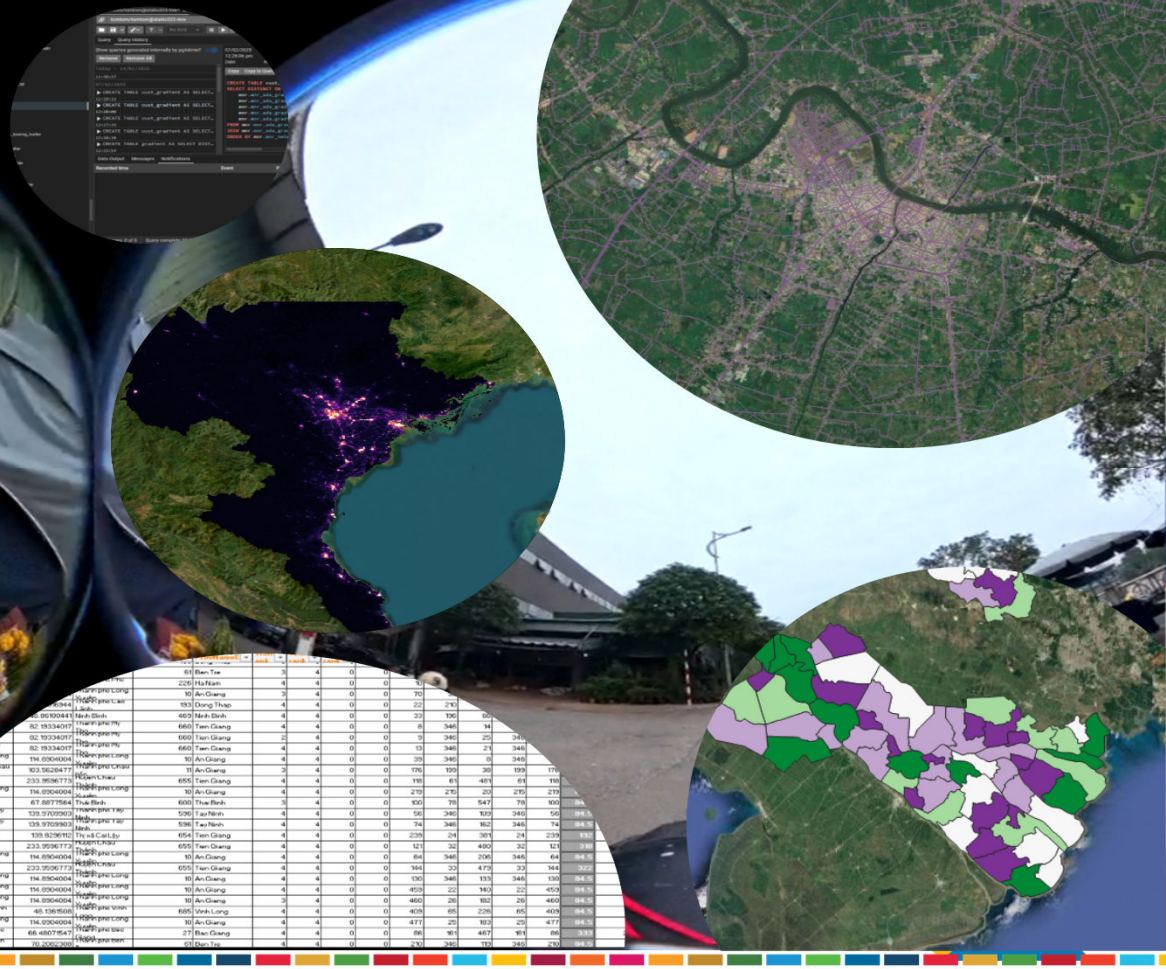
LEVEL 2
Identify
highest risk districts

