

# AIR QUALITY IN HANOI

Current Situation  
& Policy Intervention



# Outline

<b>I</b>	<u>Current Situation of Air Quality in Hanoi</u>
<b>2</b>	<u>Estimated Loss for Air Pollution</u>
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<b>4</b>	<u>Policy Recommendations for Better Air Quality Management</u>
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# CURRENT SITUATION OF AIR QUALITY IN HANOI



*This is how  
we see and feel  
everyday...*





*...and  
how we see  
everyday  
on the roads*

*What is happening with  
air quality in Hanoi?*

# Evaluation of Air Quality in Hanoi

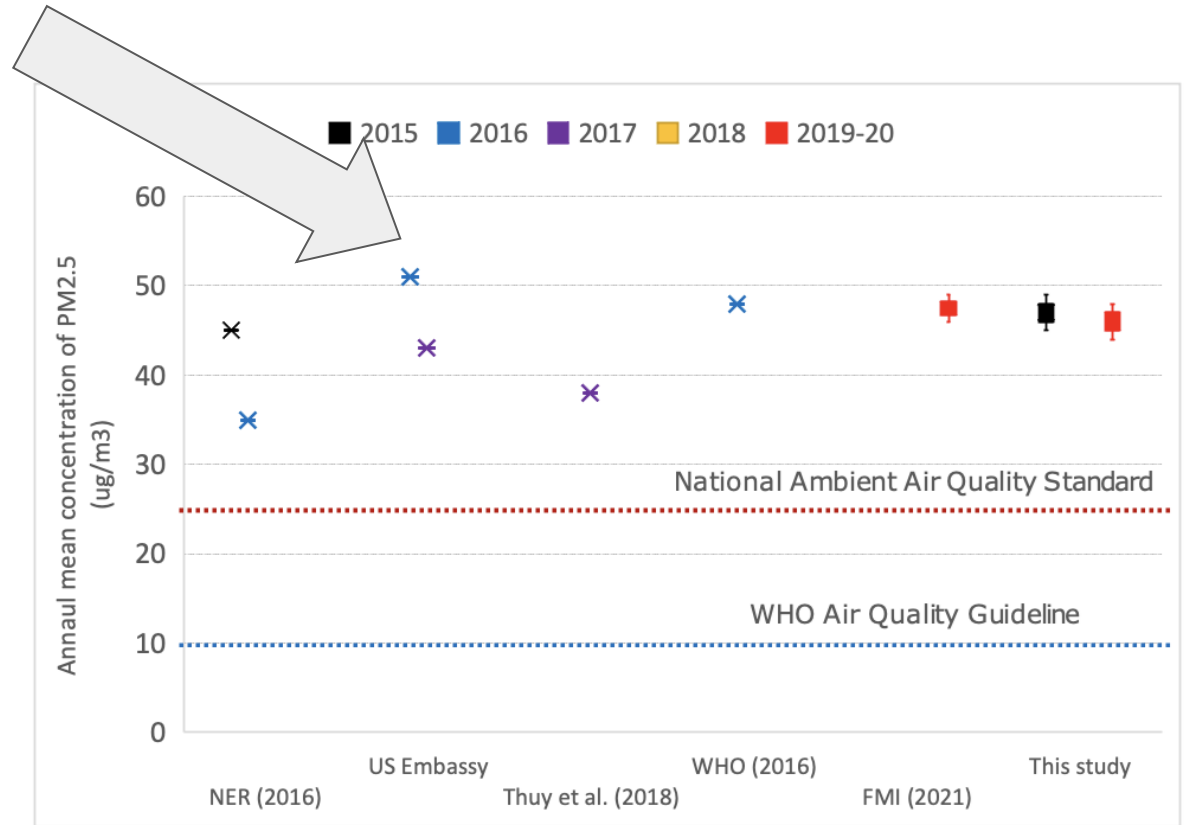
*GAINS Model offers three way to reveal policy interventions with multiple benefits*

**1** **SIMULATION**  
of the costs, health & ecosystem benefit  
*of user-defined packages of emission control measures*

**2** **COST-EFFECTIVENESS ANALYSIS**  
to identify least-cost package  
*of measures that achieve user-defined policy targets*

