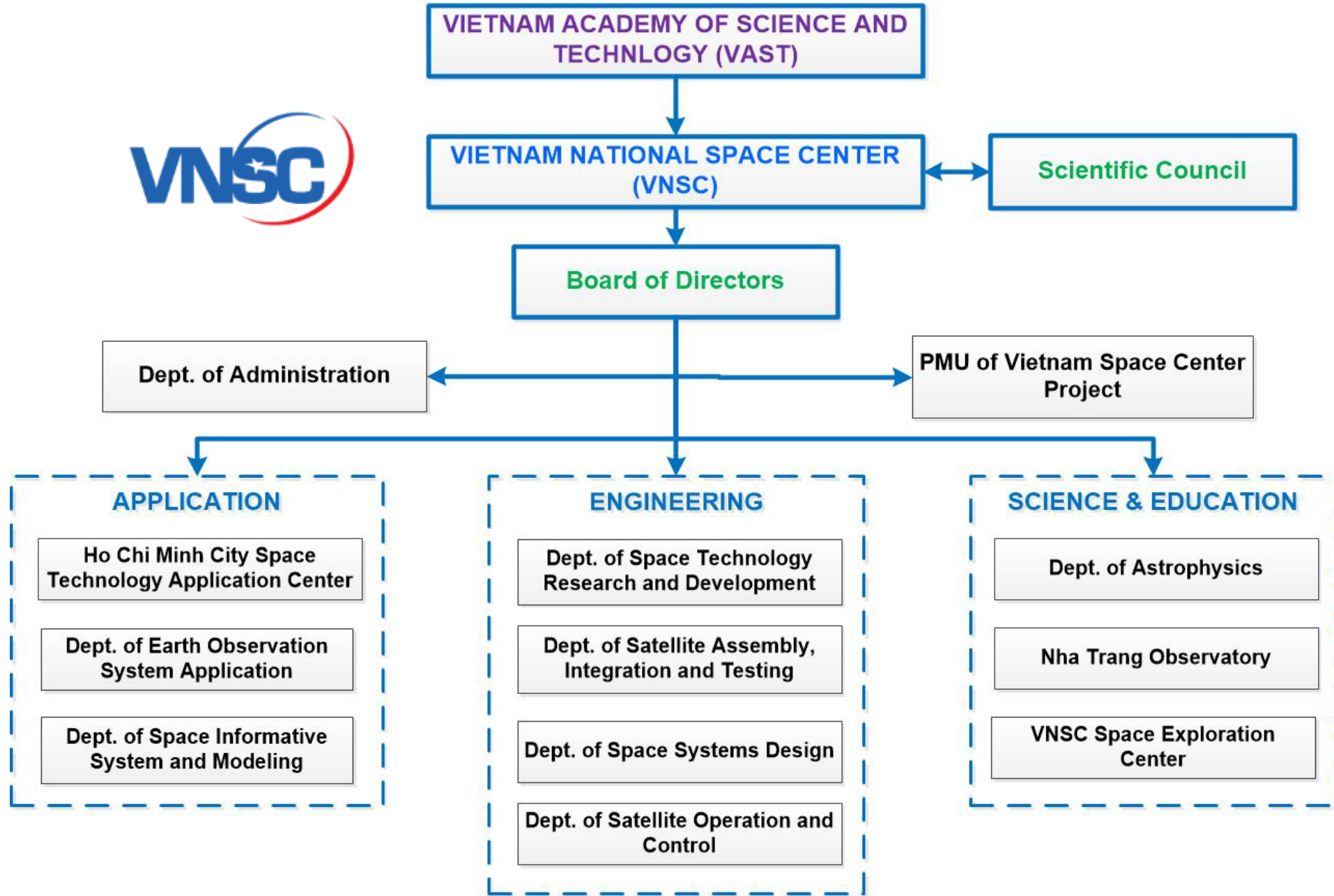




Vietnam National Space Center Activities

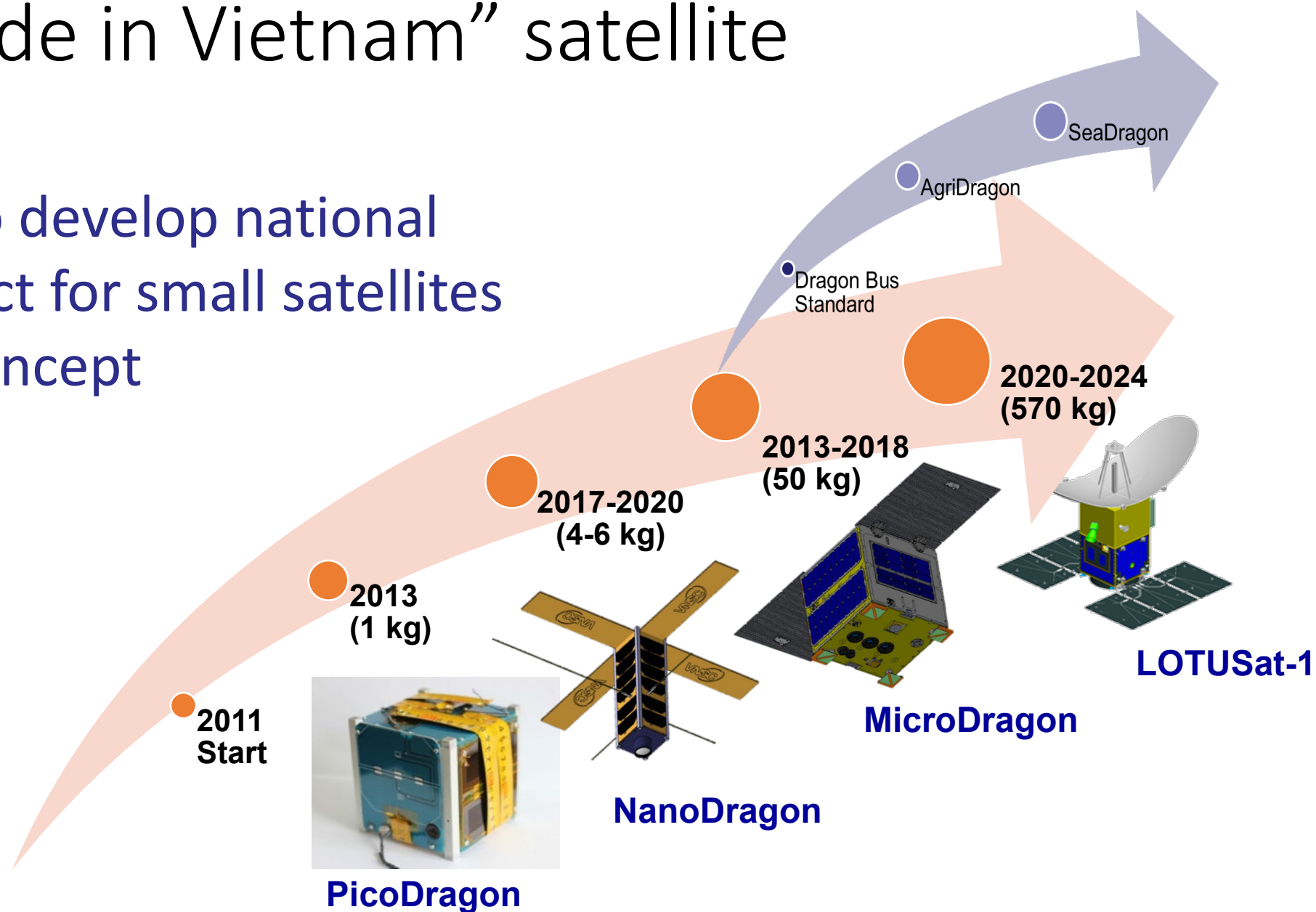
Dr. Vu Anh Tuan

Hanoi, 2023



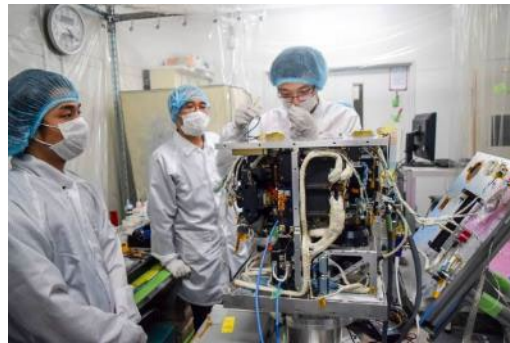
“Made in Vietnam” satellite

Aim to develop national product for small satellites bus concept



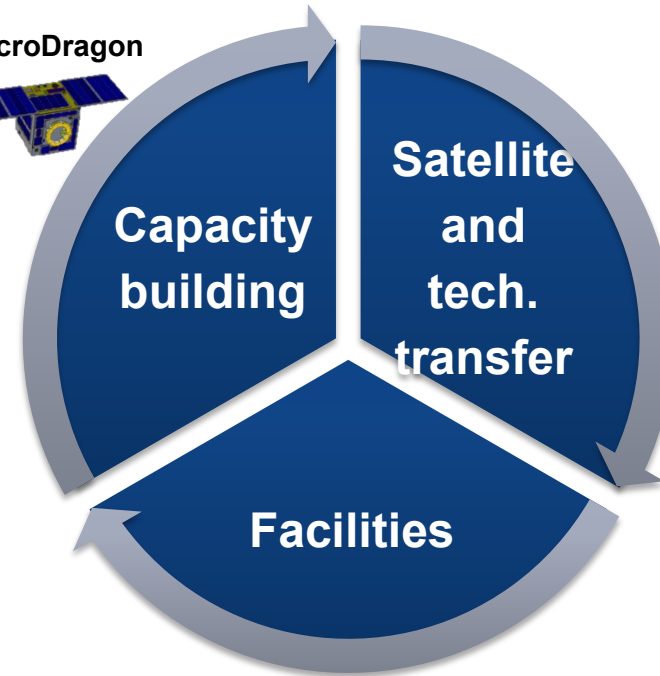
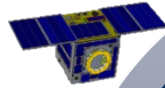
Vietnam EO satellite – LOTUSat-1

PROJECT FOR DISASTER AND CLIMATE CHANGE COUNTERMEASURES USING EARTH OBSERVATION SATELLITE



Capacity Building for Satellite Development (over 100 staffs)

