

North Korea's Ballistic Missile Site Selection

Looking Forward

Subdividing missile data by missile type and construction year would result in a more fine tuned analysis, as site selection criteria may vary accordingly. Similarly, features of interests can be disaggregated into subcomponent categories. Satellite imagery analysis using remote sensing and machine learning techniques can be combined with the geospatial overlay analysis to produce more accurate results.

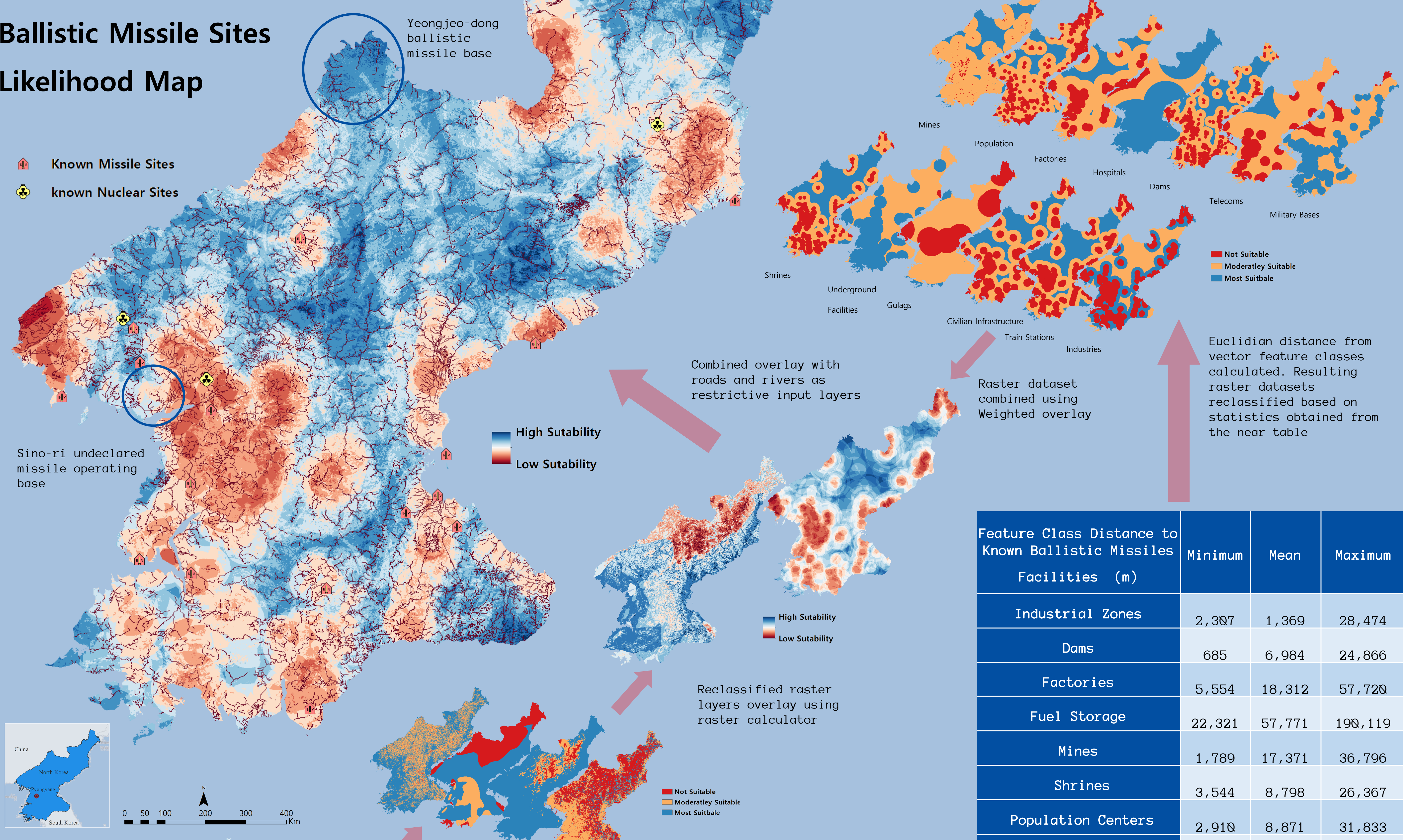
Executive Summary

Based on the locations of known ballistic missile facilities, this project derived a North Korea specific site suitability criteria and used it to generate a likelihood location map of unidentified sites.

Findings

The overlay analysis, combined with satellite imagery validation, was able to identify two known ballistic missile operating facilities that were not included in the original input sites database. The Sino-ri and Yeongjeo-dong sites are shown in the circled areas on the likelihood map.