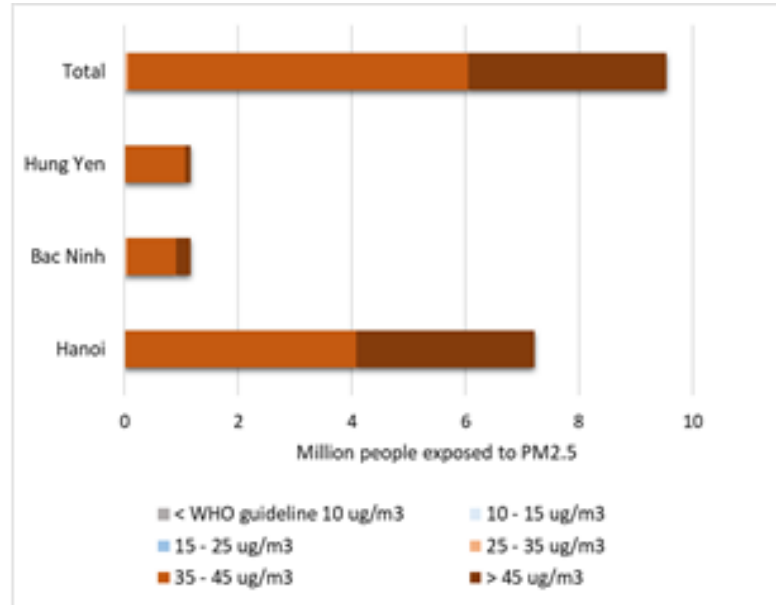
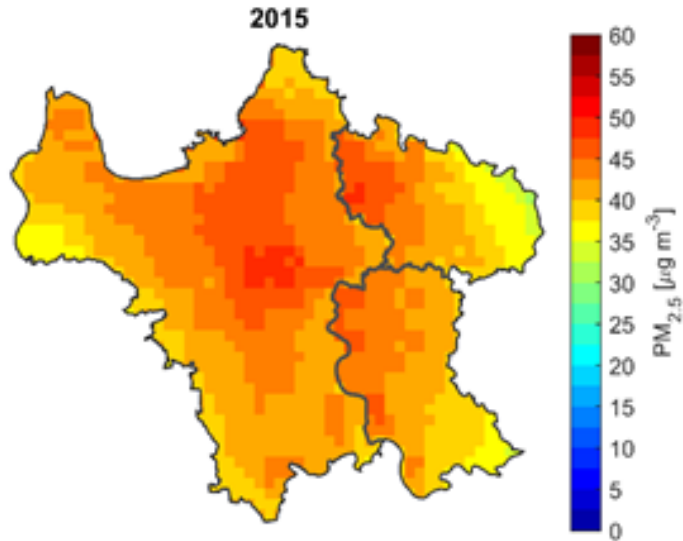
**3** **COST-BENEFIT ASSESSMENTS**  
*that maximize/monitised net benefits of policy interventions*

Annual average PM2.5 concentrations in 2015: over  $50 \mu\text{g}/\text{m}^3$  for Hanoi