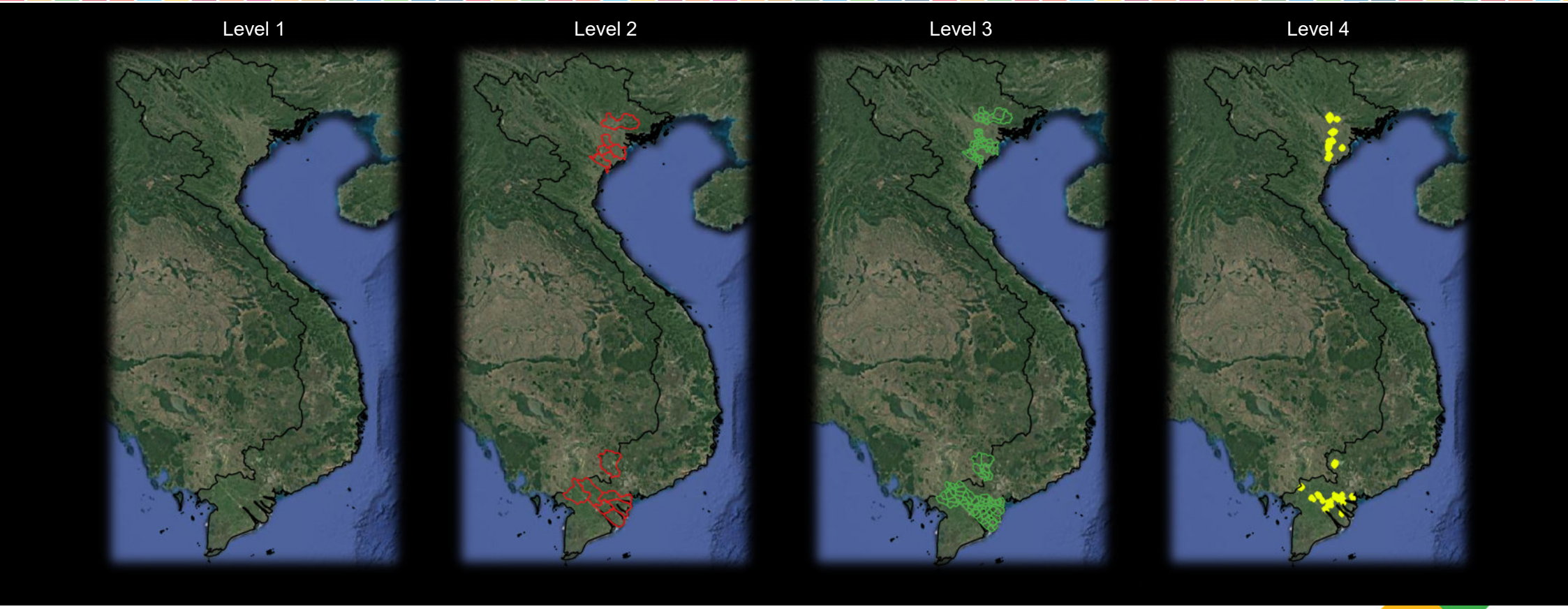
LEVEL 3
Identify
highest risk environments
around schools

