



AIR QUALITY IN HANOI

Current Situation
& Policy Intervention



Outline

I Current Situation of Air Quality in Hanoi

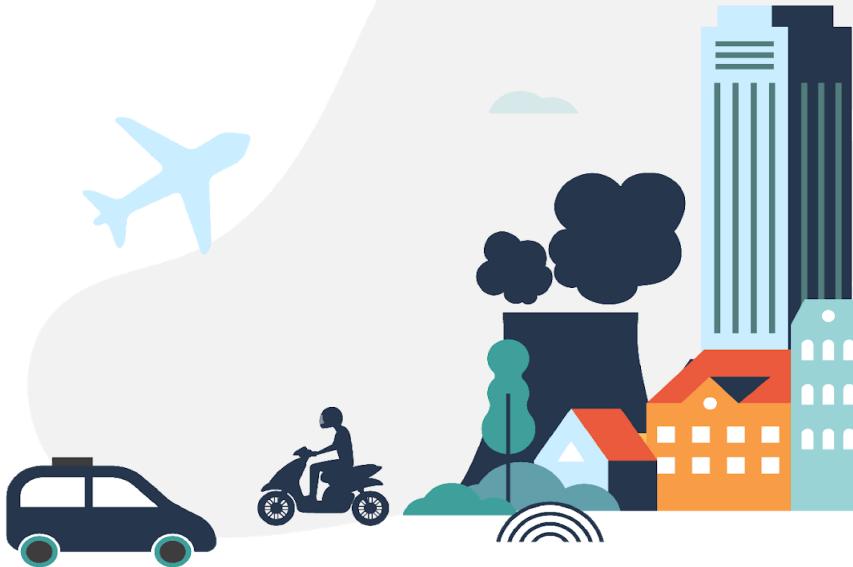
2 Estimated Loss for Air Pollution

3 Benefits of Air Quality Improvement

4 Policy Recommendations for Better Air Quality Management

5 Discussion

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

SIMULATION

of the costs, health & ecosystem benefit

of user-defined packages of emission control measures

2

COST-EFFECTIVENESS ANALYSIS

to identify least-cost package

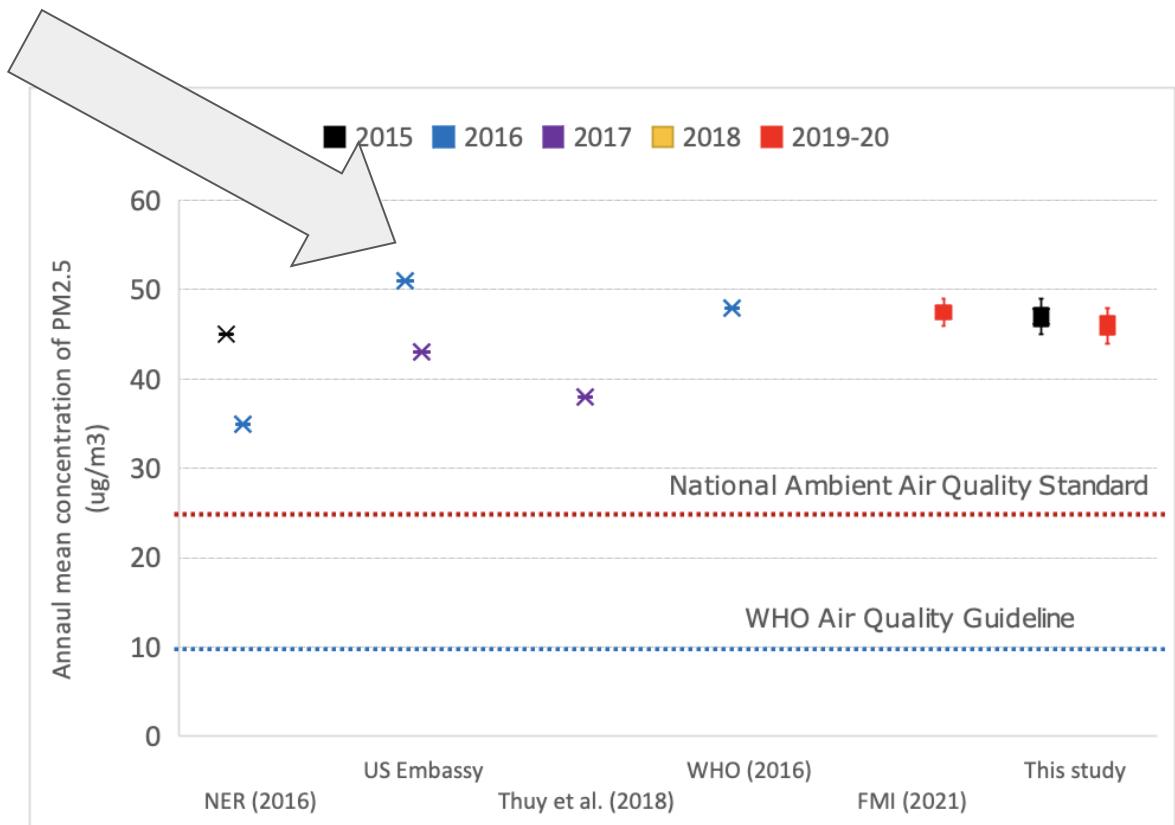
of measures that achieve user-defined policy targets