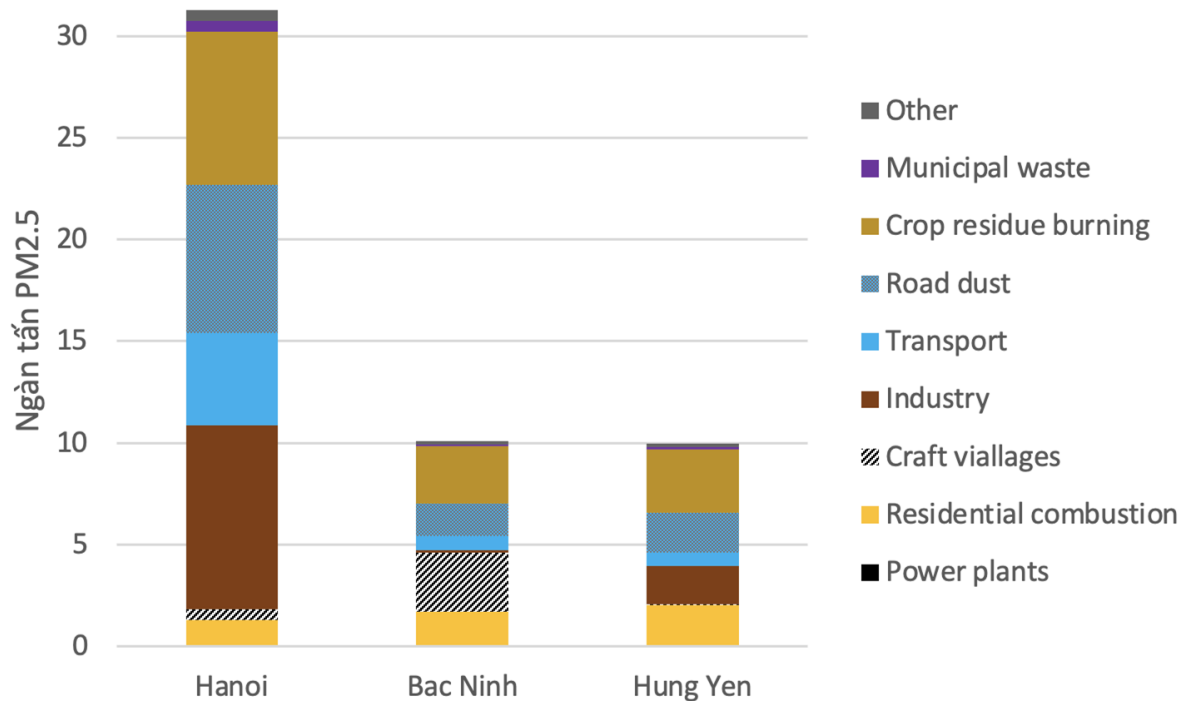


40% of the total population (3.2 million) in Hanoi were exposed to concentrations exceeding  $45 \mu\text{g}/\text{m}^3$ , nearly five times higher than the WHO air quality guideline recommendation



## Key primary PM<sub>2.5</sub> sources in Hanoi

- 29% from industrial activities
- 26% from open burning of rice straw
- 23% from road dust
- 15% from transport (mainly transport on road)
- Others from residential/commercial combustion, craft villages, and waste

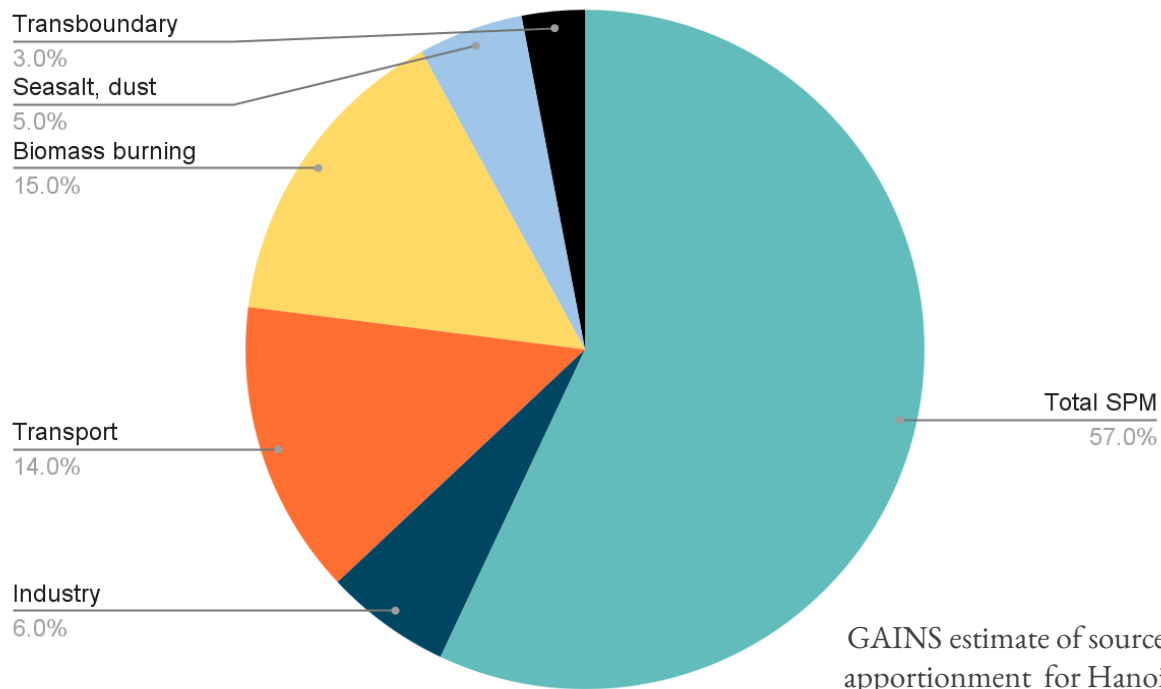


PM 2.5 Emission (2015)