LEVEL 4
Identification of most at
risk schools

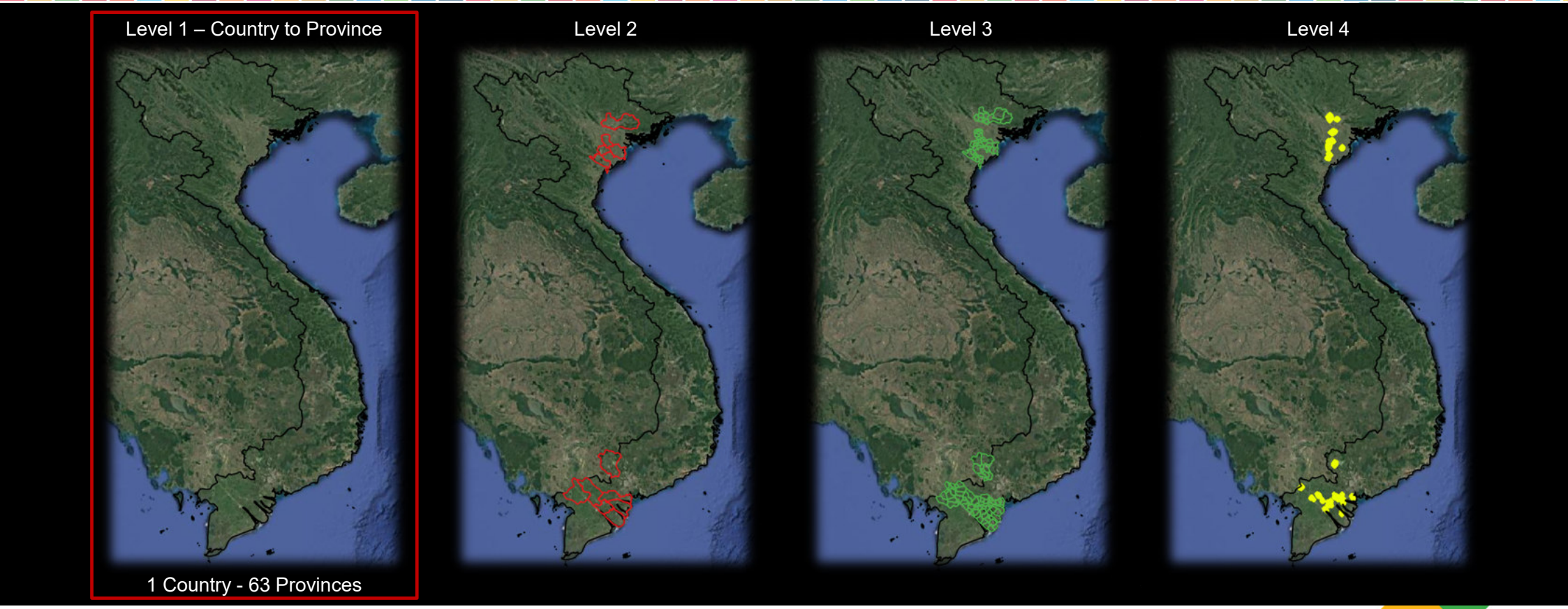
Data Types

- Census
- Official Government
- VIIRS Nighttime Lights
- ESA World Cover
- Open Street Map
- Satellite imagery (Sentinel, Landsat, Google)
- MN-R - POI, Roads, Address, Network, Route
- 360° Street view imagery
- Google building footprints
- Peer reviewed literature





2.9TB of Data


Level 1 – Country to Province
Level 2
Level 3
Level 4
1 Country - 63 Provinces

2.9TB of Data

Level 1 Analysis – At Risk Provinces

Area Type – Rural vs Urban

- Urban areas are more likely to see traffic incident

Income – High, Middle, Low

- Lower income brackets are more likely to feel larger impacts from these incidents