MicroDragon



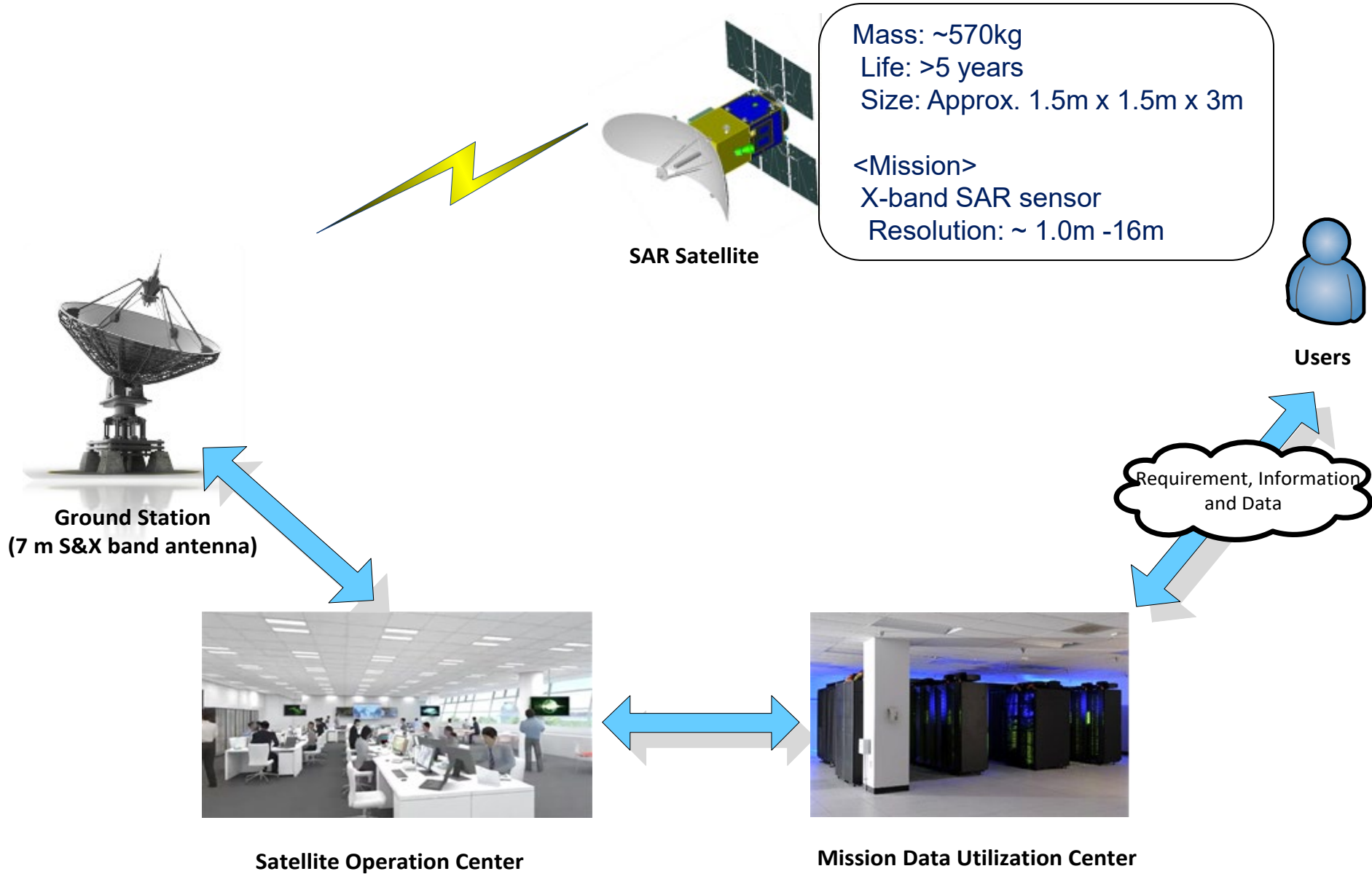
LOTUSat-1 (570 kg) with radar payload

Infrastructure in Ha Noi, Nha Trang and HCM City



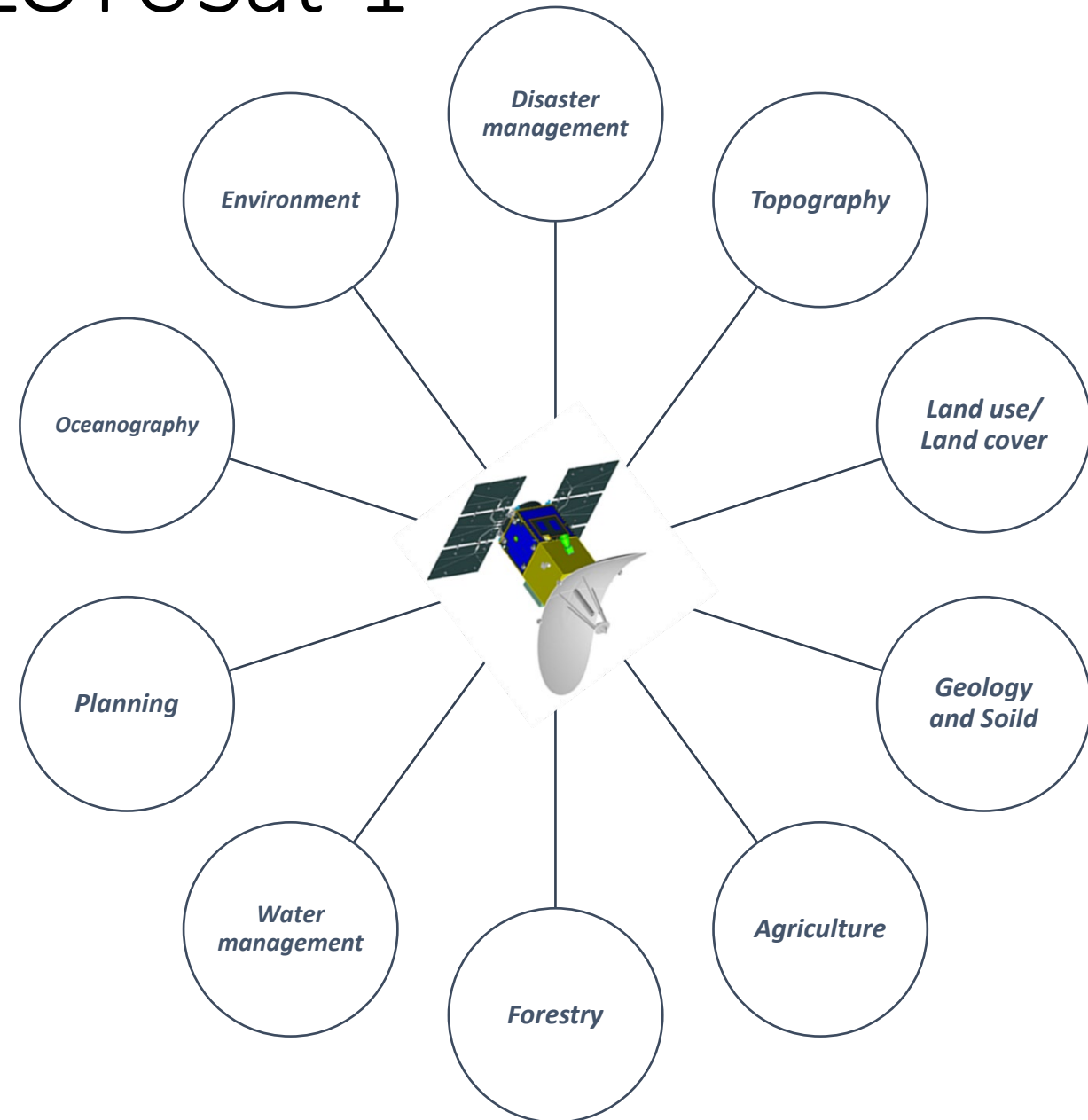
AIT facilities for small satellites up to 180kg

LOTUSat 1

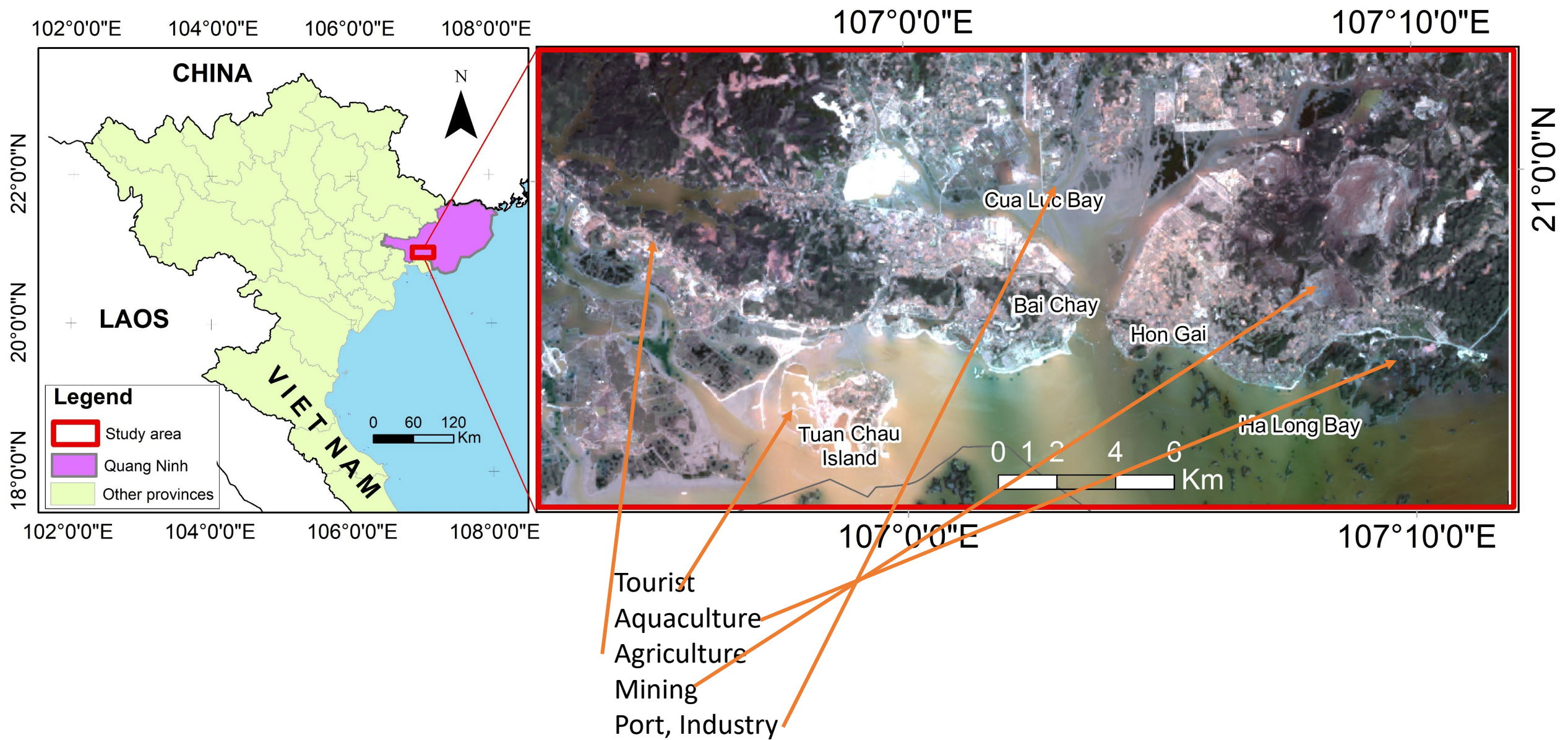


Vietnam EO satellite – LOTUSat-1

SAR Frequency	X - band
Resolution - Spotlight mode	1m x 1m (10km x 10km)
Resolution - Stripmap mode	2m x 2m (12km x 800km)
Resolution - Scan mode	16m x 16m (50km x 800km)
Polarization	HH or VV (switchable)
Look direction	Left or Right
Incidence angle	15°~ 45°
Data downlink	X-band / RHCP 16QAM(832Mbps)/QPSK(416Mbps)



