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THE IMPACTS OF THERMAL POWER PLANTS ON THE AIR QUALITY IN VIETNAM

Hanoi 02/2023

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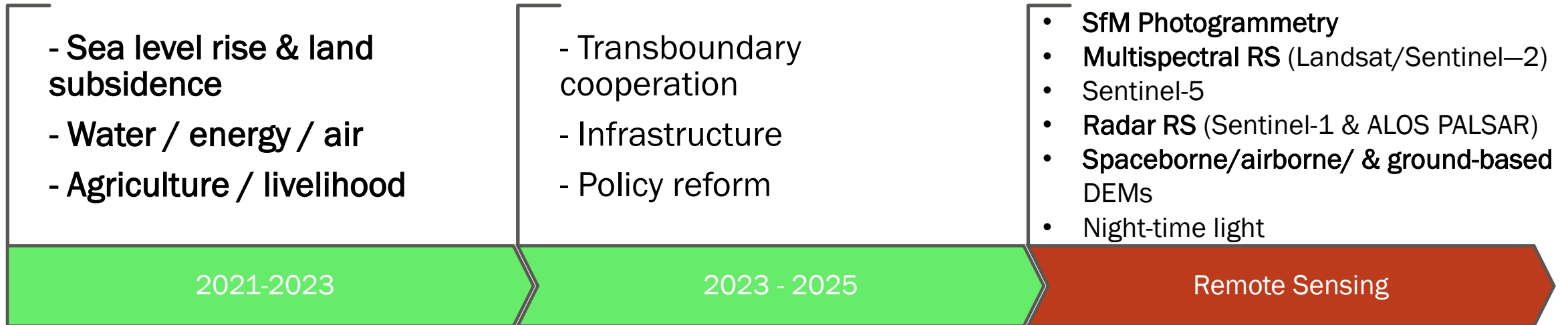Thuy T. Doan – Ph.D.

PRESENTATION OUTLINE

Introduction

Methodology

Data used

Results & Discussions

NATURAL CAPITAL MANAGEMENT (NCM) PROJECT

- Tackles the challenges in *water, agriculture, impacts of climate changes, energy, and ecosystems*, by scientific research & policy dialogue (www.mekong.org.vn)
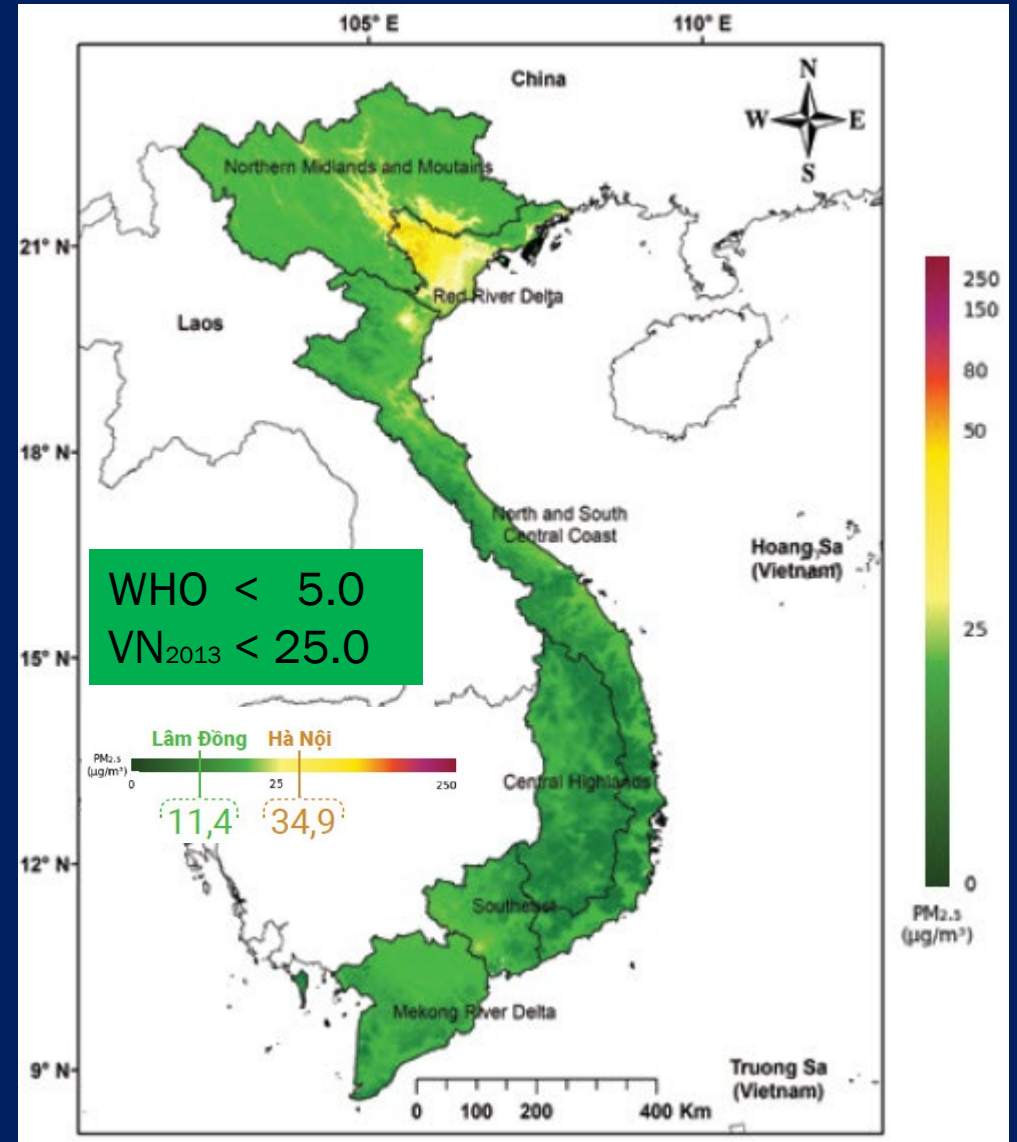
2021-2023	2023 - 2025	Remote Sensing
- Sea level rise & land subsidence - Water / energy / air - Agriculture / livelihood	- Transboundary cooperation - Infrastructure - Policy reform	• **SfM Photogrammetry** • **Multispectral RS** (Landsat/Sentinel—2) • Sentinel-5 • **Radar RS** (Sentinel-1 & ALOS PALSAR) • **Spaceborne/airborne/ & ground-based** DEMs • Night-time light

