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DIGITAL TECHNOLOGY FOR DEVELOPMENT

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

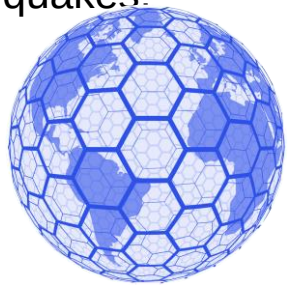
BRIN
BADAN RISET
DAN INOVASI NASIONAL

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.



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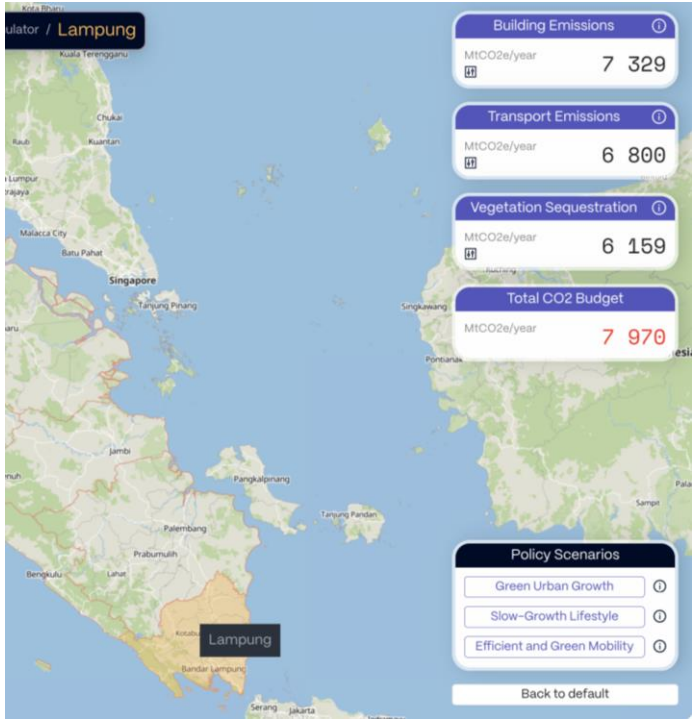
Requirement 2 Carbon Budget Simulator