**Monitor urban expansion in
Ha Long city, Vietnam,
during 2000-2023 from multi-
date Landsat satellite imagery**

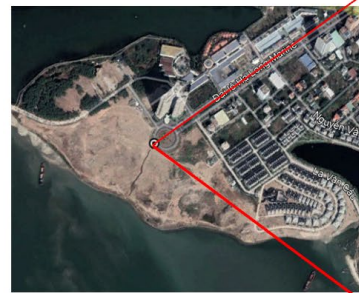




Goole Earth 12/2021



Ha Long 11/2021



Goole Earth 12/2021



Ha Long 11/2021

o	N	Date	Sensor	Satellite
1		21/11/2000	TM	Landsat5
2		2/10/2005	TM	Landsat5
3		1/11/2010	TM	Landsat5
4		15/1/2015	OLI	Landsat8
5		12/11/2020	OLI	Landsat8
6		2/3/2023	OLI-2	Landsat9

Urban: In this study, urban is understood broadly, including land use classes, such as residential land, industrial land (excluding coal mining areas), ports, and tourist areas.

Agriculture: Agriculture includes irrigated rice fields, other crop fields, and upland crops.

Bare soil: Bare soil is land that is not covered by vegetation. These are often former logged-over for urban development, vacant land, or reclaimed land.

Water: Water surfaces, such as sea, lake, and river. Some aquaculture in the study area are classified as water.

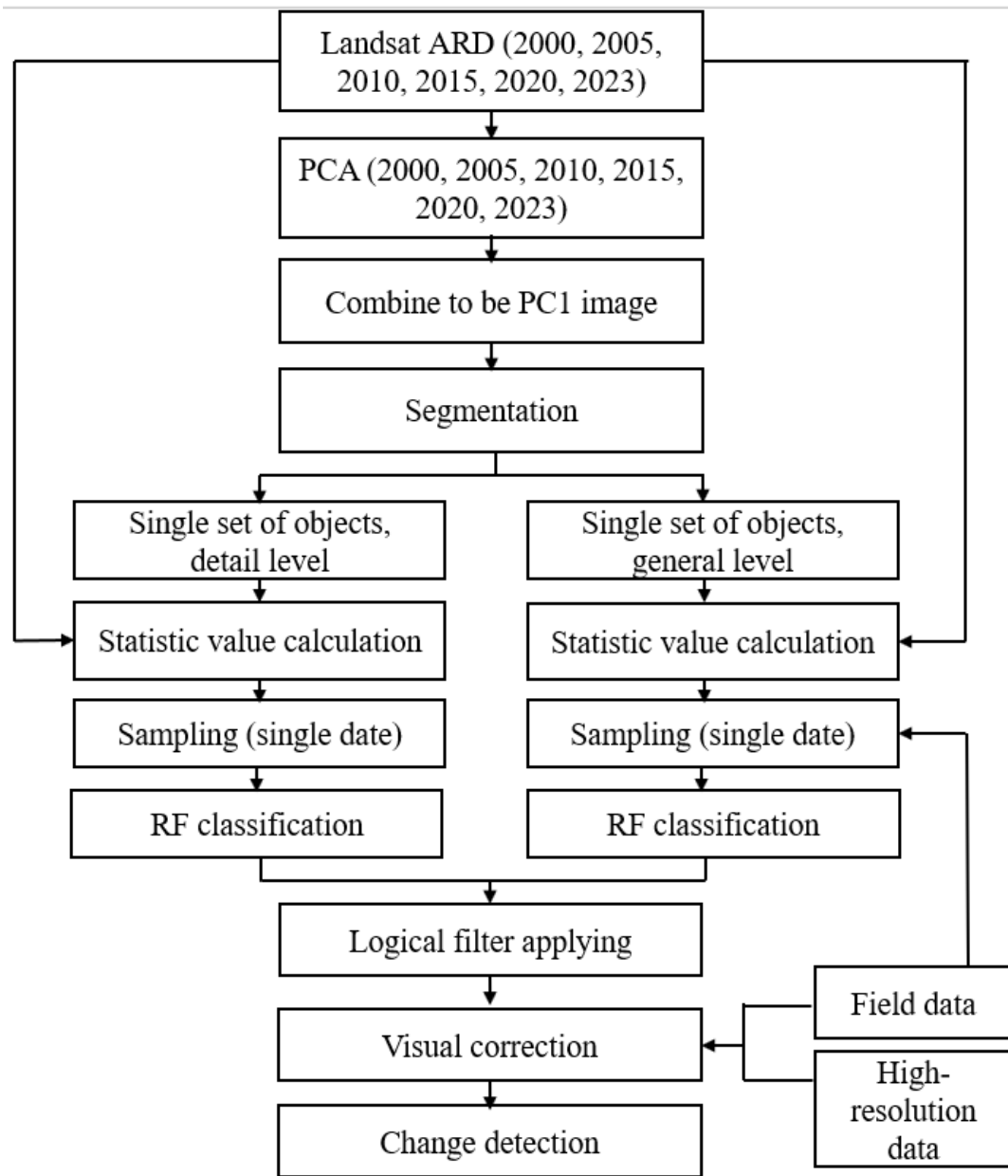
Mangrove: Mangroves grow in coastal wetlands. They can range from very fragmented to dense.

Shrub: Shrubs are usually low-height natural trees that have not closed their canopy. In some cases, young (newly planted) plantations or forests are also considered shrubs.

