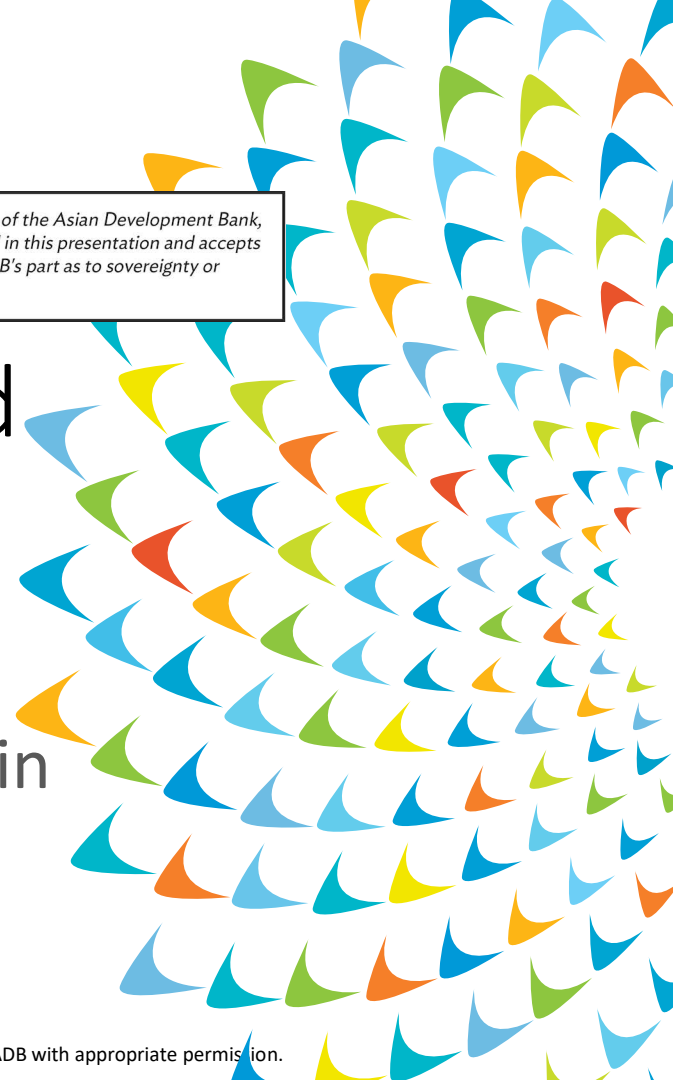




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AI for Climate Resilience and Disaster Risk Management

Geodigital Sumatra – Regional Digital Twin based on satellite Earth Observation and non Earth Observation





WHY - Requirement 1 Risk Analyzer



BAPPENAS

Kementerian Perencanaan Pembangunan Nasional/
Badan Perencanaan Pembangunan Nasional

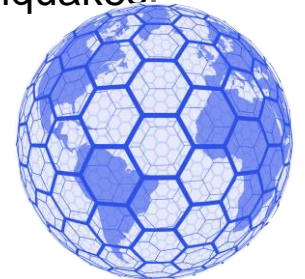


System integrated in GeoDigital Sumatra that enables users to simultaneously visualize:

environmental hazards and exposure using INA-Risk's 100m data for earthquakes, floods, etc., color-coded by risk.

Integrates population and building data for exposure assessment.

Identifies high-risk areas for better decision-making.





Requirement 2 Carbon Budget Simulator

System integrated in GeoDigital Sumatra that enables users to visualise and simulate the carbon budget for **8 provinces** in Sumatra.

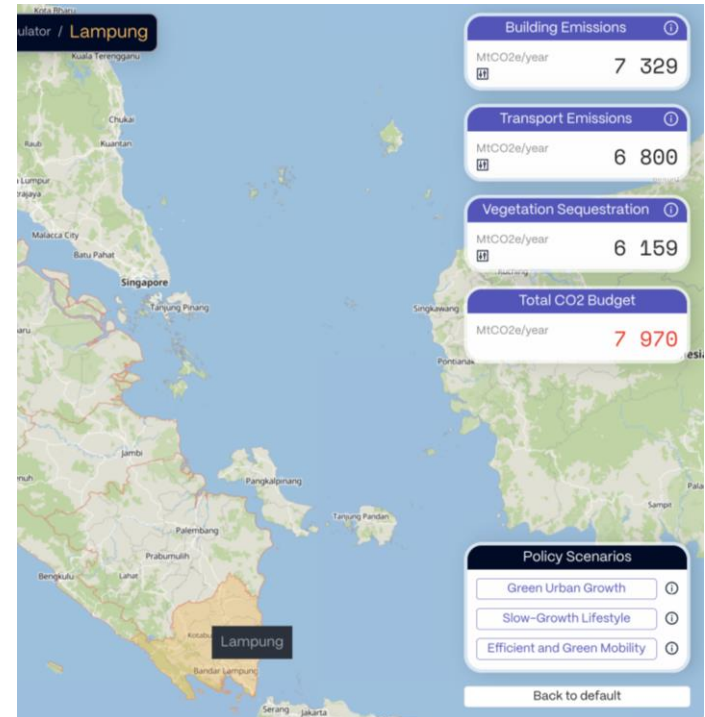
This considers three main components:

- ❖ building emissions
- ❖ transportation emissions
- ❖ vegetation sequestration



BAPPENAS

Kementerian Perencanaan Pembangunan Nasional/
Badan Perencanaan Pembangunan Nasional

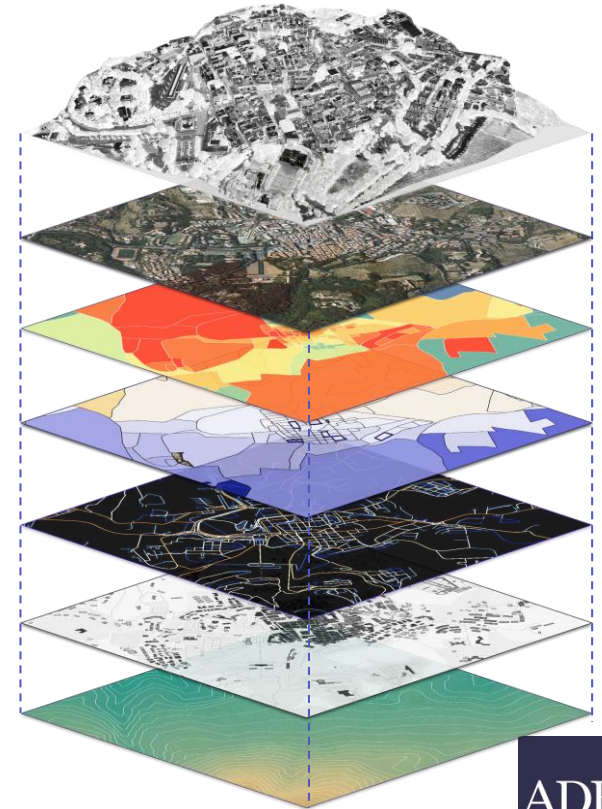




Requirement 3 User Interface: Geoportal

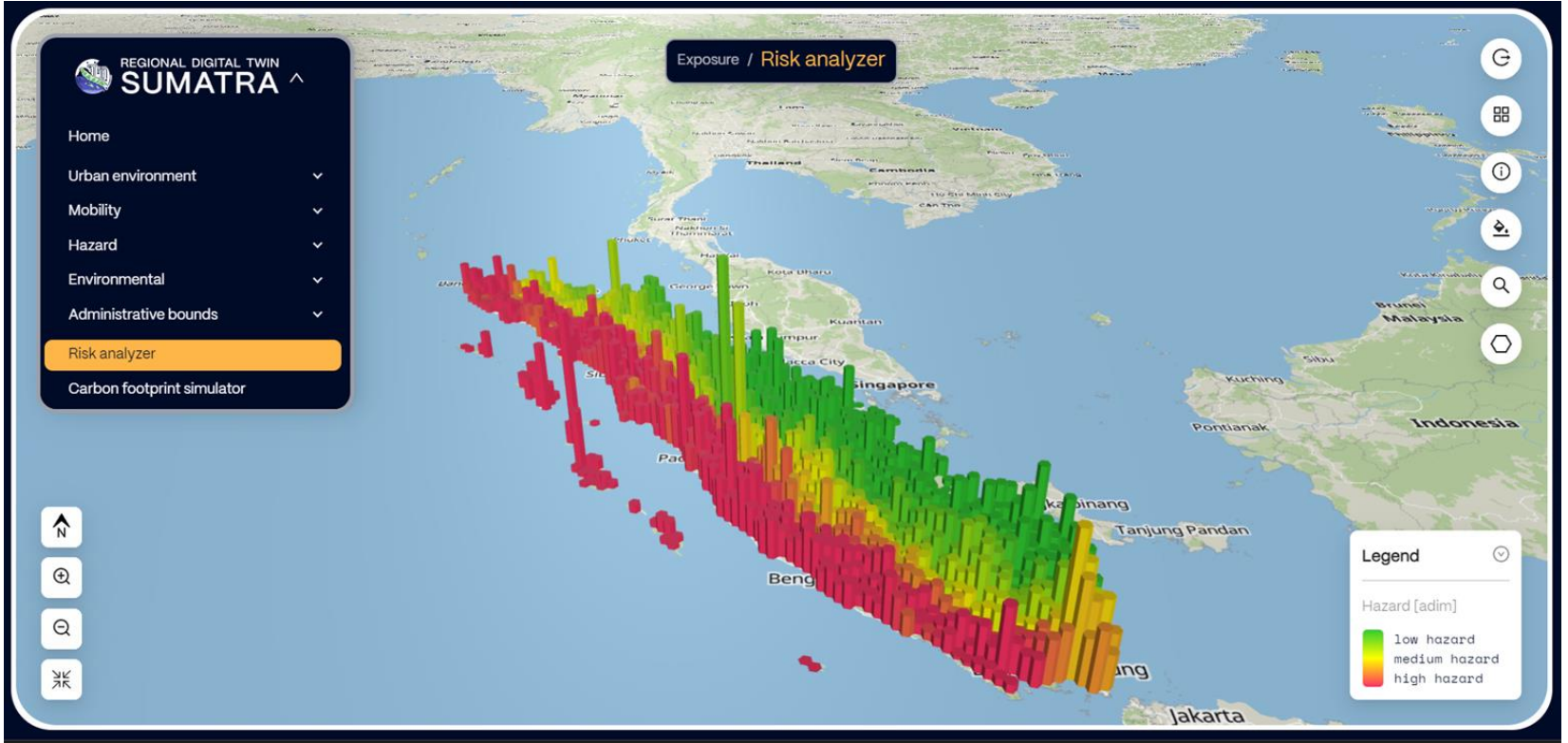


<https://rdt-sumatra.mindearth.ai/>





Output 1 Risk Analyzer





Output 2 Policy Scenarios and impact simulator:

REGIONAL DIGITAL TWIN
SUMATRA

- Home
- Urban environment
- Mobility
- Hazard
- Environmental
- Administrative bounds
- Risk analyzer
- Carbon footprint simulator

Carbon footprint simulator / Riau

Estimated CO2 Transport Emissions

	Motorcycle MtCO2e/year	Automobile MtCO2e/year	Total MtCO2e/year
	6 194	248	6 442

Km travelled

	-100%	0	+100%	
Inbound				26 406 748 km
Outbound				43 676 900 km
Inboundary				544 160 153 km
Total km travelled				614 243 801 km