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



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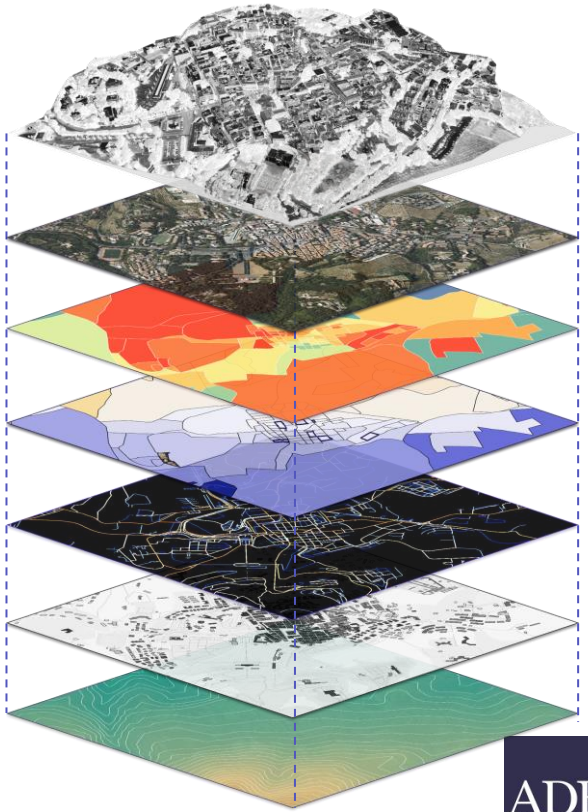
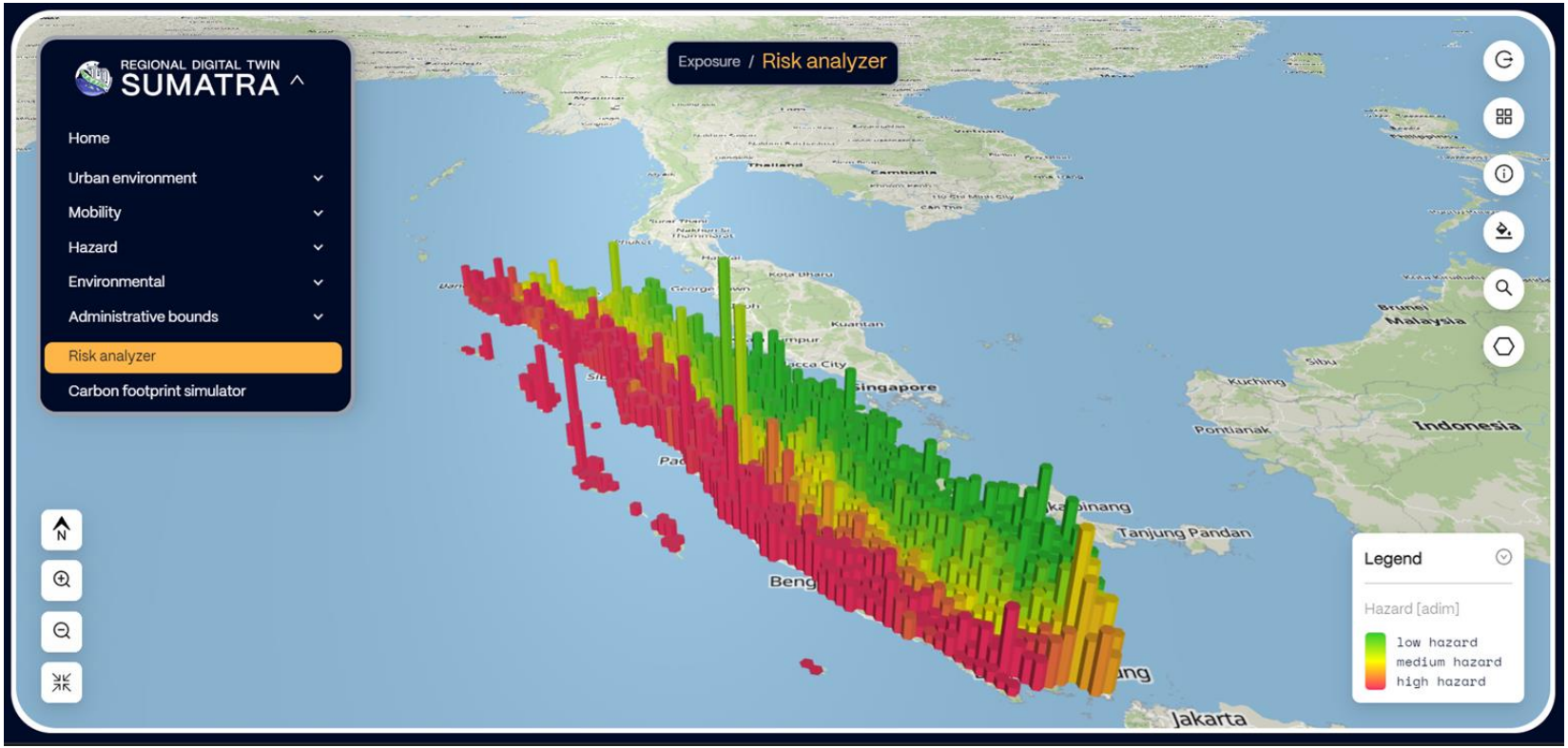
Requirement 3 User Interface: Geoportal