3

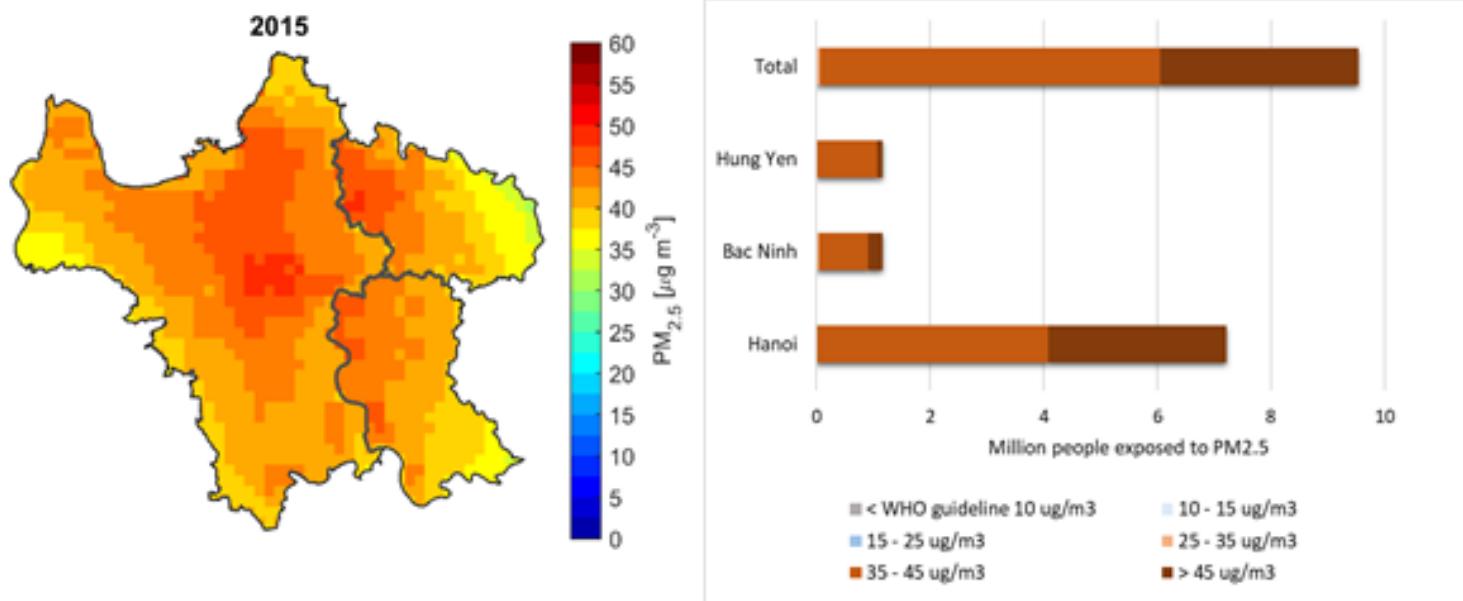
COST-BENEFIT ASSESSMENTS

that maximize/ monitorised net benefits of policy interventions

Annual average PM_{2.5}
concentrations in 2015:
over 50 µg/m³ for Hanoi

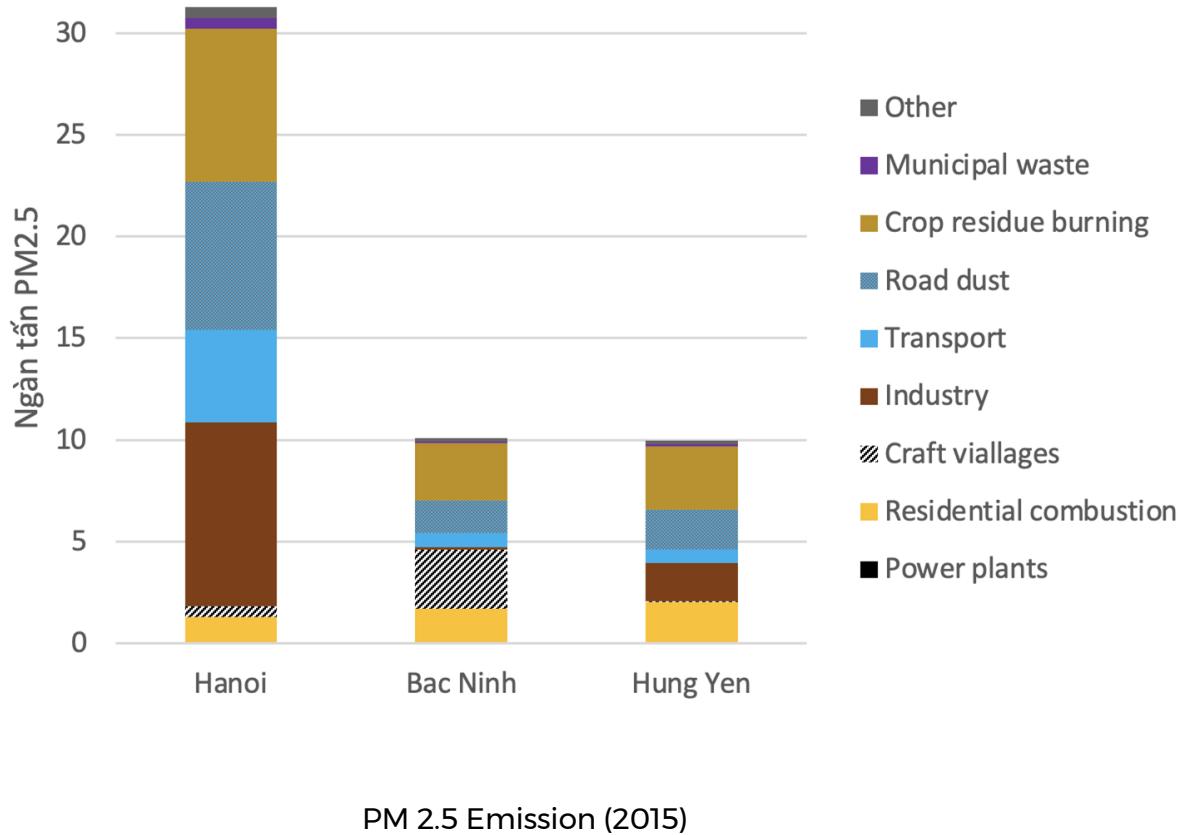


40% of the total population (3.2 million) in Hanoi were exposed to concentrations exceeding 45 $\mu\text{g}/\text{m}^3$, nearly