Urban Rapid Growth – Ranking fastest to slowest growing

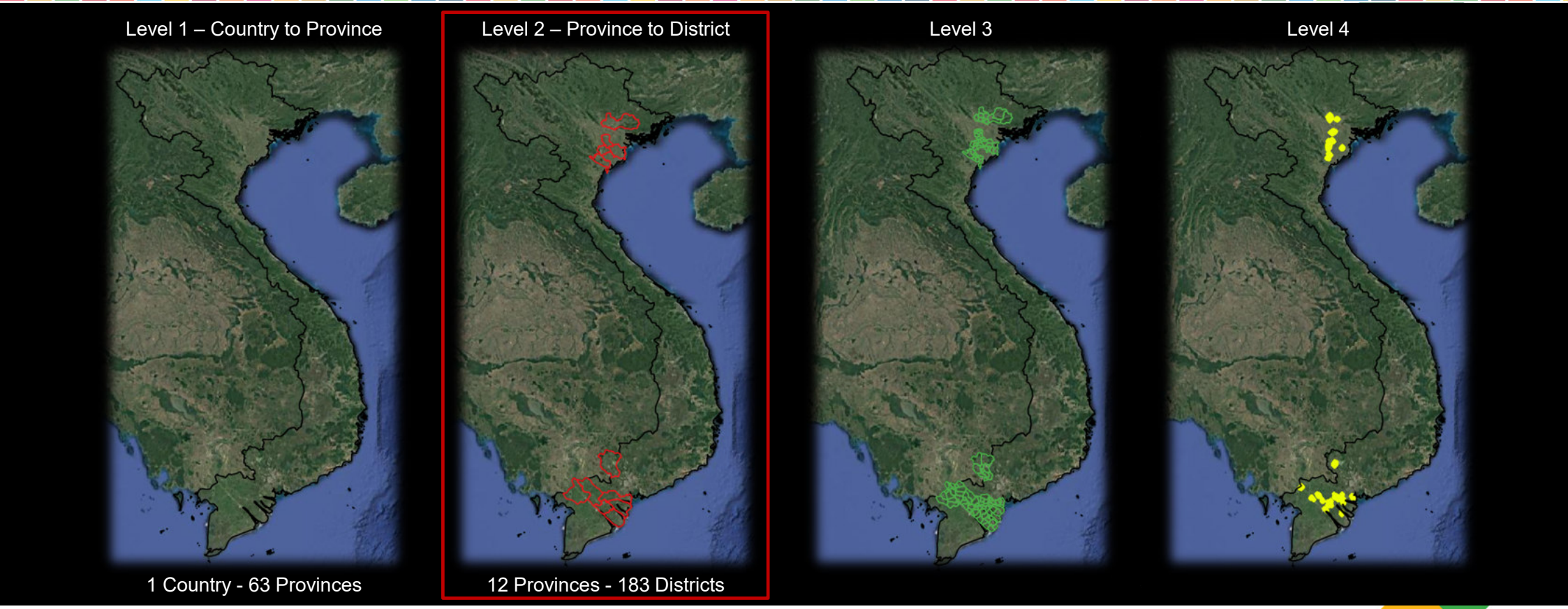
- Rapid growth can lead to insufficient infrastructure for pedestrian safety

Population Density – Ranking most to least dense ie. X people per km^2

- More people means higher risk of hitting someone

ESA World Cover
Census Data
VIIRS Nighttime Lights

2014 – 2022
A mask of rapid urban growth


Level 1 – Country to Province
Level 2 – Province to District
Level 3
Level 4
1 Country - 63 Provinces
12 Provinces - 183 Districts