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Introduction

Primary sources of PM$_{2.5}$ emission:

- 3.3% ~ thermal power plants (TPP)
- 40% ~ burning of agricultural residuals
- 15% ~ cooking
- 13% ~ transport
- 12.7% ~ forest fires
- 11% ~ industrial activities

Other analysis (VAST & IIASA, 2018):

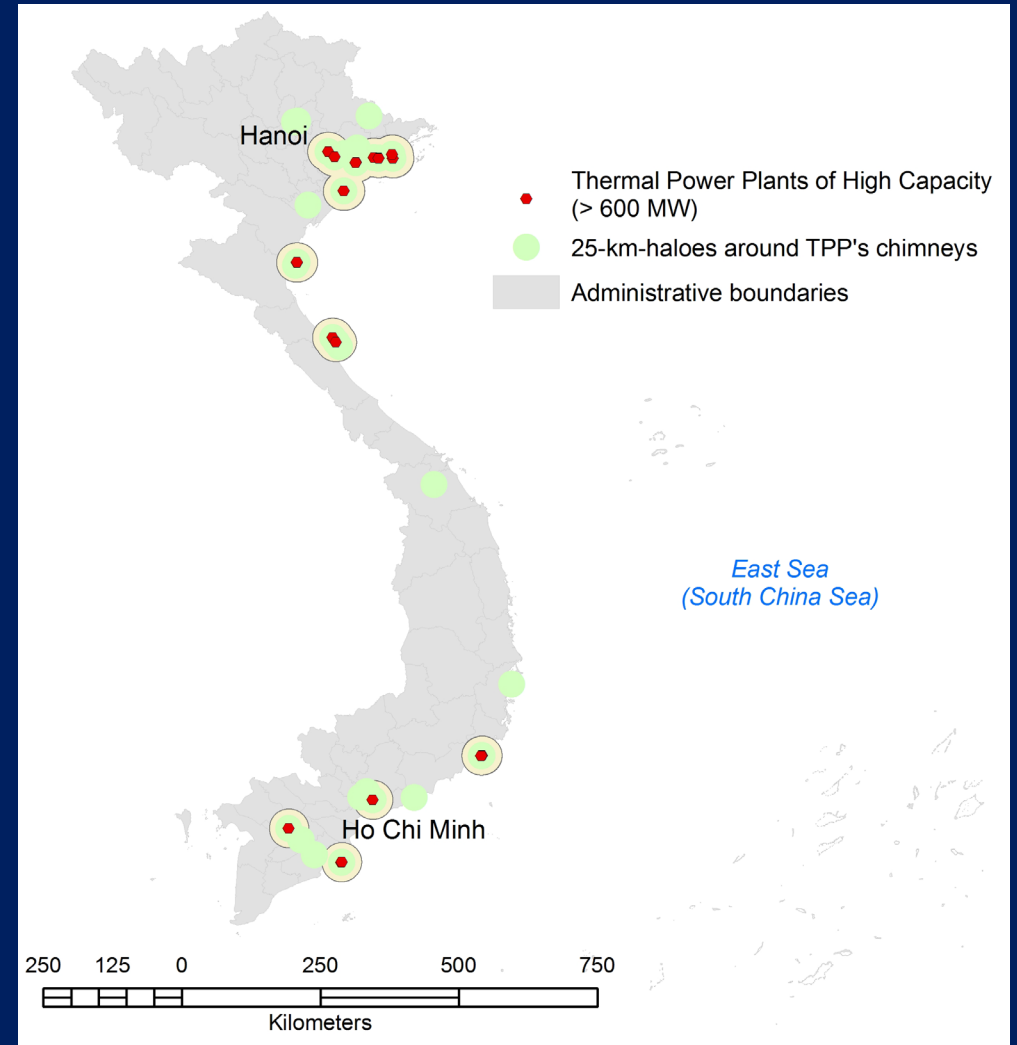- > 20% of PMs in Hanoi was from TPP & industrial activities

WHO < 5.0
VN$_{2013}$ < 25.0

Thanh Nguyen et al. 2022. The status of PM 2.5 & its impacts on public health in Vietnam 2021.

Introduction

Primary sources of PM$_{2.5}$ emission:

- 3.3% ~ thermal power plants (TPP)
- 97% ~ from other sources

Other analysis (VAST & IIASA, 2018):

- \> 20% of PMs in Hanoi was from TPP & industrial activities

Legend:
- Thermal Power Plants of High Capacity (> 600 MW)
- 25-km-haloes around TPP's chimneys
- Administrative boundaries

Hanoi

Ho Chi Minh

East Sea (South China Sea)

250 125 0 250 500 750
Kilometers

Introduction

Electric demand growth:

- High growth rate 10-12%/year

Electricity intensity:

- Energy intensive economy

EVN estimated:

- TPP accounted for 43% output capacity in 2020 (26,000 MW)
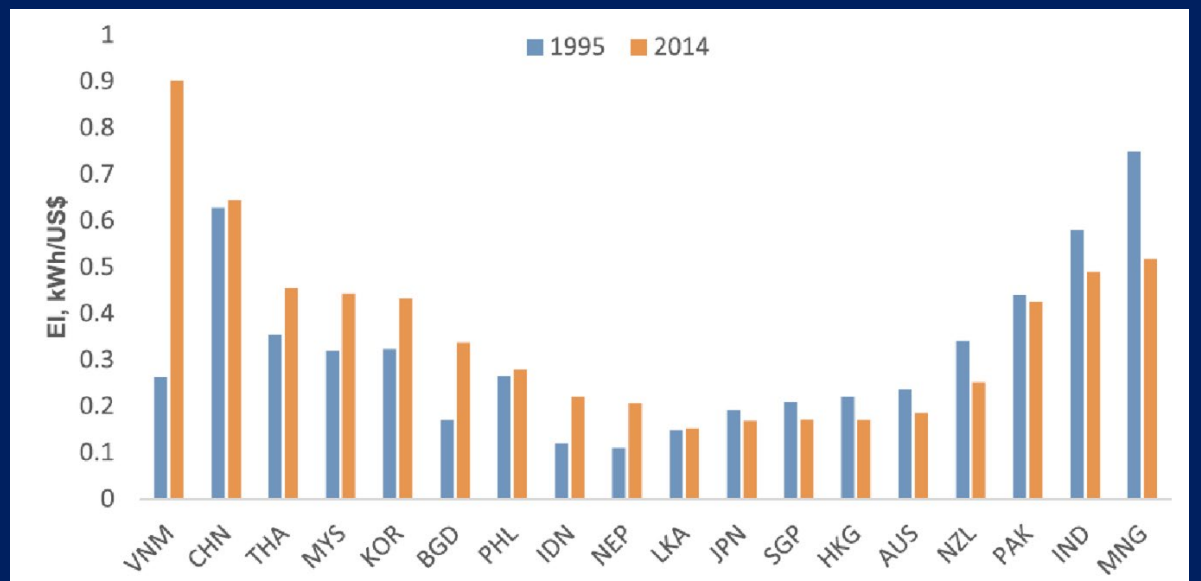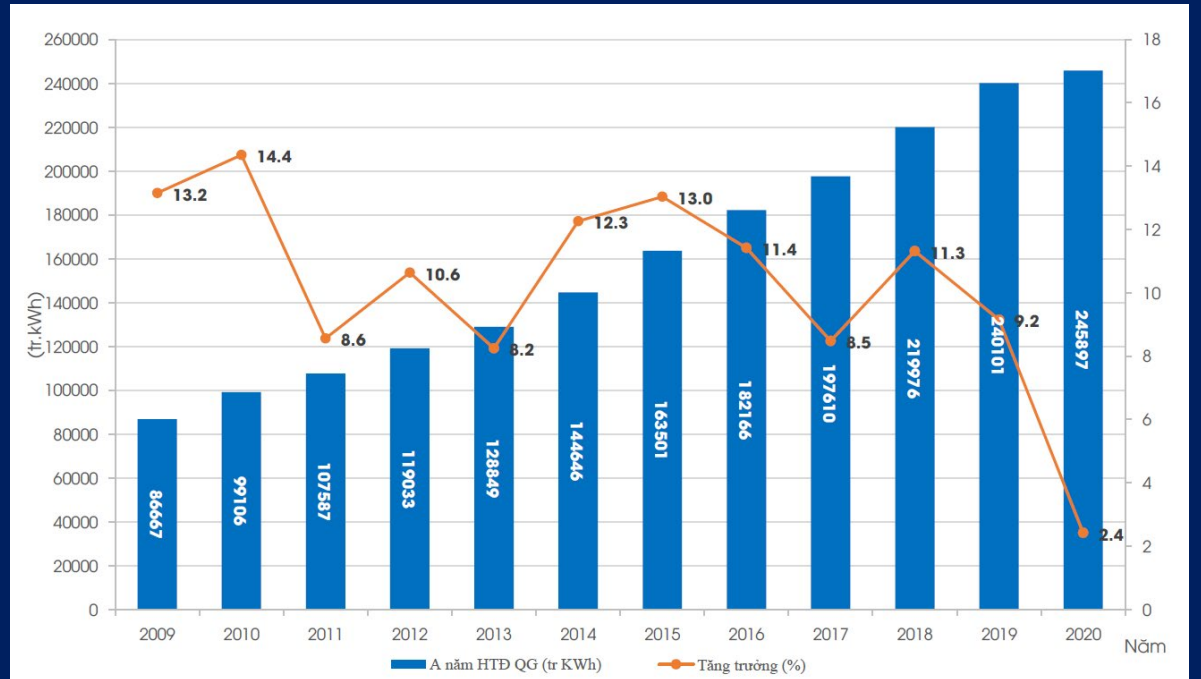
Methodology
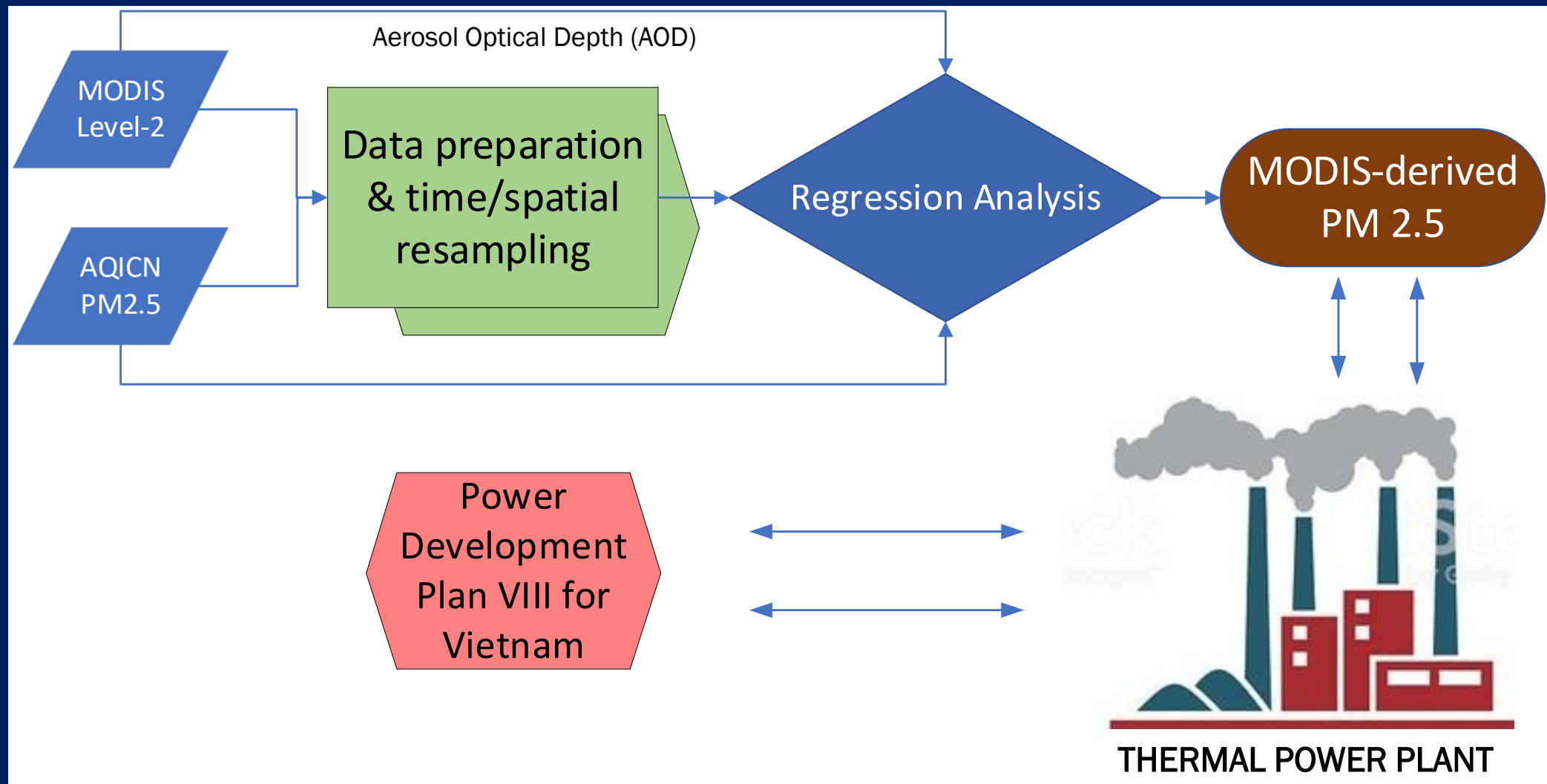
Methodology