Transport mode and efficiency

the sum must be equal 100%

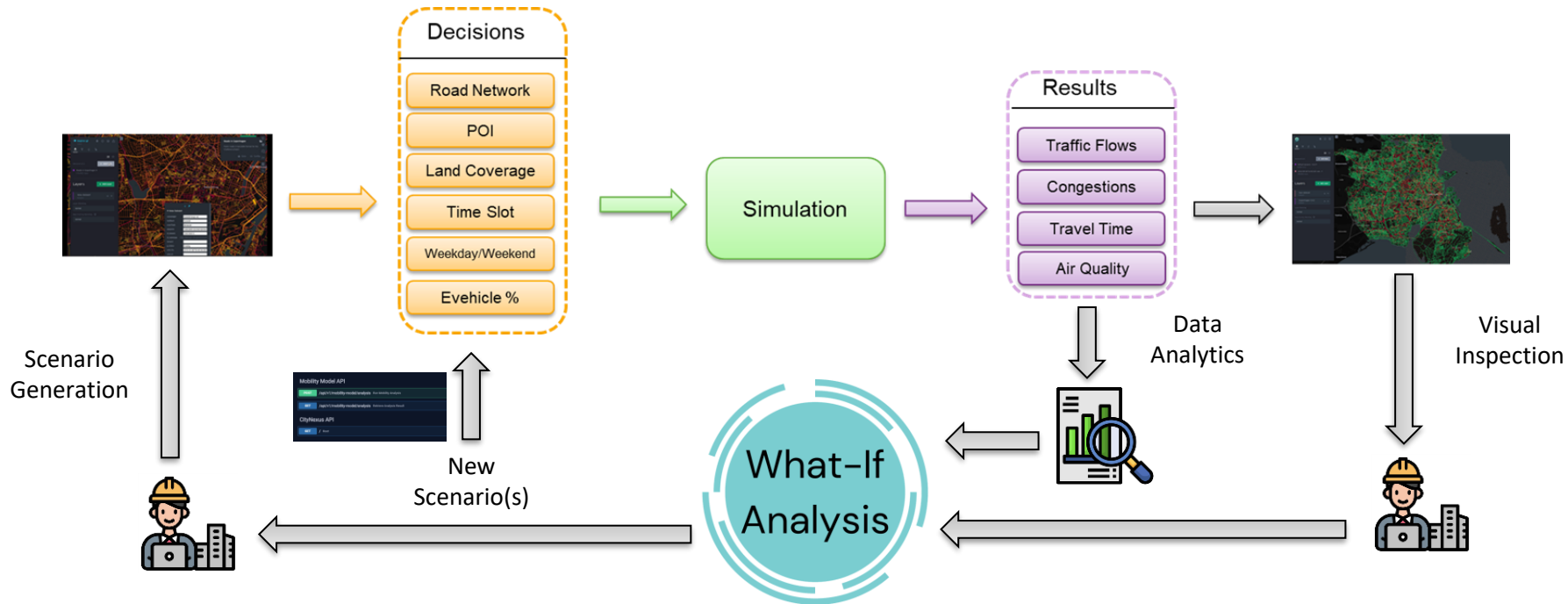
Motorcycle ratio	79.10	%	Motorcycle efficiency	56.11	km/l
Automobile Ratio	19.60	%	Automobile efficiency	9.03	km/l
Bicycle	0.28	%			
On Foot	1.02	%			

correct 100 %

- Green Urban Growth
- Slow-Growth Lifestyle
- Efficient and Green Mobility



AI pipelines to generate user-defined “what-if” scenarios – Based on Satellite EO and non EO