2.9TB of Data

Level 2 Analysis – At Risk Districts

Population between 6-18 years old

- Where are the school children concentrated, these areas will have higher risk

Number of Pedestrian Casualties

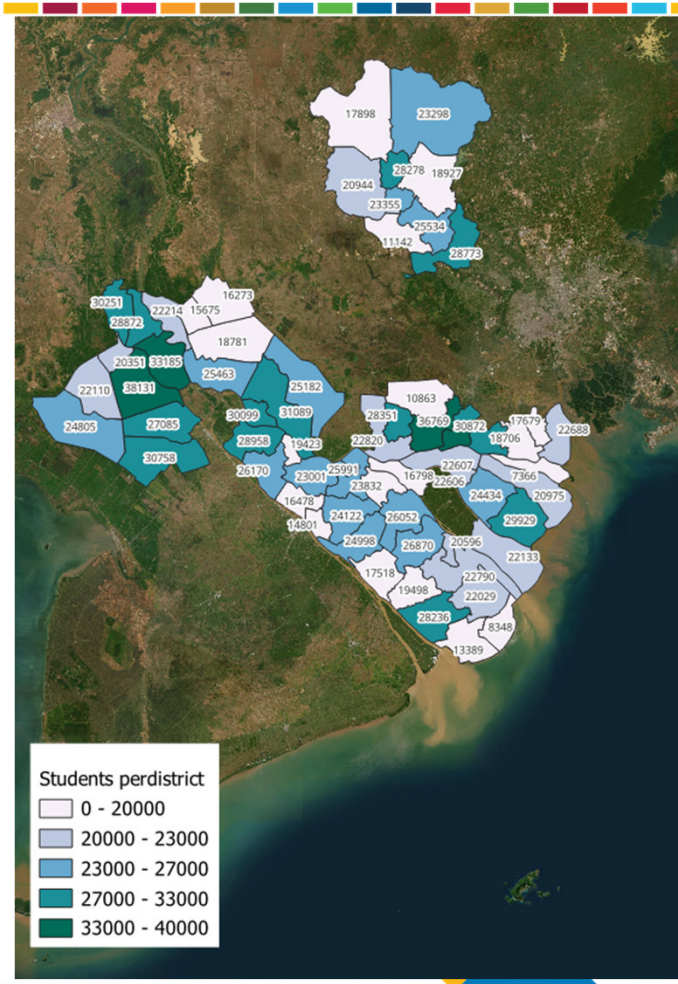
- Indicator of dangerous areas

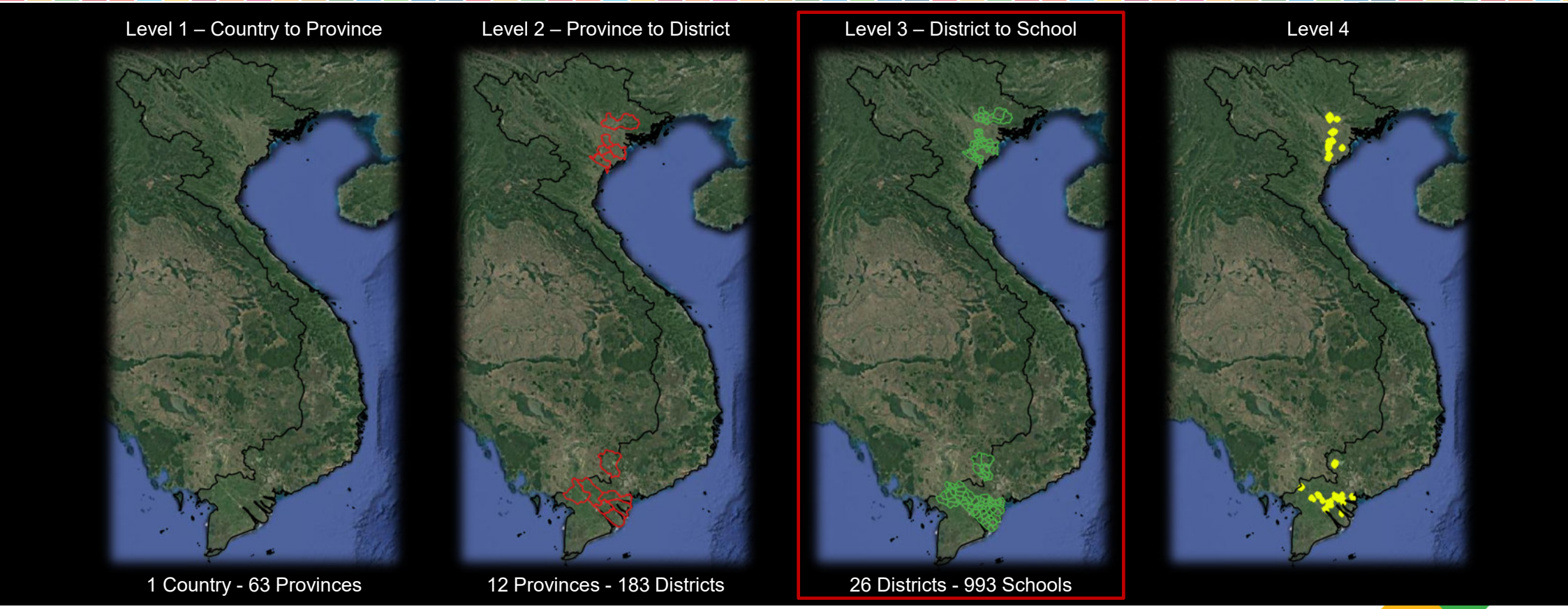
School Density

- More schools would indicate more chance of problem

Road Density

- As with schools more roads would also indicate more chance of a problem




Level 1 – Country to Province
Level 2 – Province to District
Level 3 – District to School
Level 4
1 Country - 63 Provinces
12 Provinces - 183 Districts
26 Districts - 993 Schools

2.9TB of Data

Where are they?