five times higher than the WHO air quality guideline recommendation



Key primary PM_{2.5} sources in Hanoi

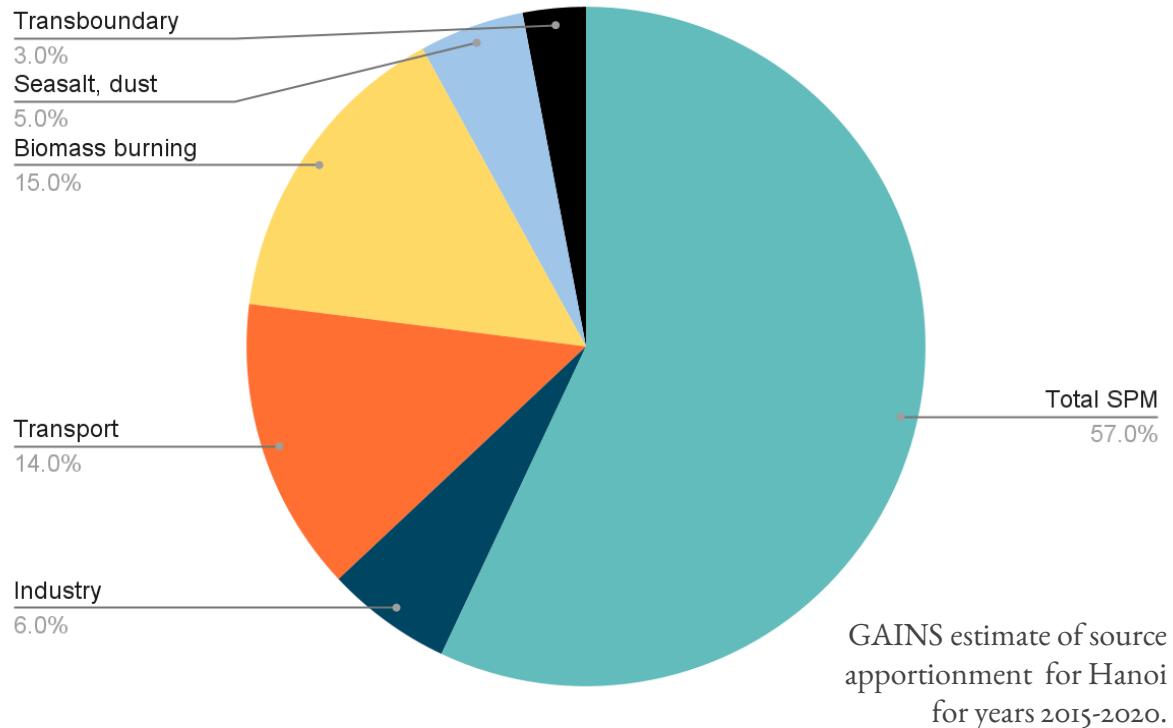
- 29% from industrial activities
- 26% from open burning of rice straw
- 23% from road dust
- 15% from transport (mainly transport on road)
- Others from residential/commercial combustion, craft villages, and waste