Variables Categories

The **building emissions** component

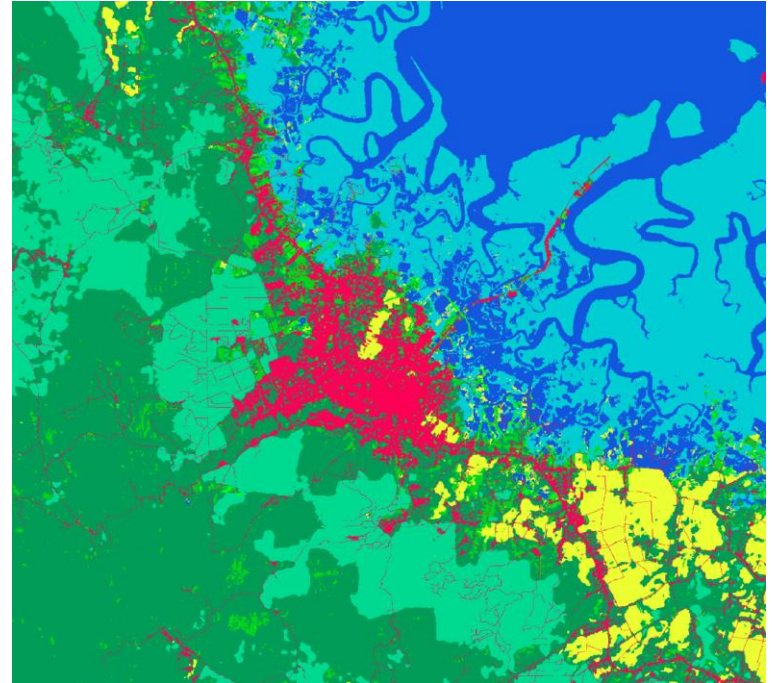
The **transport emissions** component

The **vegetation sequestration** component



AI/ML for Land Cover Classification and CO2 Estimation

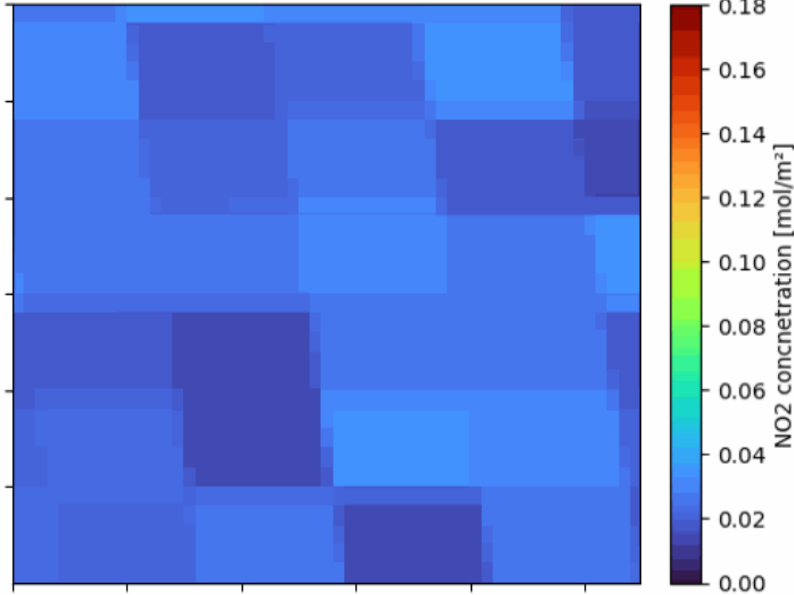
- **AI/ML pipeline:** Created a regional land cover classification for Sumatra, forming one of the three core layers for CO2 budget estimates (along with transportation and buildings).
- **Classification:** AI/ML predicts land cover types classified (Cropland, Mangrove, Artificial Surfaces, Water, Palm Oil Plantation, Forest, etc.) using satellite data (Sentinel-1, Sentinel-2), elevation models and proxy patterns, even with limited training data.
- **CO2 Sequestration:** Each land cover assigned a CO2 sequestration efficiency through an empirical formula.





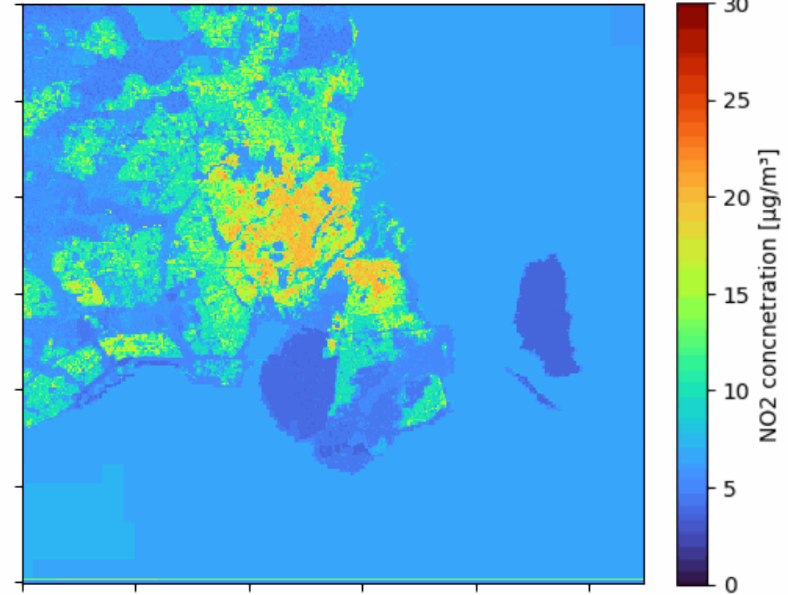
EVOLUTION AI techniques to improve Data Resolution

Copenhagen S5P01-02-2024



**Sentinel 5P NO2 concentration
resolution: 5.5 x 3.5 km**

Copenhagen 2024-01-01



**Up-scaled NO2 concentration
resolution: 0.1 x 0.1 km**



AI/ML in Geospatial science

Automated Mapping:

AI/ML technology helps create detailed maps of entire regions or countries with less effort, making it easier to manage large-scale geospatial data.

Filling Data Gaps:

When the input data is incomplete, has gaps or missing values, ML/AI pipelines allow to fill in the missing data, ensuring a complete and accurate view.

Little Ground truth

AI/ML methods allow to generate accurate geospatial data even when only limited “ground truth” samples are available, where traditional methods would struggle due to data scarcity.

Predicting Missing Data:

AI/ML can generate new information even when direct data is unavailable, by analyzing large amounts of related information helping to create a complete picture of phenomena of interest.

Improving Data Quality:

AI/ML can be used to increase the level of detail in geospatial data by refining low-resolution inputs and combining multiple data sources, resulting in sharper and more precise maps.



**DIGITAL
TECHNOLOGY**
FOR DEVELOPMENT

Thank you.