# About half of the Particulate Matter mass **composed of secondary particulate matter (SPM)**

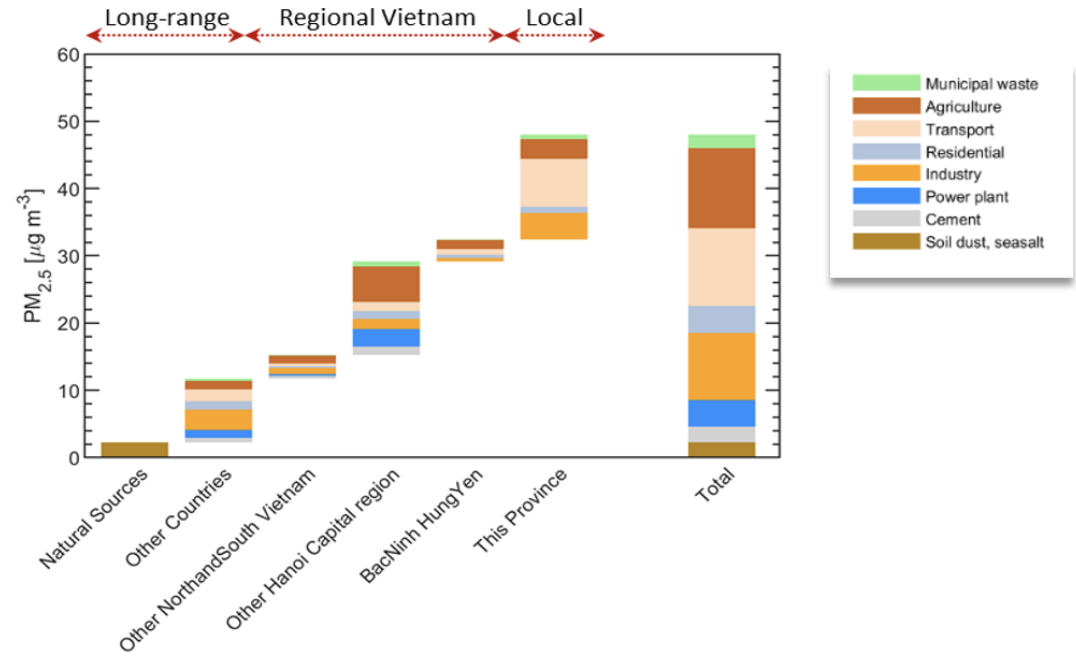
Vietnam GAINS AQM model validated of the sources measured by FMI at two monitoring stations: Hanoi EPA and N-CEMM

*Source apportionment analysis performed by FMI and GAINS also shows same results*



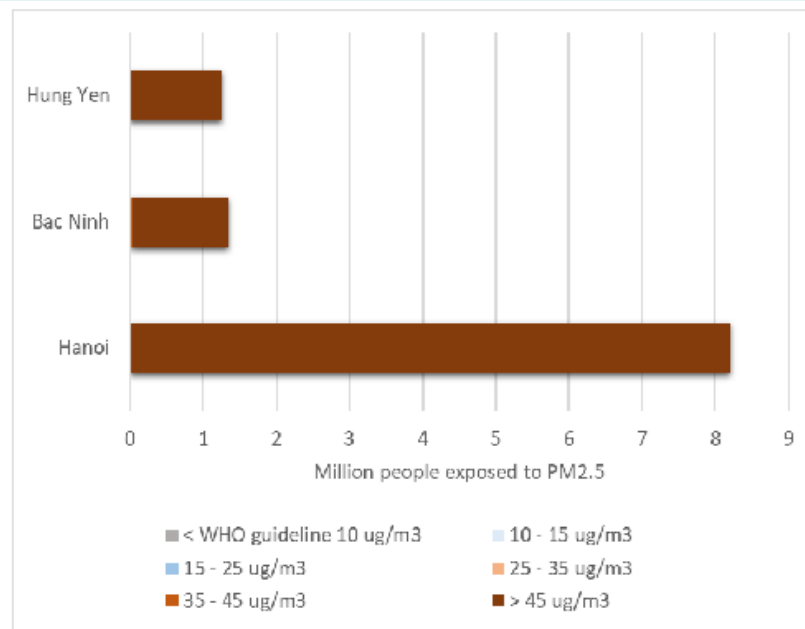
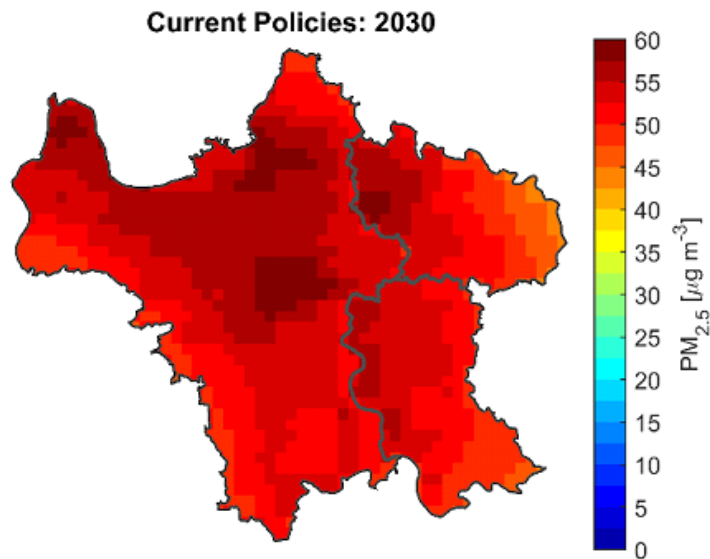
GAINS estimate of source apportionment for Hanoi for years 2015-2020.