Number of Schools = >26 000

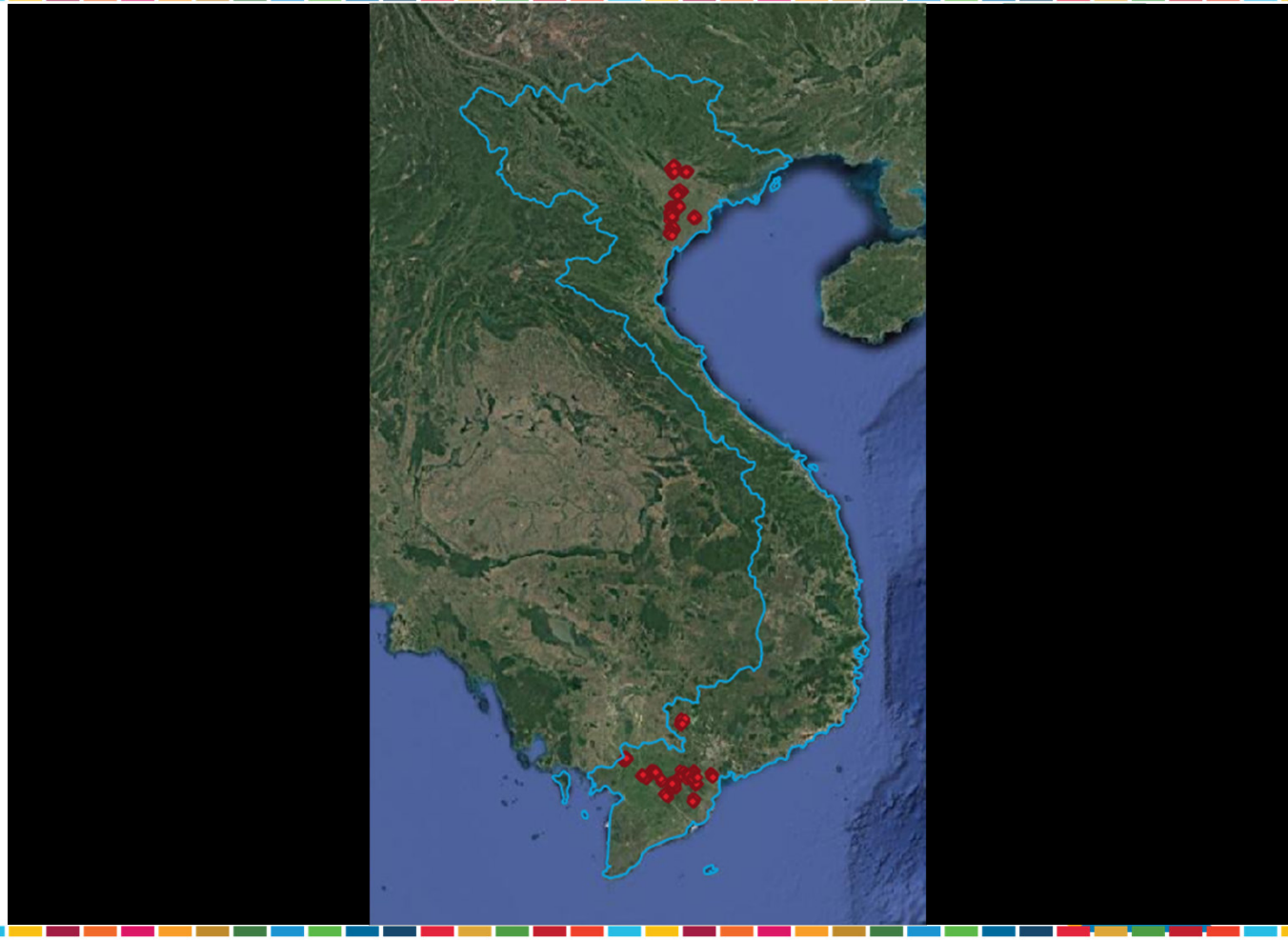
School place data is highly variable

MNR reporting 3300

OSM reporting 5000 and

UNICEF Giga reporting 7000

Not all georeferenced



Plan DNN – Deep Neural Network Machine Learning

- Scalable school mapping
- Many school structures have identifiable overhead signatures that make them detectable in high-resolution imagery
- Multipurpose usage
- Analogue data set found in 26 districts by trained GIS Analyst

Challenges

- High resolution data acquisition
- Code interpretation
- Hospitals and Churches

Open Access Article

Automated School Location Mapping at Scale from Satellite Imagery Based on Deep Learning

by Iyke Maduako [1], Zhuangfang Yi [2], Naroa Zurutuza [1], Shilpa Arora [1], Christopher Fabian [1] and Do-Hyung Kim [1,*]

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(This article belongs to the Special Issue Land Use Classification with GIS and Remote Sensing Data Based on AI Technology)

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Abstract

Computer vision for large scale building detection can be very challenging in many environments and settings even with recent advances in deep learning technologies. Even more challenging is modeling to detect the presence of specific buildings (in this case schools) in satellite imagery at a global scale. However, despite the variation in school building structures from rural to urban areas and from country to country, many school buildings have identifiable overhead signatures that make them possible to be detected from high-resolution imagery with modern deep learning techniques. Our hypothesis is that a Deep Convolutional Neural Network (CNN) could be trained for successful mapping of school locations at a regional or global scale from high-resolution satellite imagery. One of the key objectives of this work is to explore the possibility of having a scalable model that can be used to map schools across the globe. In this work, we developed AI-assisted rapid school location mapping models in eight countries in Asia, Africa, and South America. The results show that regional models outperform country-specific models and the global model. This indicates that the regional model took the advantage of having been exposed to diverse school location structure and features and generalized better, however, the global model was the worst performer due to the difficulty of generalizing the significant variability of school location features across different countries from different regions.