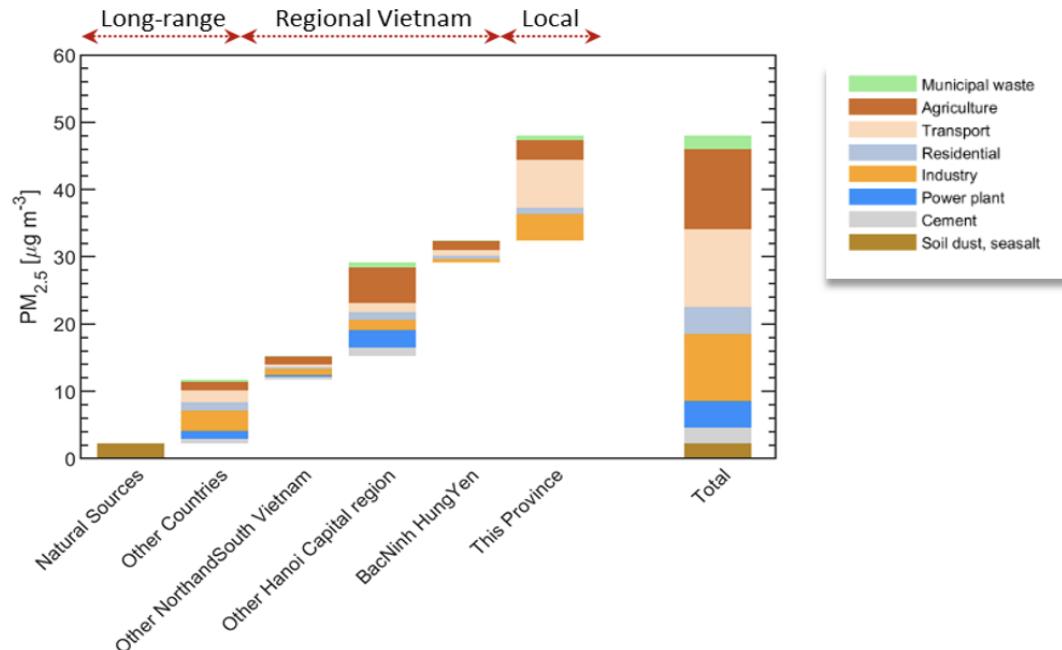
About half of the Particulate Matter mass composed of secondary particulate matter (SPM)