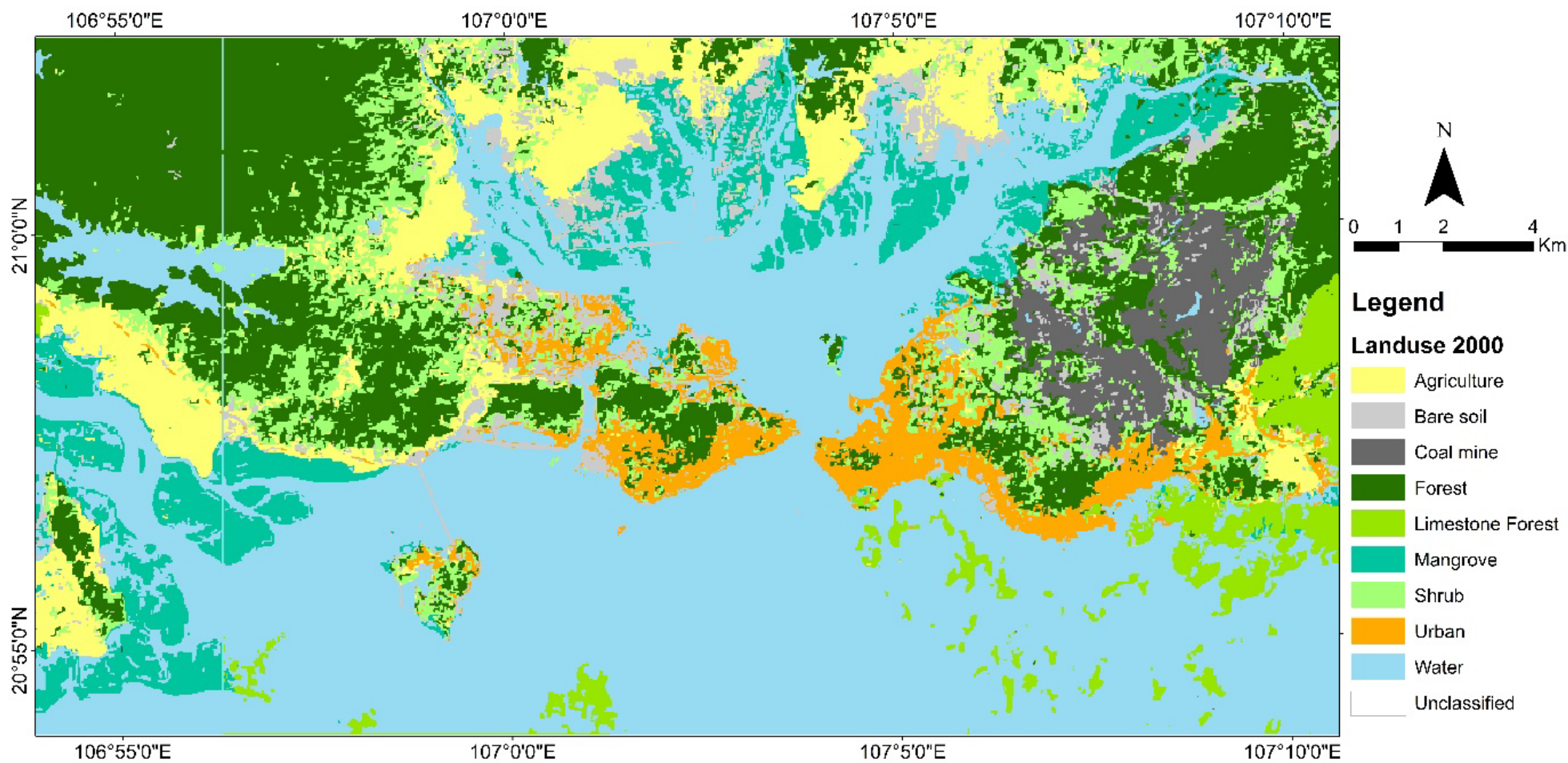
Forest: Forests have a dense canopy.

Limestone forest: Limestone forests are particular vegetation communities that grow on limestone mountains. They often include many shrubs and vines that create a dense canopy.

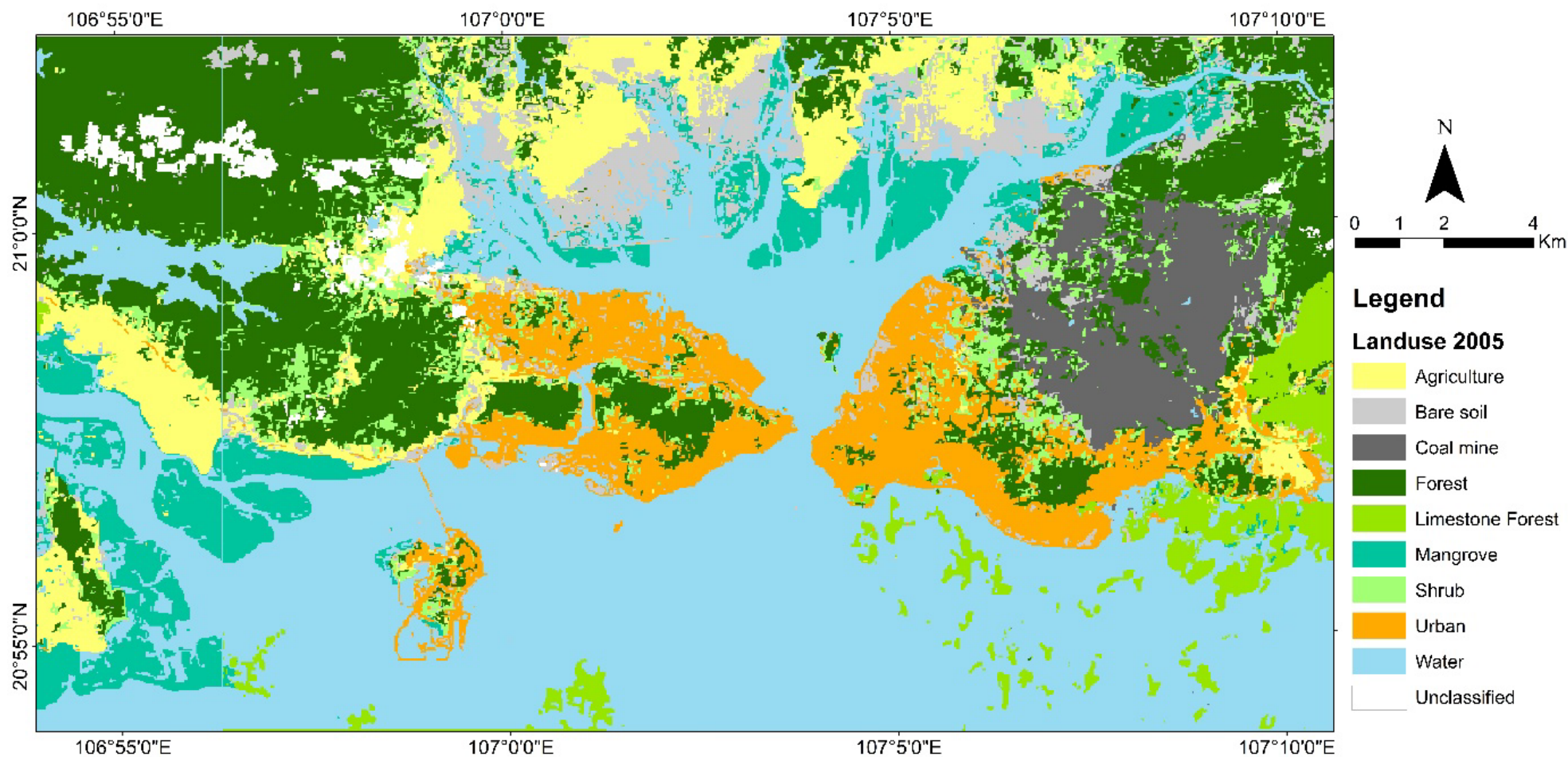
Coal mine: Coal mines are open-pit coal mining areas.