Ground-based PM$_{2.5}$:

- Air quality index project (www.aqicn.org)
- Aerosol Robotic Network (AERONET) (https://aeronet.gsfc.nasa.gov/)

Aerosol Optical Depth (AOD) from RS data:
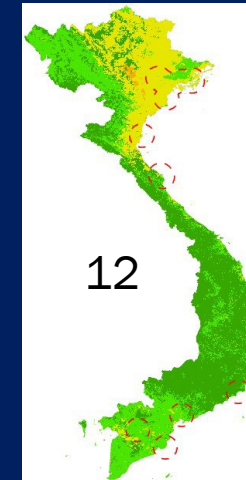
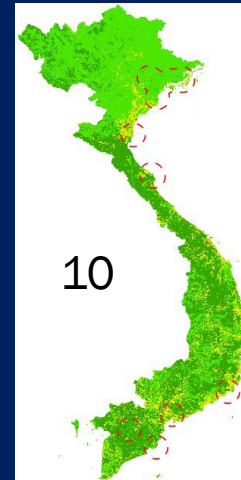- MODIS level-2 data archive 2019 - 2022
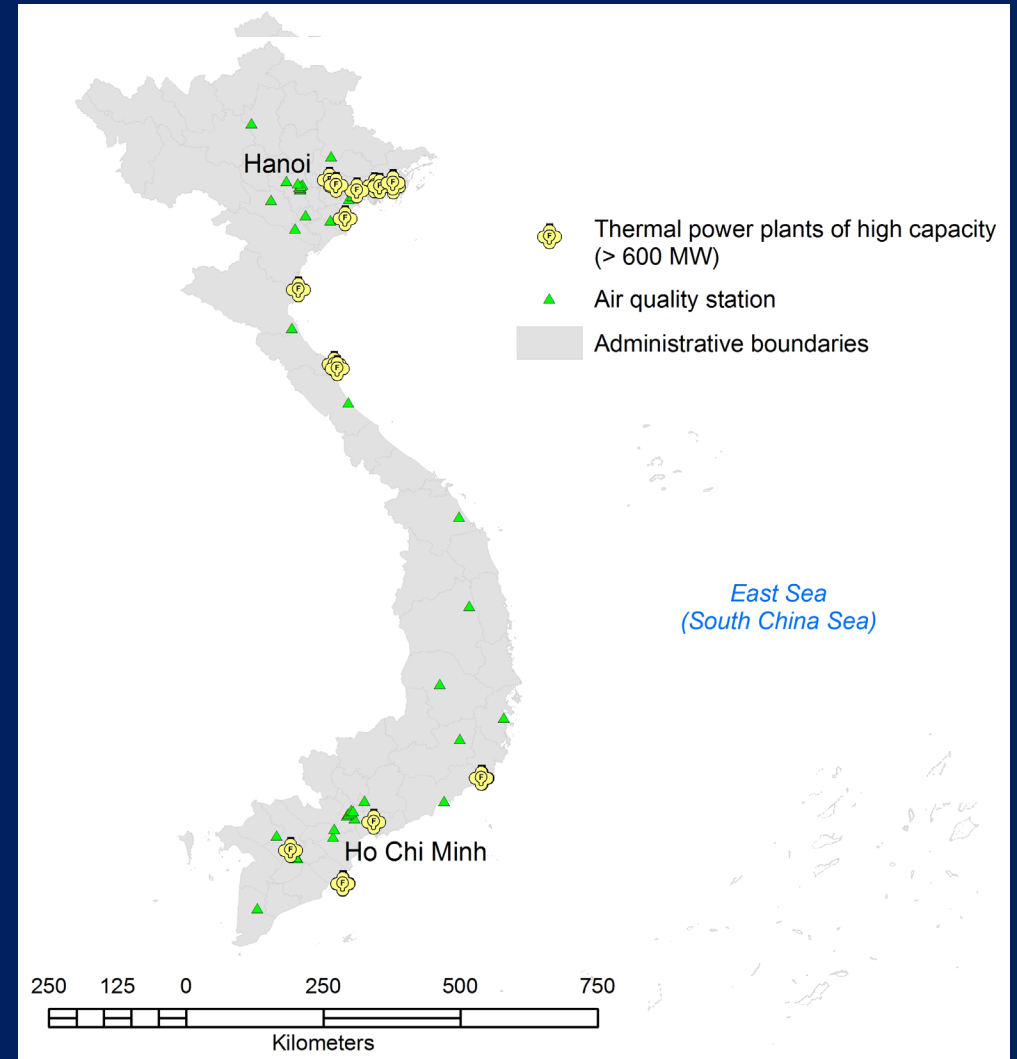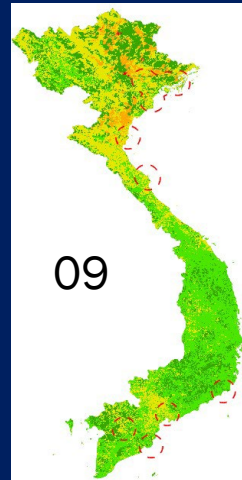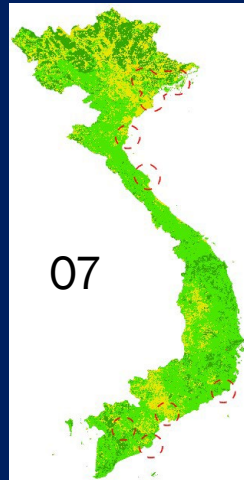
Methodology

