

Supplementary Material

Supplementary Material Table 1. Multi source geo spatial attributes specifications.

Attribute	Data source/platform	Data extraction method
GEOLOGY_CODE	Indonesia Geospatial	Vector polygon rasterization and geological attribute encoding
DIST_COAST	Overpass Ultra (OpenStreetMap API)	Euclidean distance from localized coastline geometry
DIST_ROAD	Overpass Ultra (OpenStreetMap API)	Euclidean distance from road infrastructure networks
DIST_RIVER	Overpass Ultra (OpenStreetMap API)	Euclidean distance from hydrographic line networks
POPULATION	WorldPop	Gridded population raster extraction and spatial matching
LAND_COVER	Google Earth Engine Cloud Platform	Supervised classification from Sentinel-2 imagery
LST	Google Earth Engine Cloud Platform	Thermal infrared calibration from Landsat 8 composites
NDVI	Google Earth Engine Cloud Platform	Spectral index calculation from Sentinel-2 surface reflectance
TWI	Google Earth Engine Cloud Platform	Topographic wetness index calculation using flow accumulation
COAST_CHANGE	Google Earth Engine Cloud Platform	Multi-temporal shoreline-change calculation
ELEVATION	DEMNAS (Badan Informasi Geospasial)	Digital elevation model extraction
SLOPE	DEMNAS (Badan Informasi Geospasial)	First-derivative terrain calculation from the digital elevation model