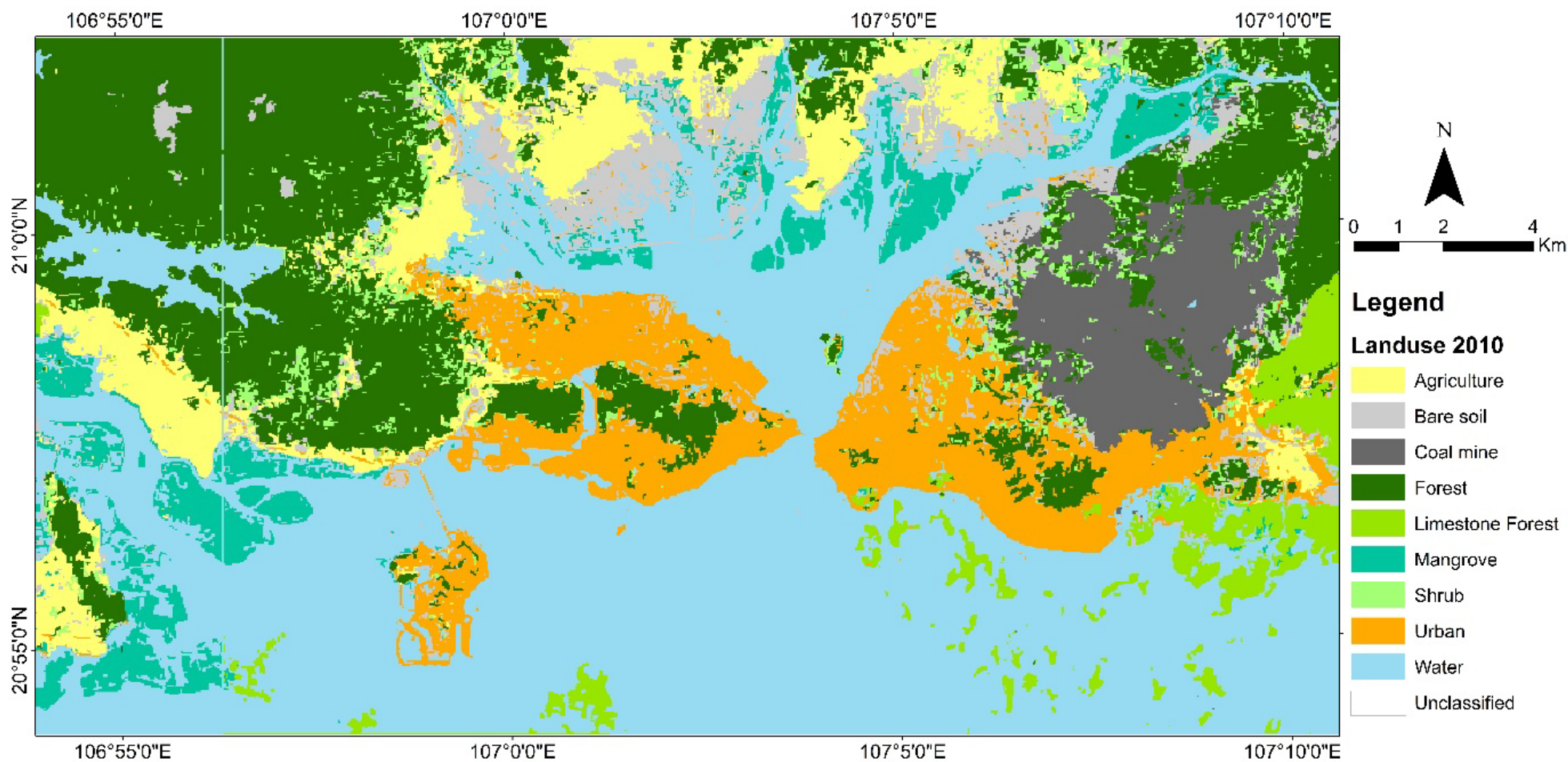
2000



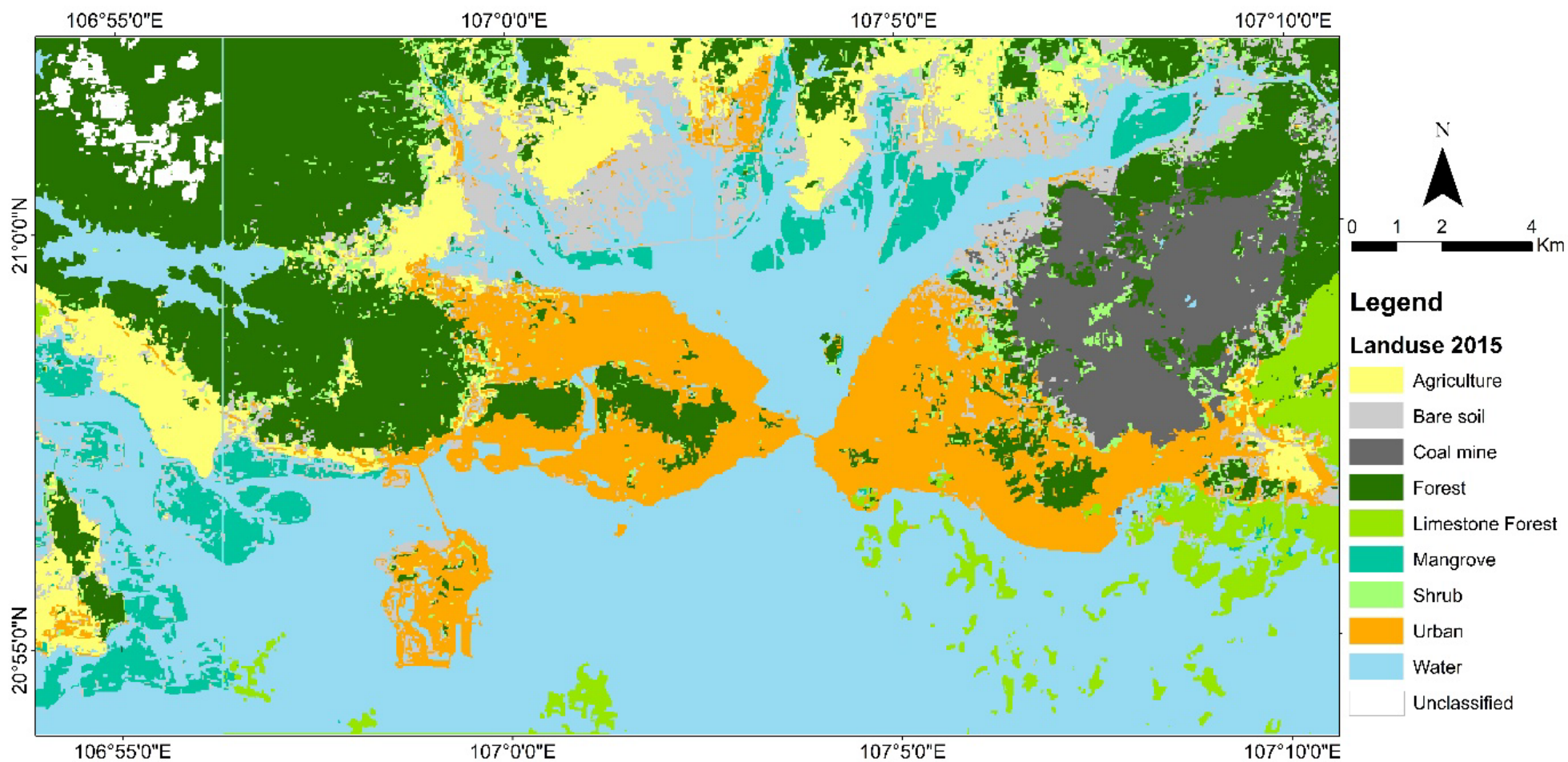
2005



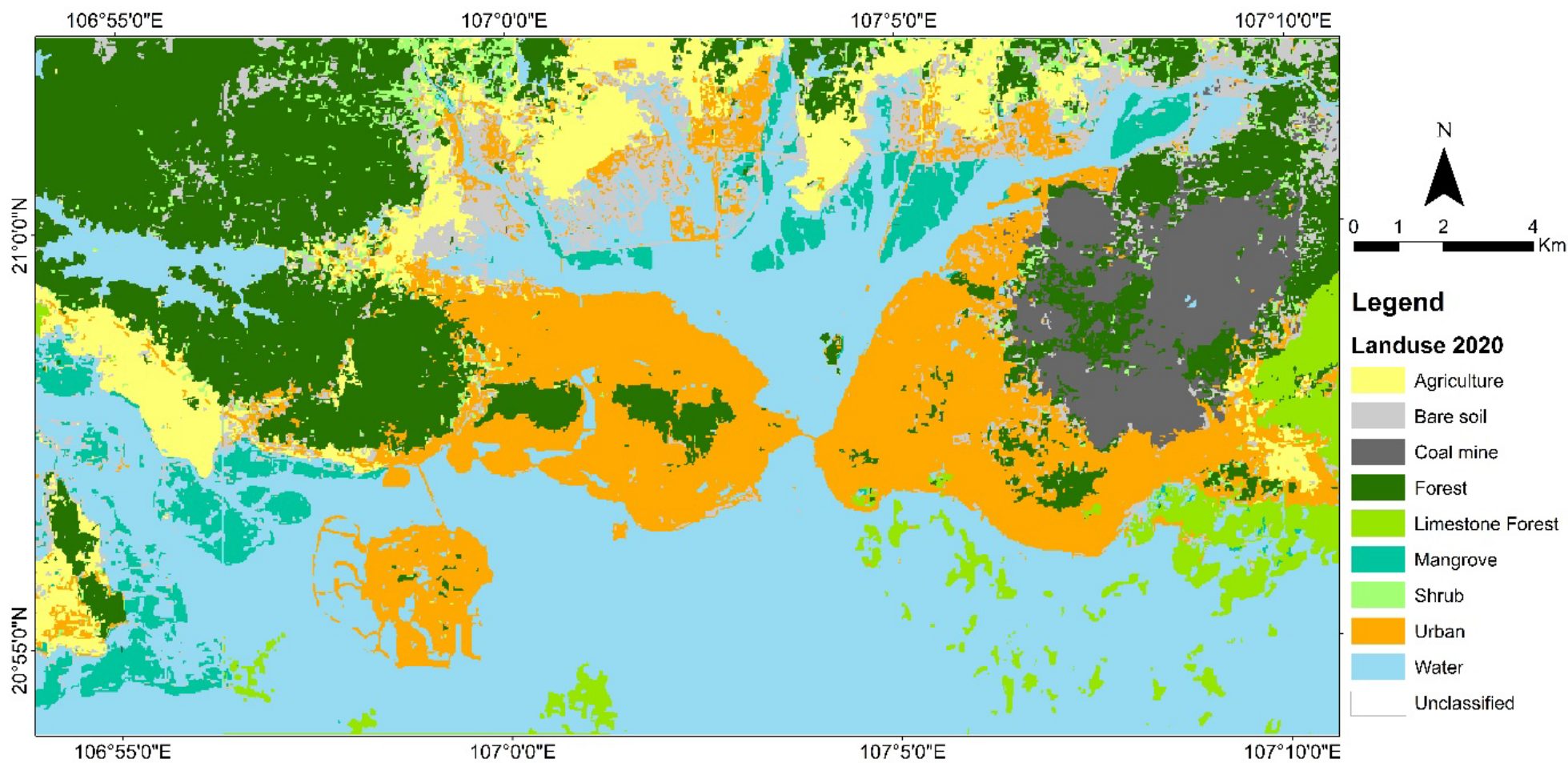
2010



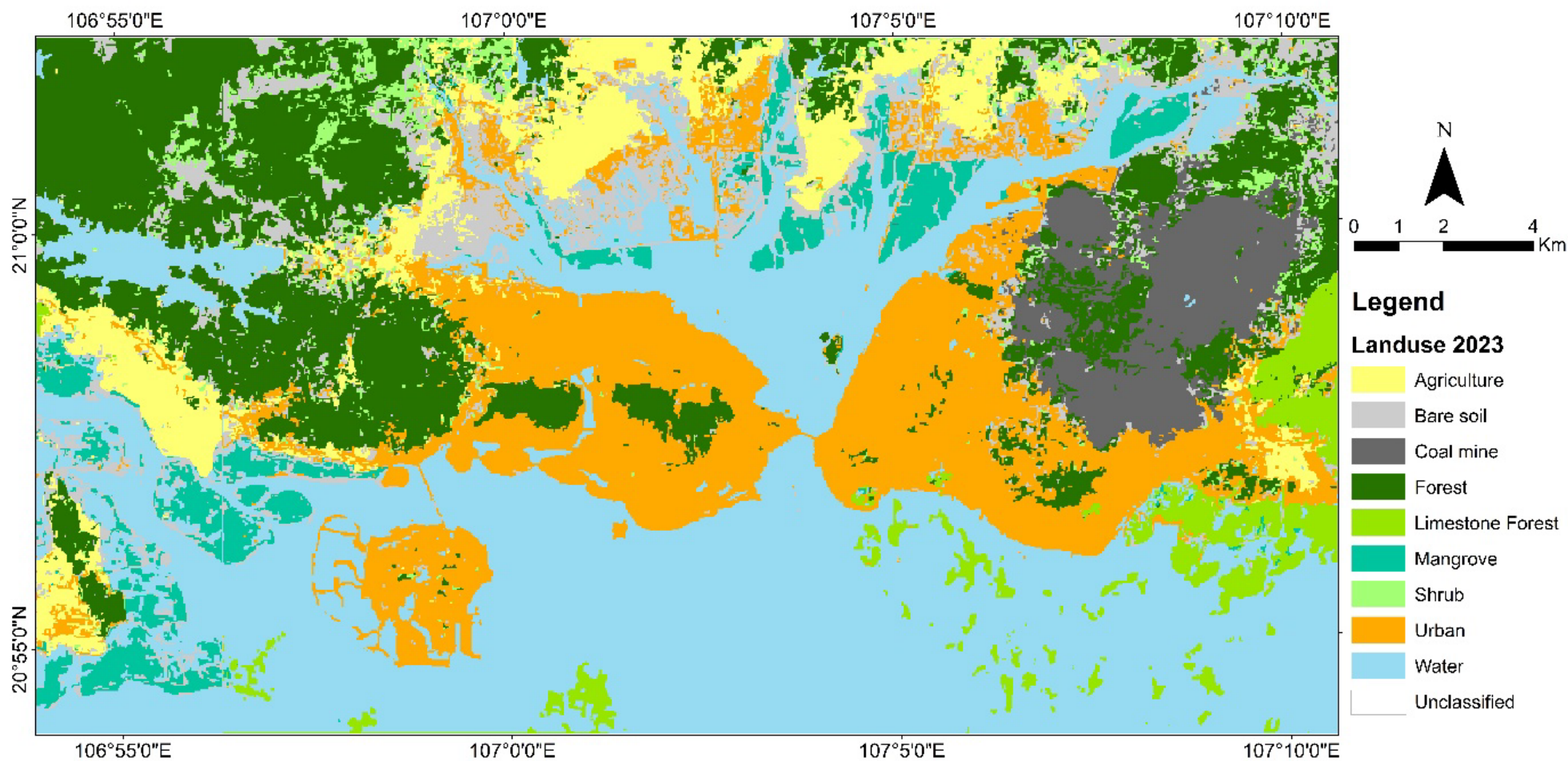
2015