Only about one third of PM<sub>2.5</sub> in the ambient air originates from local emission sources while the rest is transported from the Greater Hanoi areas, Red River Delta Region, other provinces in Vietnam, as well as other countries, international shipping and natural sources



*Nồng độ các nguồn bụi PM<sub>2.5</sub> (trung bình năm theo trọng số dân số) ở Hà Nội vào năm 2015.*

Ambient PM<sub>2.5</sub> concentrations would continue increasing throughout the region up to 2030, more than twice above Vietnam's NAAQS of 25  $\mu\text{g}/\text{m}^3$ , exceed the global guideline value of the WHO



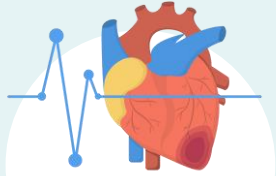
*Ambient concentrations (left panel) and population exposure (right panel) for PM<sub>2.5</sub> in the current policy case in 2030*

# ESTIMATED LOSS FOR AIR POLLUTION



*6 main health effects  
of long term exposure to outdoor  
ambient PM<sub>2.5</sub> air pollution*





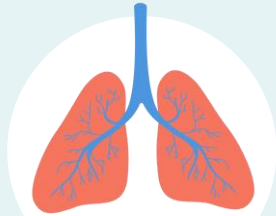
**Ischemic heart  
disease (IHD)**



**Cerebrovascular  
disease (stroke)**



**Chronic obstructive  
pulmonary disease (COPD)**



**Lung cancer (LC)**



**Acute lower respiratory  
infections (ALRI)**



**Diabetes type II  
among adult**



The ambient PM2.5 concentrations in the **15 provinces** have caused more and more serious illness

**18,000**  
deaths



**225 mil**  
days lived  
with illness

- (A) Ha Noi;
- (B) Bac Ninh province;
- (C) Hung Yen province;
- (D) The Greater Ha Noi region and Red River Delta, i.e., the Red River Delta and northern midland. This includes the provinces of Hai Duong, Bac Giang, Quang Ninh, Hai Phong, Thai Binh, Ha Nam, Nam Dinh, Ninh Binh, Thai Nguyen, Vinh Phuc, and Hoa Binh;
- (E) The remaining areas of northern and northern central Vietnam, i.e., the provinces of Son La, Yen Bai, Lao Cai, Lang Son, Thanh Hoa, and Nghe An.

# Number of deaths from ambient PM<sub>2.5</sub> in Hanoi is high

32%

or 5,800 deaths  
in Hanoi

9%

or 1,700 deaths  
in Bac Ninh and  
Hung Yen

Bac Ninh  
Hung Yen

41%

or 7,400 deaths  
in 8 RRD  
provinces

Vinh Phuc Vinh Phuc  
Quang Ninh Quang Ninh  
Hai Duong Hai Duong  
Hai Phong Hai Phong  
Thai Binh Thai Binh  
Ha Nam Ha Nam  
Nam Dinh Nam Dinh  
Ninh Binh Ninh Binh

17%

or 3,100 deaths  
in 4 Northern  
Midlands &  
Mountain  
Regions

Thai Nguyen  
Bac Giang  
Phu Tho  
Hoa Binh

The social cost or  
welfare cost of these  
health effects  
**is enormous**

7.74%

*GRDP in Hanoi*

5.9%

*GRDP in RRD regions*

5.29%

*GRDP in Northern Midlands &  
Mountain Areas*

# BENEFITS OF AIR QUALITY IMPROVEMENT



With the large health effects of ambient air pollution in the 15 provinces, **health benefits of air quality improvements will be substantial.**