- Single regression analysis between **RS-derived AOD** vs **Ground PM 2.5:**
  - ❖ based on averaged 24 bi-week measurements from AQICN
  - ❖ only from 09/2022 – 01/2023
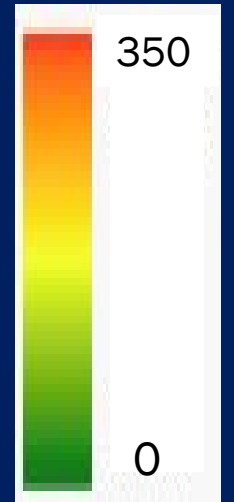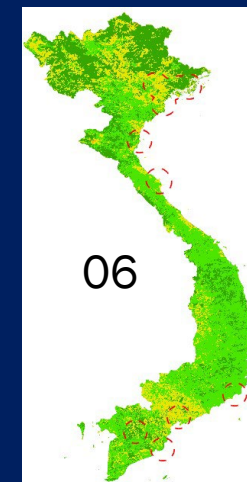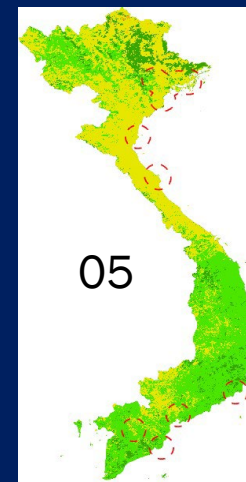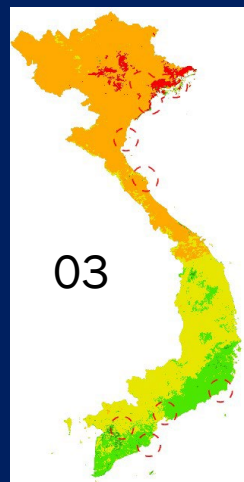- Only characterized for ~ 60% of the variability of the air quality
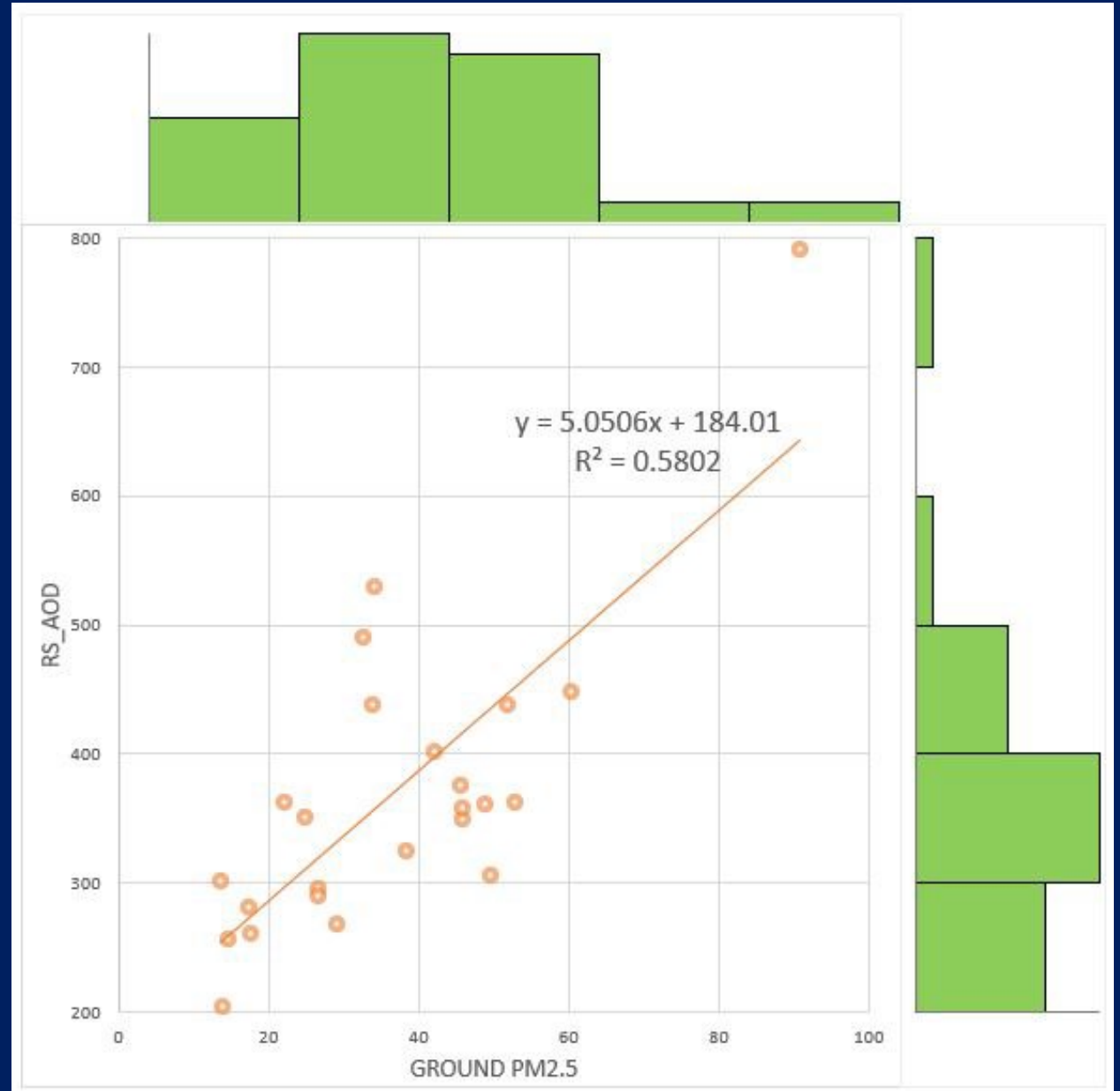
Averaged PM 2.5 - 2022