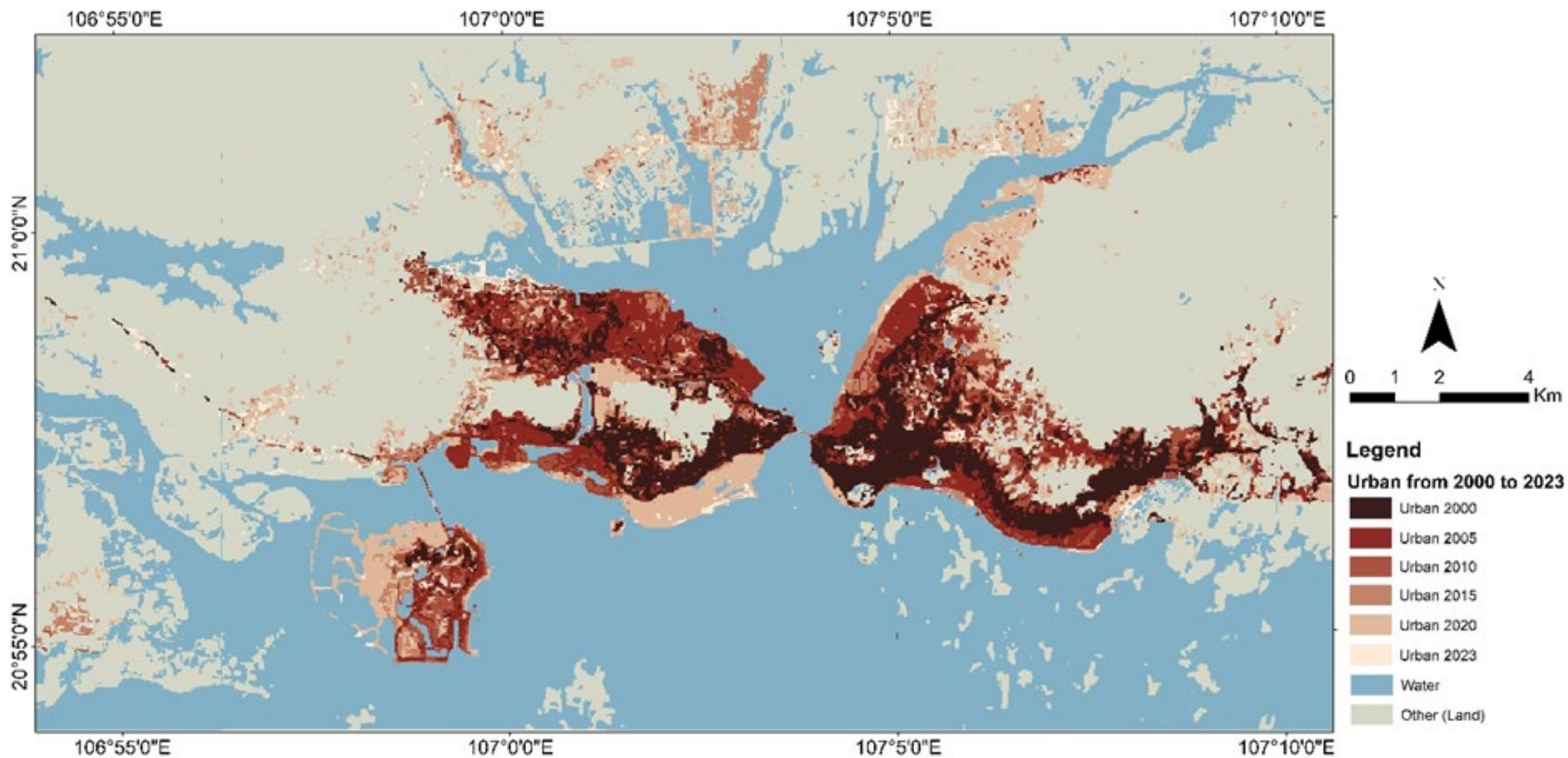


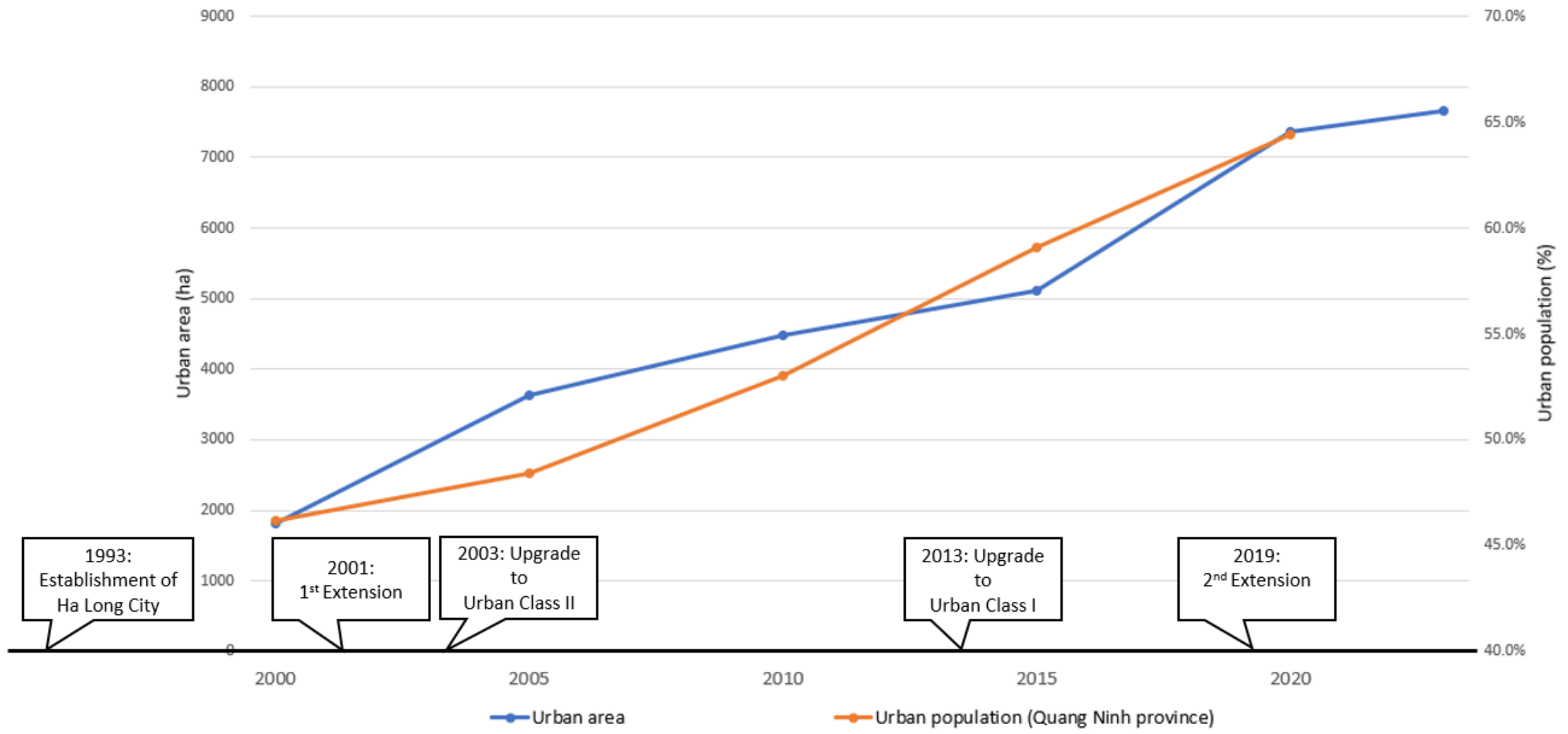
2020



2023







Discussion:

- Remote sensing data is useful for long-time LU/LC change – It may need the smart techniques
- The change occurs everyday, and accumulate some time big surprise
- The driving force of LU/LC change: City has its own story. However, the role of policy is significant

Thank you