**4,500-13,300**  
lives saved/year

**25-74%**  
deaths  
decreased/year

*Reaching WHO Interim Targets of 25  $\mu\text{g}/\text{m}^3$  and 15  $\mu\text{g}/\text{m}^3$  of annual  $\text{PM}_{2.5}$ , and the WHO Air Quality Guideline of 10  $\mu\text{g}/\text{m}^3$  of annual  $\text{PM}_{2.5}$  may save health and economic loss.*



**2-5.1%**  
GDP saved

**44-114 tril**  
**VND**  
Saved/year

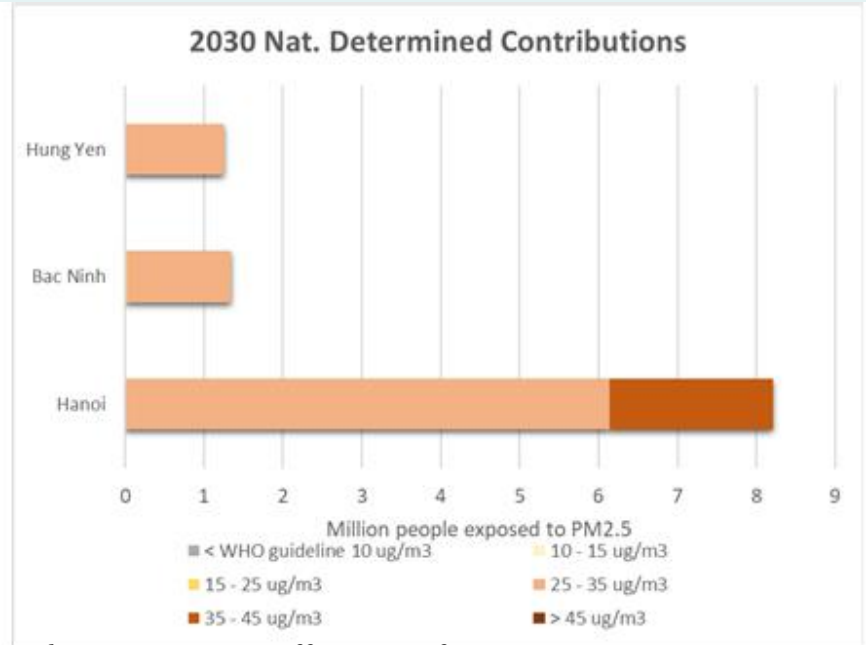
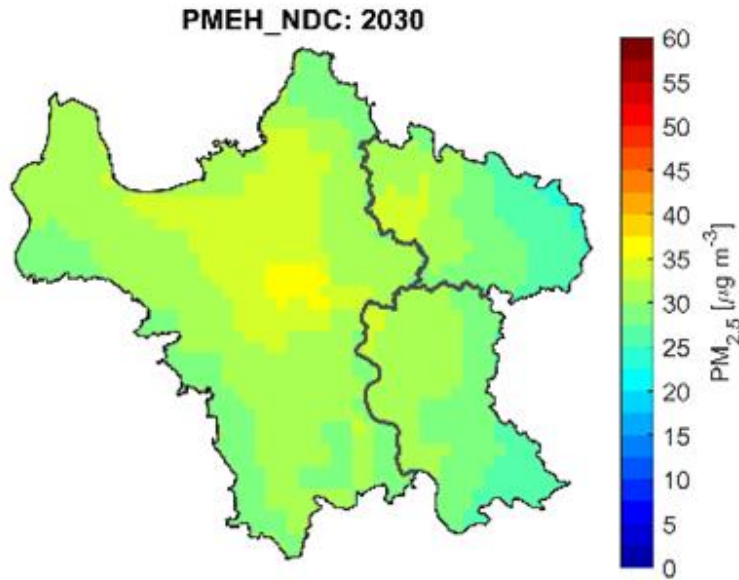


# POLICY RECOMMENDATIONS TO REDUCE AIR POLLUTION IN HANOI



# POLICY INTERVENTIONS

The implementation of newly issued policies including the NDC will **bring sizable improvement and concentrations decline** from nearly  $60\mu\text{g}/\text{m}^3/\text{year}$  to about  $35\mu\text{g}/\text{m}^3/\text{year}$ . Still higher than the national standards of  $25\mu\text{g}/\text{m}^3$ .