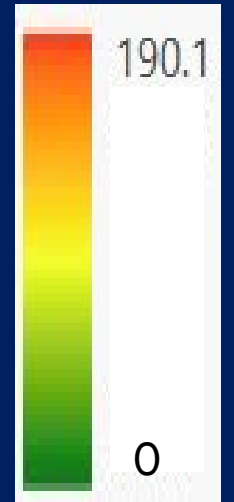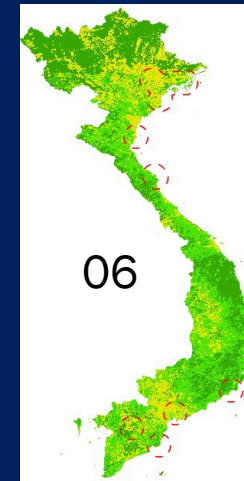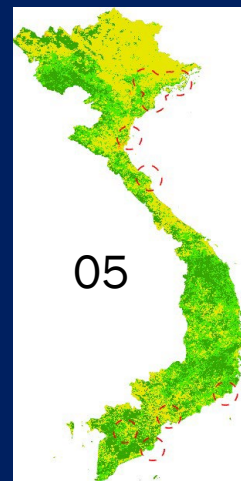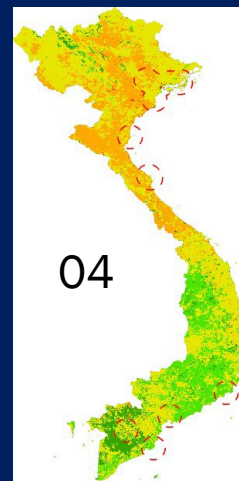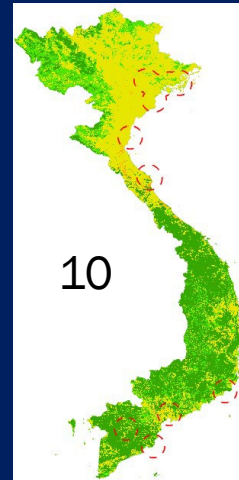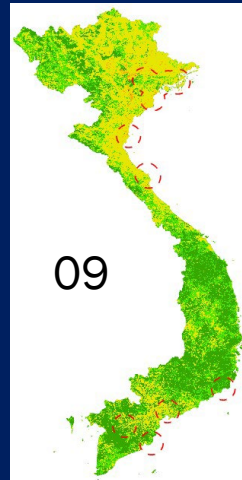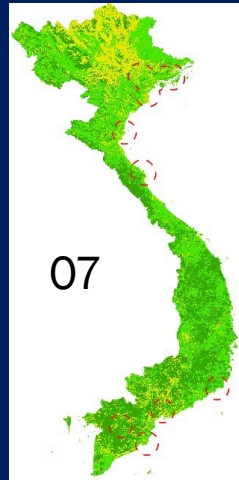
Averaged PM 2.5 - 2020
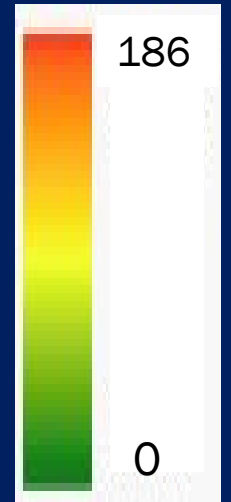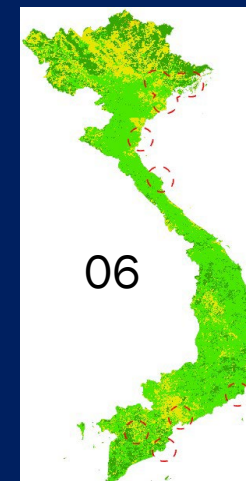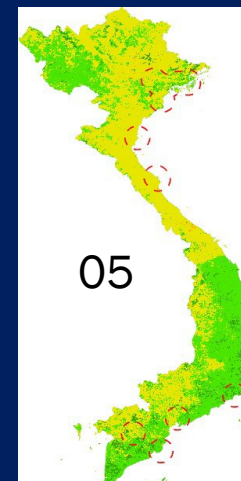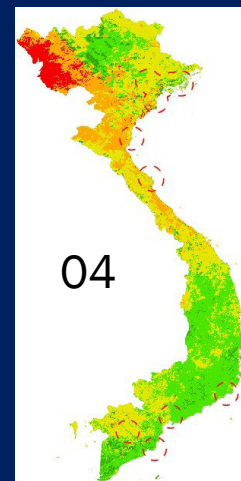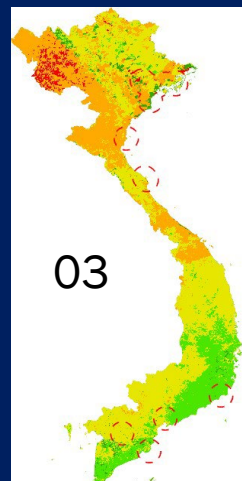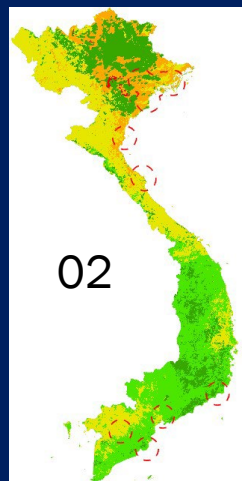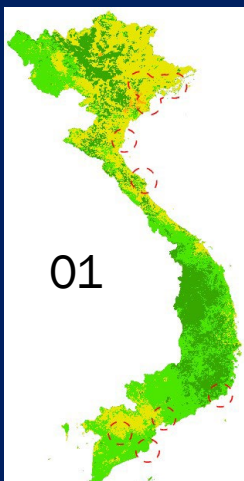
Averaged PM 2.5 - 2010