Ballistic Missile Sites Likelihood Map



Combined overlay with roads and rivers as restrictive input layers

Raster dataset combined using Weighted overlay

Euclidian distance from vector feature classes calculated. Resulting raster datasets reclassified based on statistics obtained from the near table

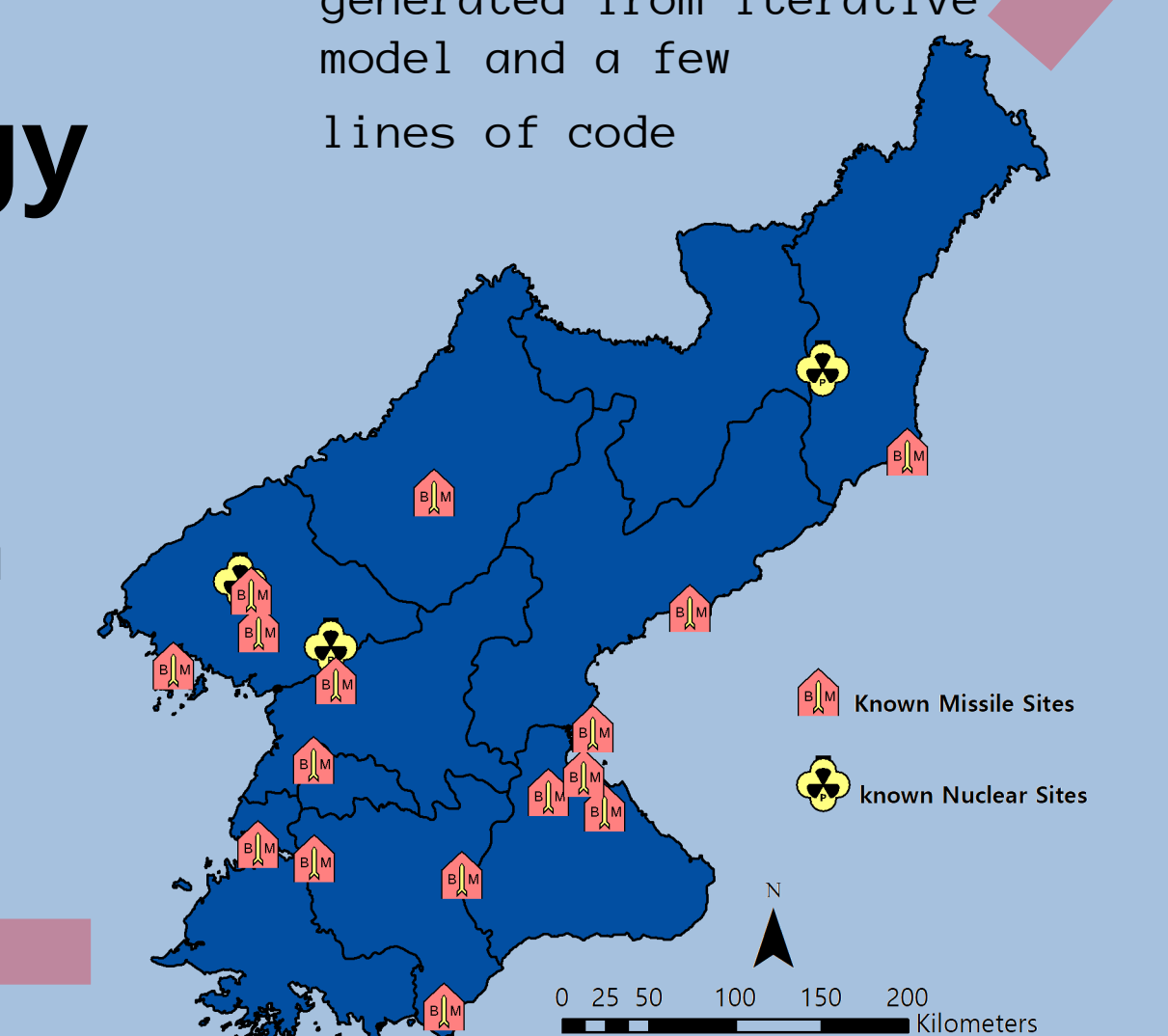
Reclassified raster layers overlay using raster calculator

Distances from missile sites to various vector feature classes of interest generated from iterative model and a few lines of code