Keywords: computer vision; deep learning; school mapping; high resolution satellite imagery

993 schools detected and ranked

Screened to 500 most at risk

Data sets utilised at level 3

Google Building Footprint

MNR Point of Interest

MNR Road Network

School Survey Data

Street View Imagery

Number of intersections in school zone

Street View Imagery Collection

North West Sub Institute of Forestry

Hanoi VN

Collected street view imagery of 993 schools in 12 weeks

Level 3 Analysis – At Risk Schools by Environment

Length of Road by Type
- Major roads with high volume increases risk

Number of Intersections
- A higher number of intersections increases the need for crossing

% of Commercial Land Use
- Commercial areas attract walking trips and pedestrian risk

Number of Transit Stops
- Accessing transit stops can be unsafe

School Road Type
- Location of the school entrance on a major road increases risk

Number of Lanes on the School Road
- More lanes present creates higher crossing risk

Number of Students
- Focusing on collective risk and potential to improve safety for the highest number of people

Shift Schedule
- Two or more shifts would see more pedestrian activity

Level 1 – Country to Province

1 Country - 63 Provinces

Level 2 – Province to District

12 Provinces - 183 Districts

Level 3 – District to School

26 Districts - 993 Schools

Level 4 – School Risk Ranking

500 Schools Ranked as High Risk

2.9TB of Data

Level 4 Analysis – Highest Risk Ranked 500 Schools

Presence of Safe Pedestrian Crossings

- Safe crossings are elementary in reducing risk to students

Number of Pedestrian Casualties in School Zone

- High levels of pedestrian casualties indicate risk for students

Average Operational Speed in School Zone

- The probability of accidents and severity increases

Average Operational Speed on School Road

- The probability of accidents and severity increases

Average Peak Flow in the School Zone

- Heavy flow ca indicate a priority of vehicle movement over other transport types