*GAINS AQM model can help Hanoi and MONRE to determine most-cost effective specific air measures to take in short term and analyse costs and benefits to inform decisions*

*Despite already adopted policies, Hanoi's air quality **could further deteriorate** in the future.*

*The newly announced policies **bring improvement in terms of population exposure** but still **do not lead to air quality** that meets the national requirements.*





*Effective improvements to Hanoi's air quality **requires further actions and it must be coordinated with neighboring provinces.***



*Substantial improvement in air quality requires **cost-effectiveness measures across all sectors to avoid high costs** for government and private sector.*





# 1

## Need to further strengthen emission limit values for power plants and industry

(for PM<sub>2.5</sub> and SO<sub>2</sub> for large installations)

- *Need flue gas desulphurization and high-efficiency dust filters.*
- *Reduce coal and biomass use in boilers and furnaces in industry in craft villages*
- *Contribute over 30% of the achieved reduction of the PM<sub>2.5</sub> concentrations*

# 2

Need to effectively **enforce the ban on open burning** of crop residues & **introduce measures to suppress road dust**

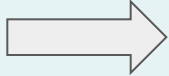
- *Ban open burning of crop residues will contribute ~25% of total decline in PM<sub>2.5</sub> concentrations*



# 3

## Need to strictly **tighten standards for road and non-road vehicles**, including motorcycles

- *Promote public transport & electric vehicles*
- *Enforce the emission control standards for motorcycles*



*Contribute to reduce about  $5\mu\text{g}/\text{m}^3$  of  $\text{PM}_{2.5}$*





# 4

## Develop sustainable waste management strategies

- *Eliminate open burning of waste*
- *Improve waste treatment, higher collection rates, separation and recycling and stop burning of waste*



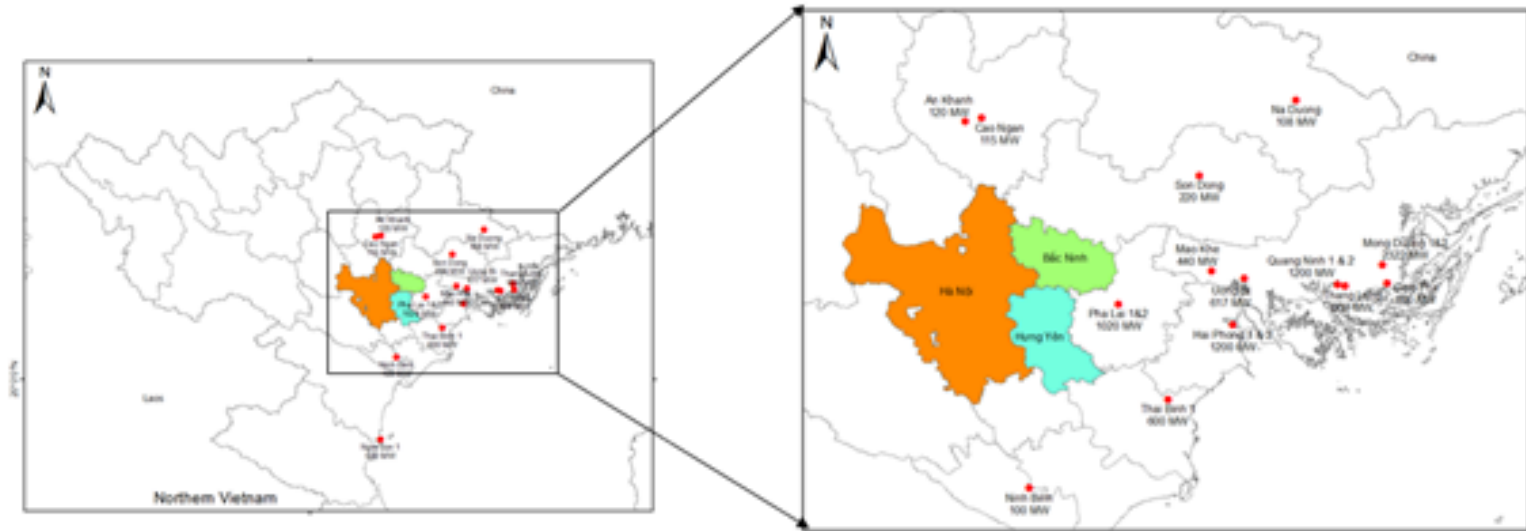
# 5

## Address sources of ammonia from agriculture

- *Reduce ammonia emissions from mineral fertilizer*

## New coal power plants **must comply with emission limits**

*i.e. Ultra Supercritical and advanced flue gas cleaning, or replace coal capacity with renewables as foreseen in the NDC policy*



*Most of coal-fired power plants are located East of Hanoi.*

*Contribution of coal plants to worsening air quality is expected to increase strongly in the next years.*