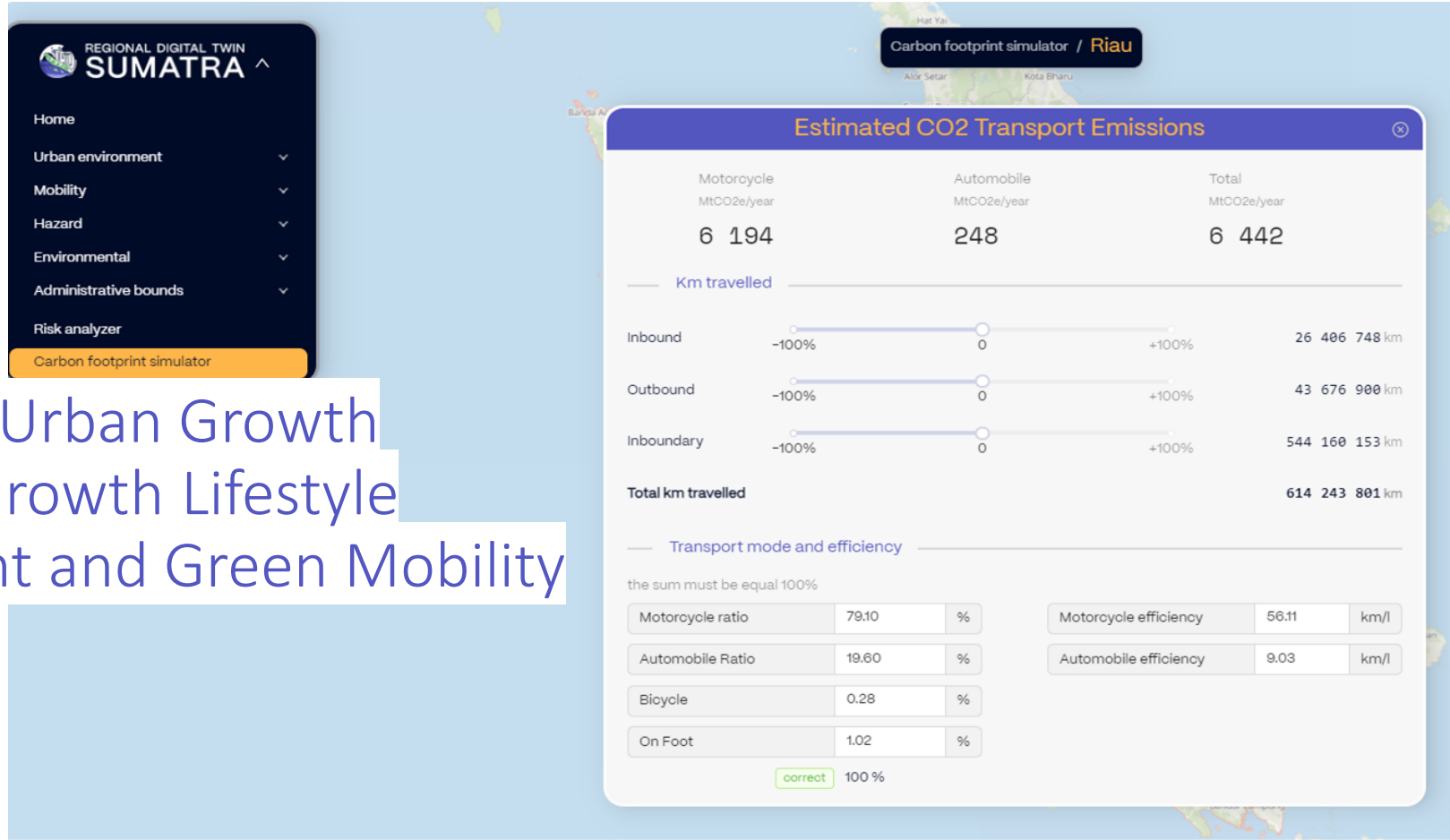


https://rdt-sumatra.mindearth.ai/

Output 1 Risk Analyzer