% Heavy Vehicles

- Heavy vehicle traffic can impose safety risk due to shape and size

WP2 Feature Extraction for SR4S Assessment

- Use AI to extract features for coding
- Upload code to SR4S dashboard
- Schools are rated for safety

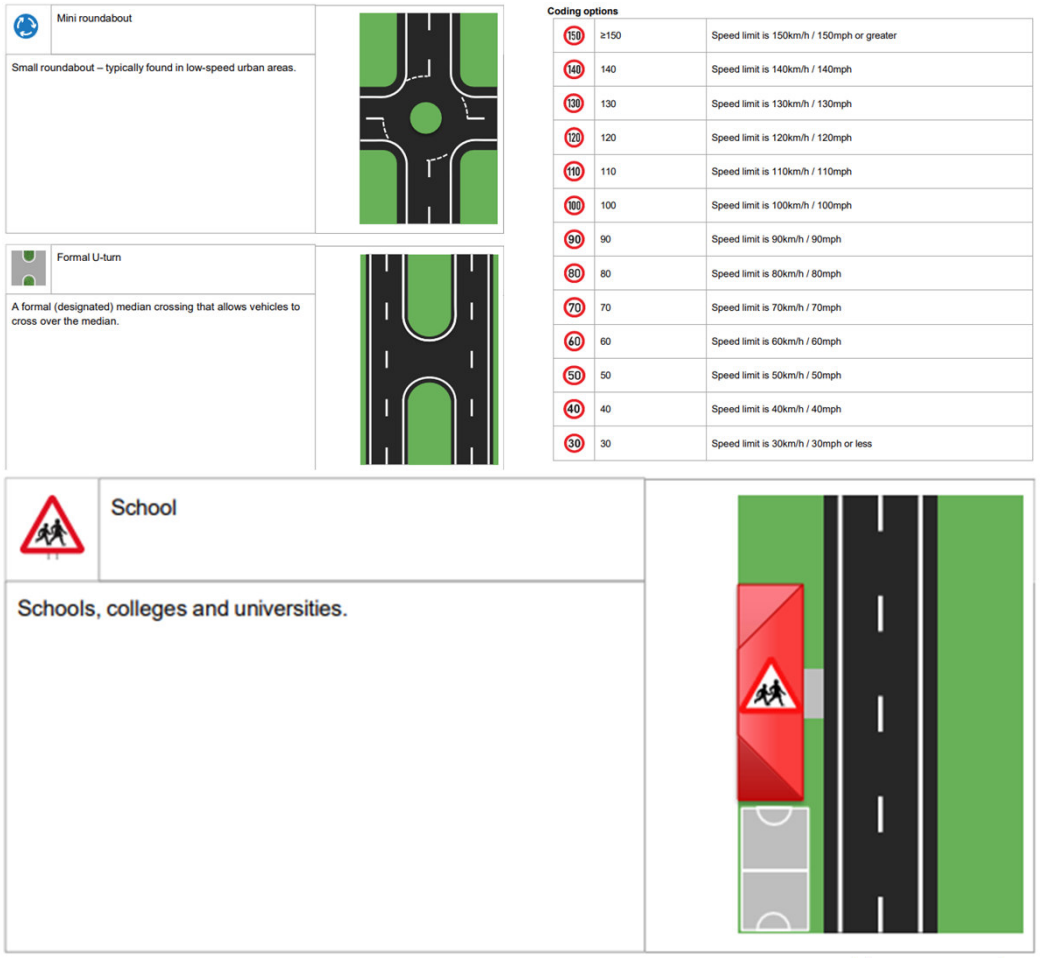
WP3 Youth Engagement

- Distribute an app to a selection of schools and their students to help them engage and identify where they feel safe

WP4 Road Upgrade Demonstrations

WP5 Validation and Dissemination

STAR RATING FOR SCHOOLS



THANK YOU