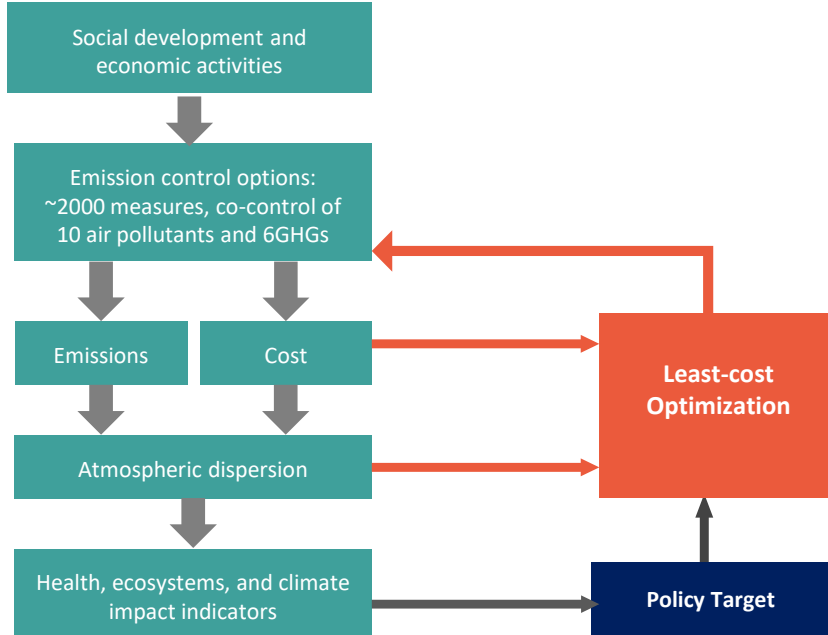
The implementation of newly introduced policies and the NDC will bring significant co-benefit for for GHG emission reduction, in addition to air pollution reduction.



# Annex

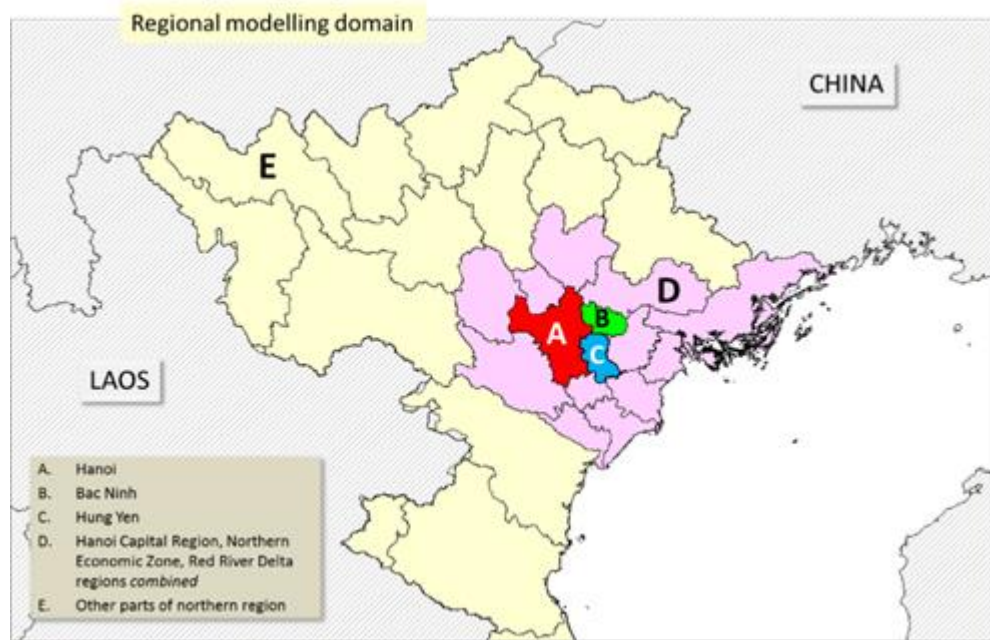
# The analysis conducted for this assessment employs the Greenhouse gas – Air pollution Interactions and Synergies (GAINS) model tool

## The GAINS model



- *The GAINS (Greenhouse gas-Air Pollution Interactions and Synergies)*
- *Developed by the International Institute for Applied Systems Analysis (IIASA)*
- *Applied and modelled in European countries, China, Thailand*

The GAINS model domain includes all northern Vietnam; impact of emissions from neighboring countries, international shipping, natural sources on concentrations in Vietnam is also considered in the model



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- (B) Bac Ninh province;
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