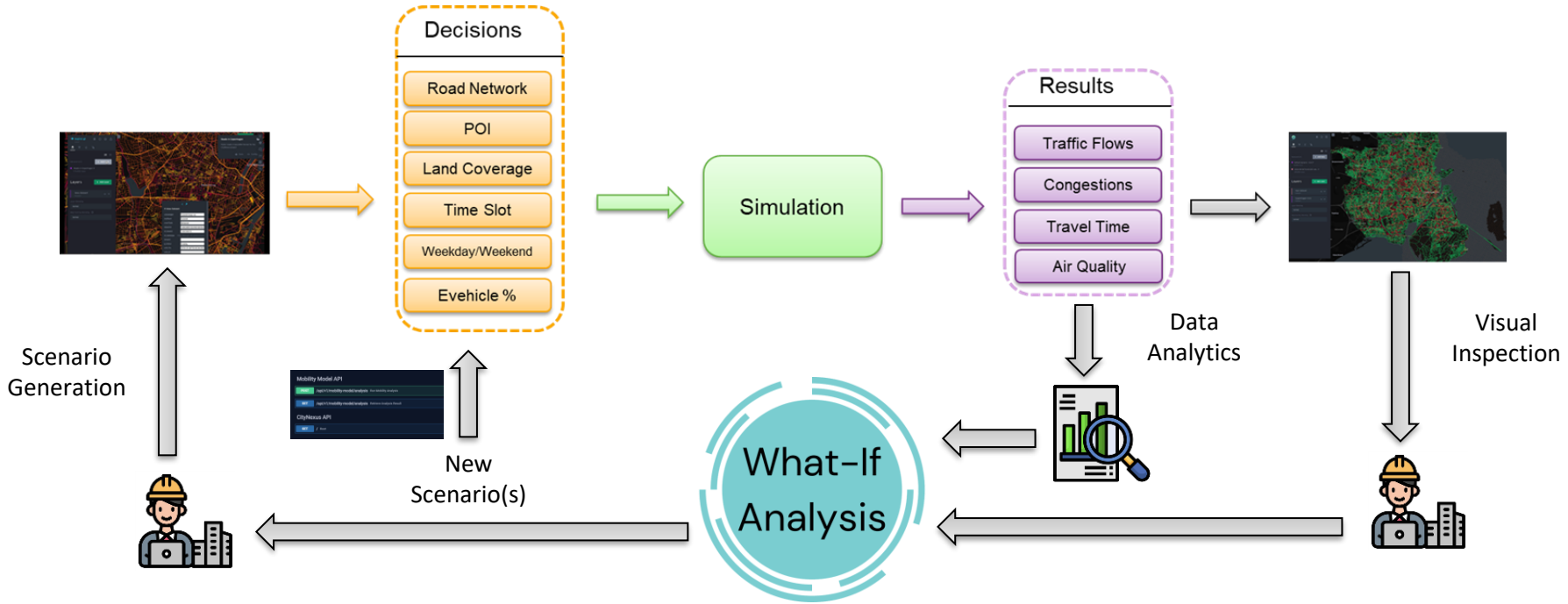


Output 2 Policy Scenarios and impact simulator:



-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

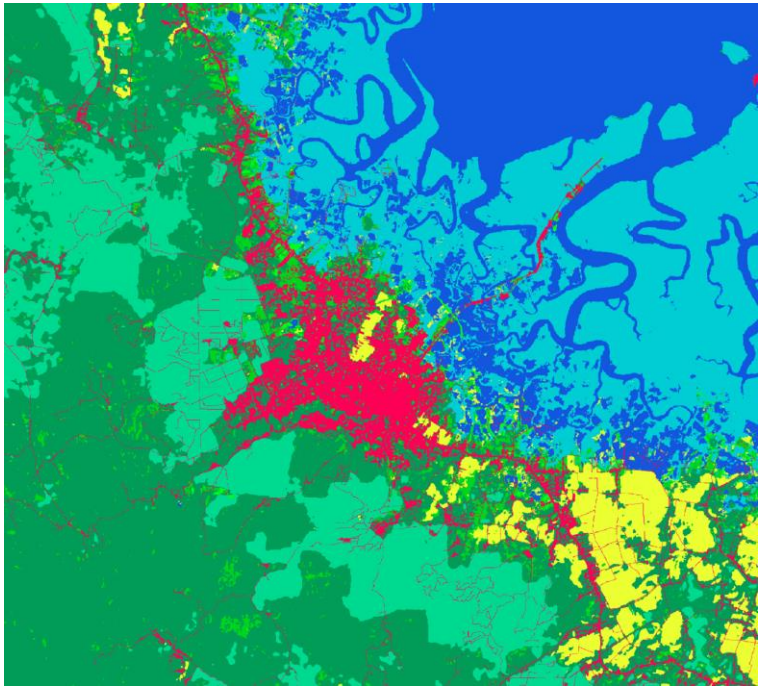
The **building emissions** component

The **transport emissions** component

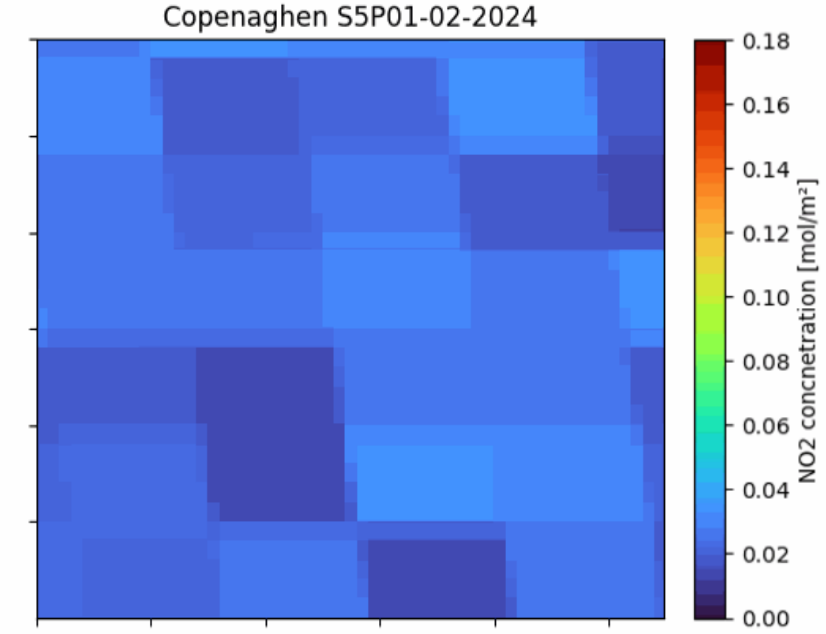
The **vegetation sequestration** component

AI/ML for Land Cover Classification and CO2 Estimation

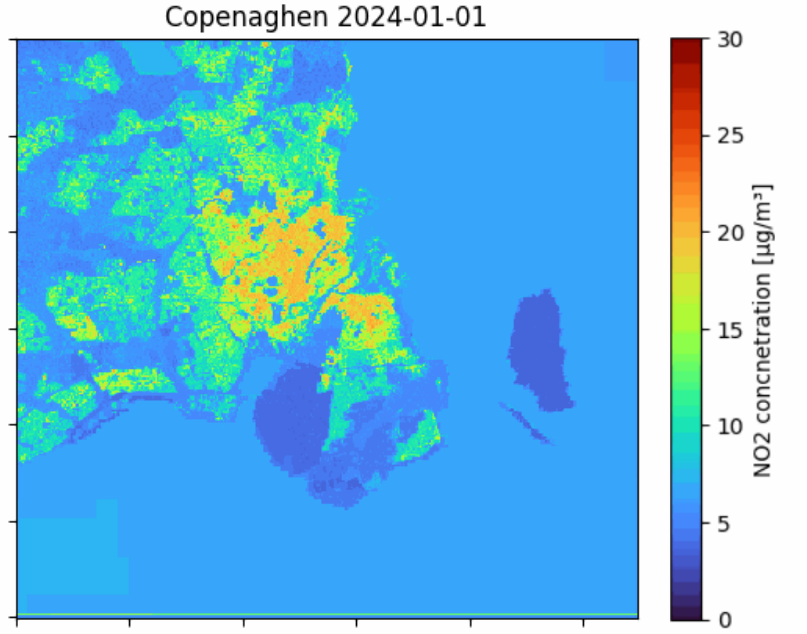
- **AI/ML pipeline**: Created a regional land cover classification for Sumatra, forming one of the three core layers for CO2 budget estimates (along with transportation and buildings).
- **Classification**: AI/ML predicts land cover types classified (Cropland, Mangrove, Artificial Surfaces, Water, Palm 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



Sentinel 5P NO2 concentration resolution: 5.5 x 3.5 km



Up-scaled NO2 concentration resolution: <u>0.1 x 0.1 km</u>

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 thruth	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.

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Thank you.