Averaged PM 2.5 - 2000

Patterns of air quality near TPP

- Air quality getting worse over time (peak time: Jan. – Apr.)
- Better air quality in the past few years

- All > 30 $\mu g/m3$

Mean PM 2.5 from 2000 - 2023

Patterns of air quality near TPP

- Max PM 2.5 fluctuates (does not get any better)

- Get worse over time

Max PM 2.5 from 2000 - 2023
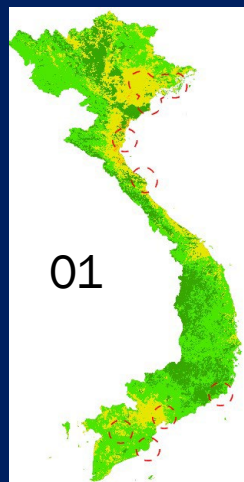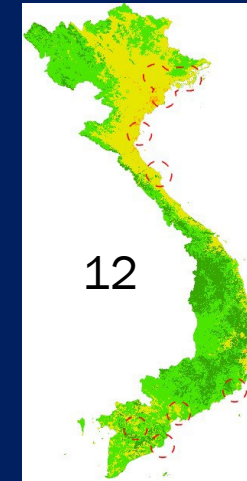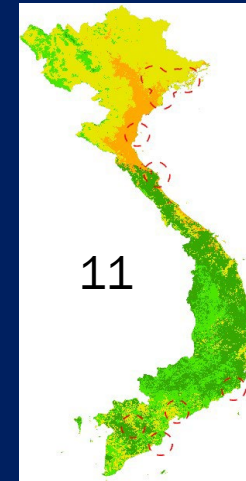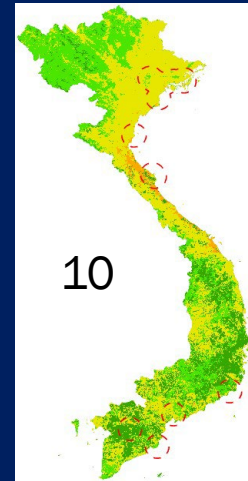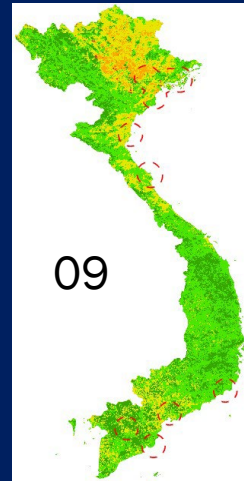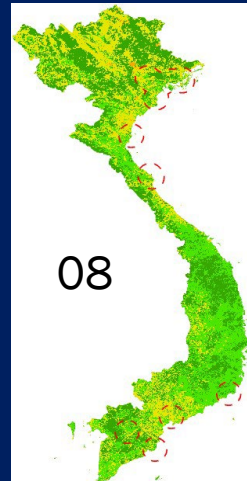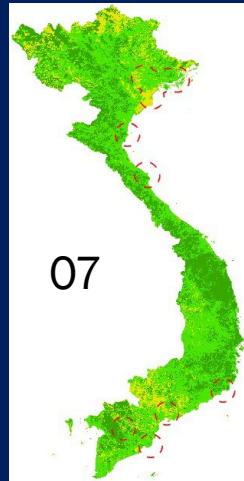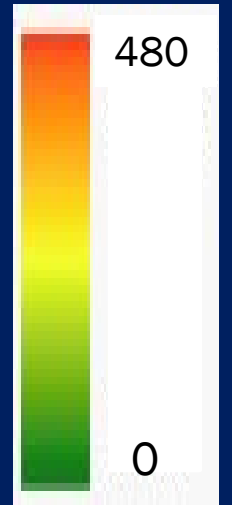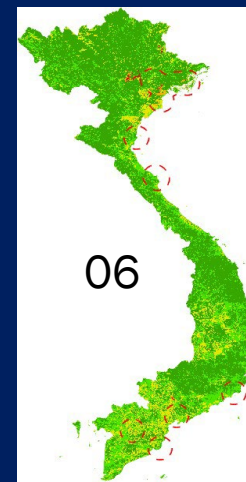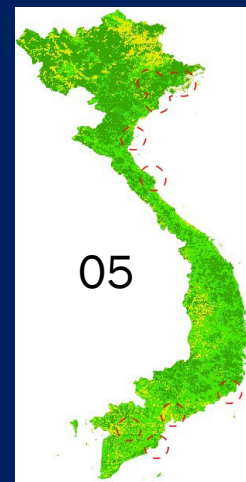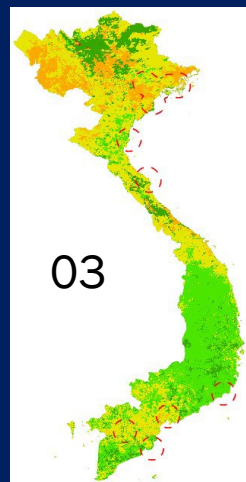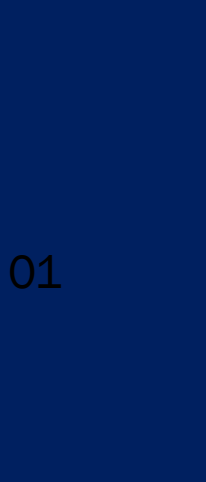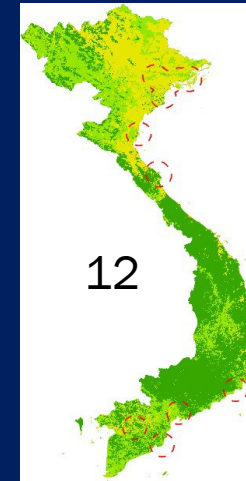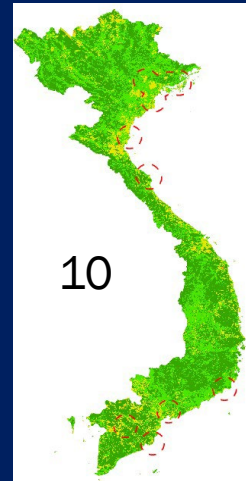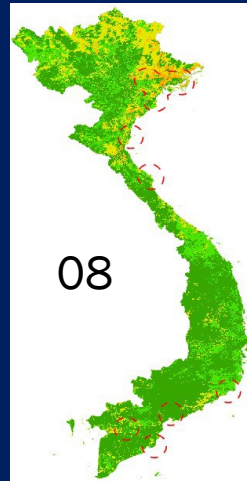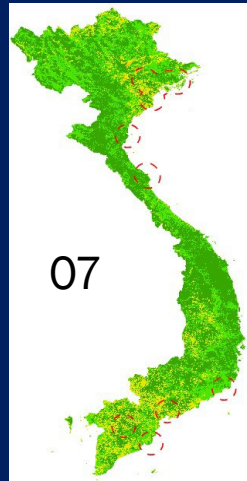
Results & discussions