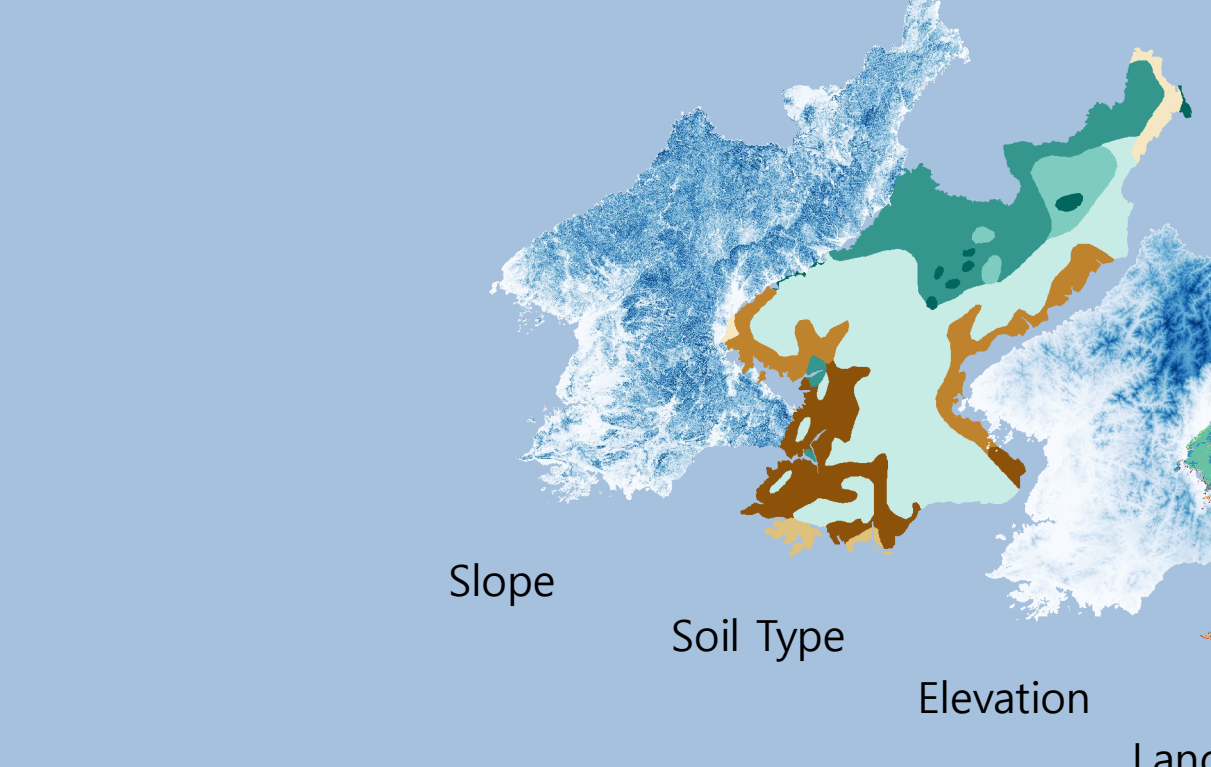
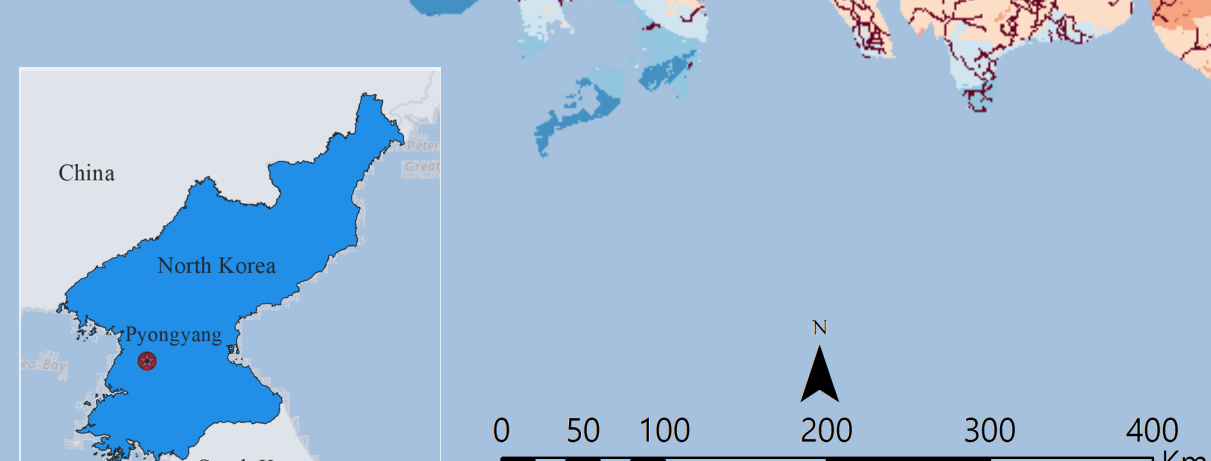
Feature Class Distance to Known Ballistic Missiles Facilities (m)	Minimum	Mean	Maximum
Industrial Zones	2,307	1,369	28,474
Dams	685	6,984	24,866
Factories	5,554	18,312	57,720
Fuel Storage	22,321	57,771	190,119
Mines	1,789	17,371	36,796
Shrines	3,544	8,798	26,367
Population Centers	2,910	8,871	31,833
Public Infrastructure	12,622	17,667	37,400
Hospitals	3,592	54,188	155,339
Train Stations	1,935	13,278	31,446
Telecommunication	8,375	23,169	96,432
Gulags	6,802	70,042	182,987
Military Facilities	4,679	19,230	59,125
Underground Facilities	806	14,633	112,098
Roads	36	150	589
Rivers	129	2,225	7,914

Methodology

Zonal statistics extracted from buffer around existing missile sites to determine most common raster feature subclass



Known existing missile facilities latitude and longitude coordinates overlaid on province level map



Most Common Feature Class within 200 meter buffer zone around known missile sites	Range/Type
Elevation (meters)	5-1232
Slope (percent)	1-35
land Use	- Natural vegetation mosaic - Forest Deciduous Broadleaf - Grasslands
Soil	Be1-2b / Be86-2b / I-Be-2c