- Air quality worsen by TPP over the year

- Current reduction in Coal energy does not guarantee "Net zero emission' by 2030

After COP26, power capacity mix in PDP8 shifted toward less coal and LNG, more RE

Compare installed capacity of Draft PDP8 ver. 10/2022 (after COP26) and ver. 3/2021 (before COP26) Year 2045

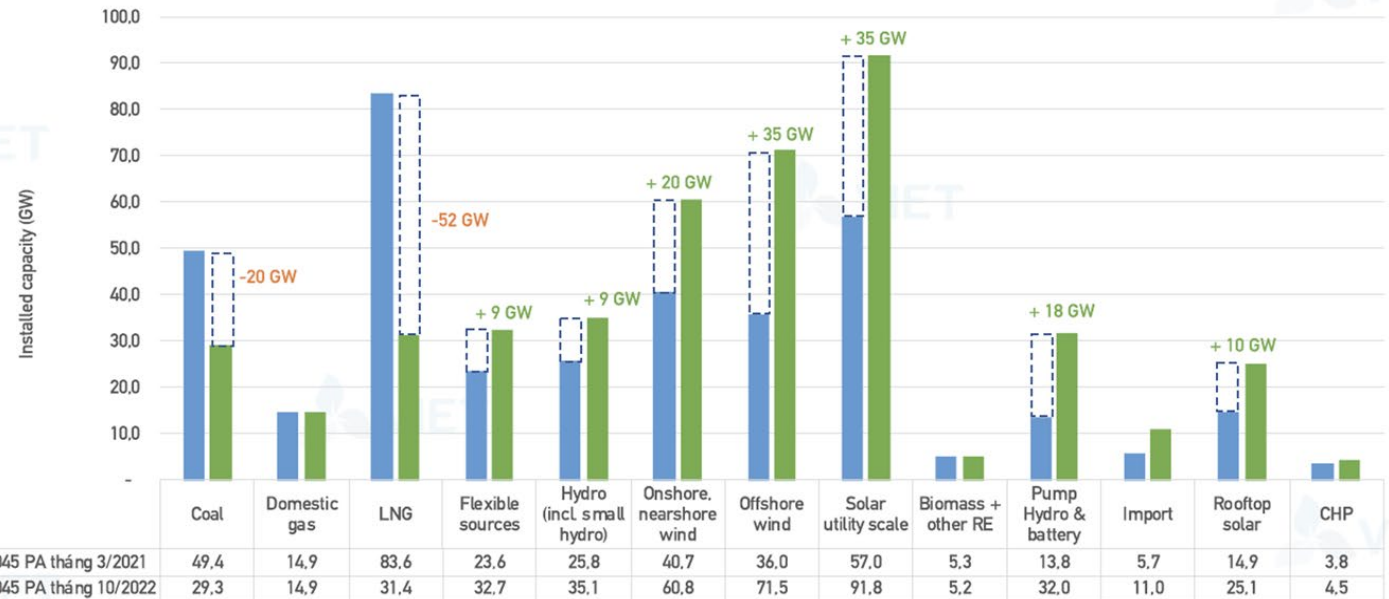|	Coal	Domestic gas	LNG	Flexible sources	Hydro (incl. small hydro)	Onshore, nearshore wind	Offshore wind	Solar utility scale	Biomass + other RE	Pump Hydro & battery	Import	Rooftop solar	CHP
2045 PA tháng 3/2021	49,4	14,9	83,6	23,6	25,8	40,7	36,0	57,0	5,3	13,8	5,7	14,9	3,8
2045 PA tháng 10/2022	29,3	14,9	31,4	32,7	35,1	60,8	71,5	91,8	5,2	32,0	11,0	25,1	4,5

Source: Draft PDP8 attached MOIT's letter 6328/TTr-BCT dated 13/10/2022

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THANK YOU FOR YOUR ATTENTION!