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

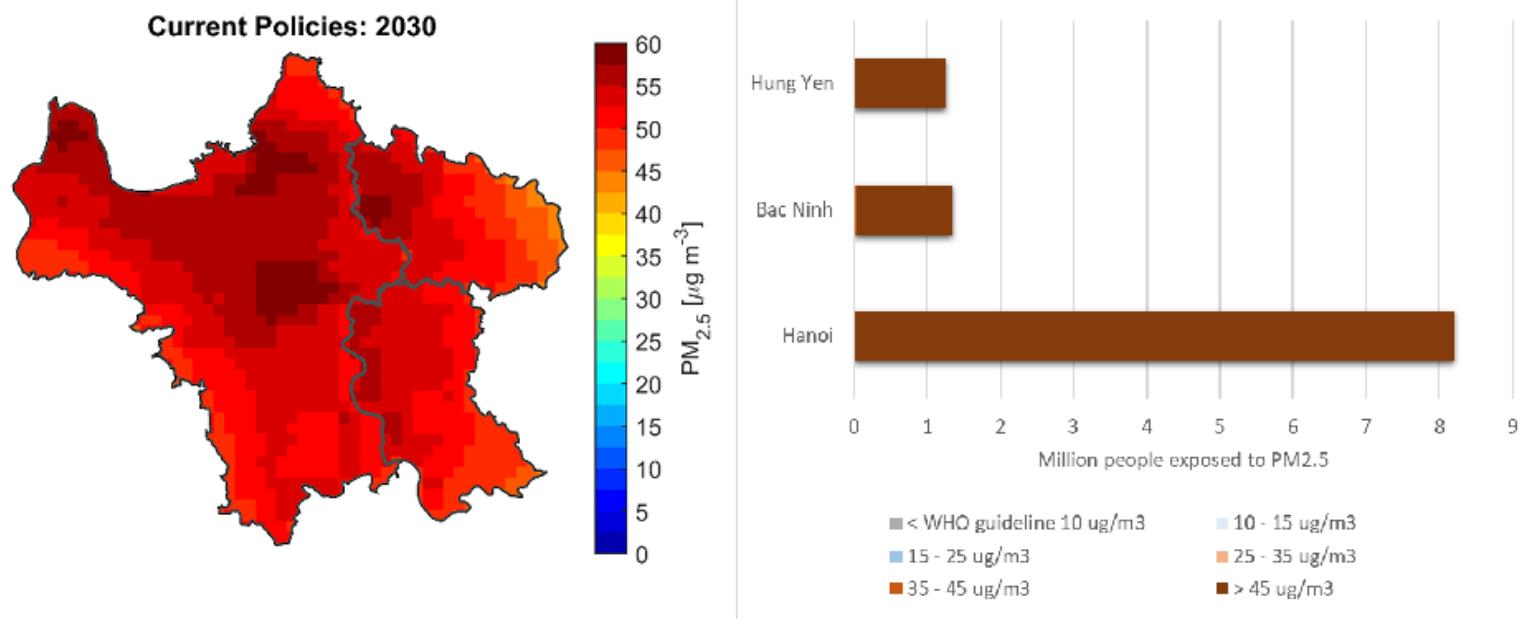


Only about one third of PM2.5 in the ambient air originates from local emission sources while the rest is transported from the Greater Hanoi areas, Red River Delta Region, other provinces in Vietnam, as well as other countries, international shipping and natural sources



Nồng độ các nguồn bụi PM2.5 (trung bình năm theo trọng số dân số) ở Hà Nội vào năm 2015.

Ambient PM_{2.5} 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



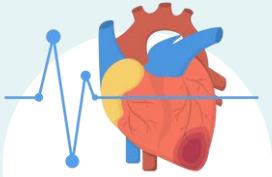
Ambient concentrations (left panel) and population exposure (right panel) for PM_{2.5} in the current policy case in 2030

ESTIMATED LOSS FOR AIR POLLUTION





6 main health effects
of long term exposure to outdoor
ambient PM_{2.5} air pollution



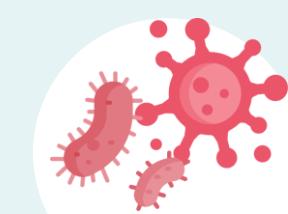
Ischemic heart
disease (IHD)



Lung cancer (LC)



Cerebrovascular
disease (stroke)



Acute lower respiratory
infections (ALRI)



Chronic obstructive
pulmonary disease (COPD)



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_{2.5} in Hanoi is high

32%

or 5,800 deaths
in Hanoi

9%

or 1,700 deaths
in Bac Ninh and
Hung Yen

41%

or 7,400 deaths
in 8 RRD
provinces

17%

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

Bac Ninh
Hung Yen

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

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%

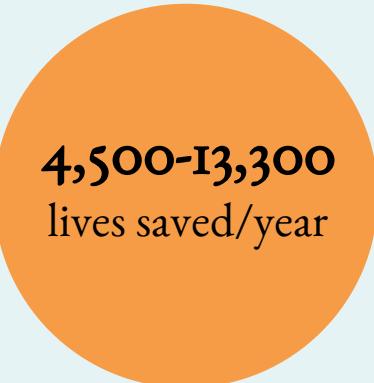
*GRDP in Northern Midlands &
Mountain Areas*

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.**

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



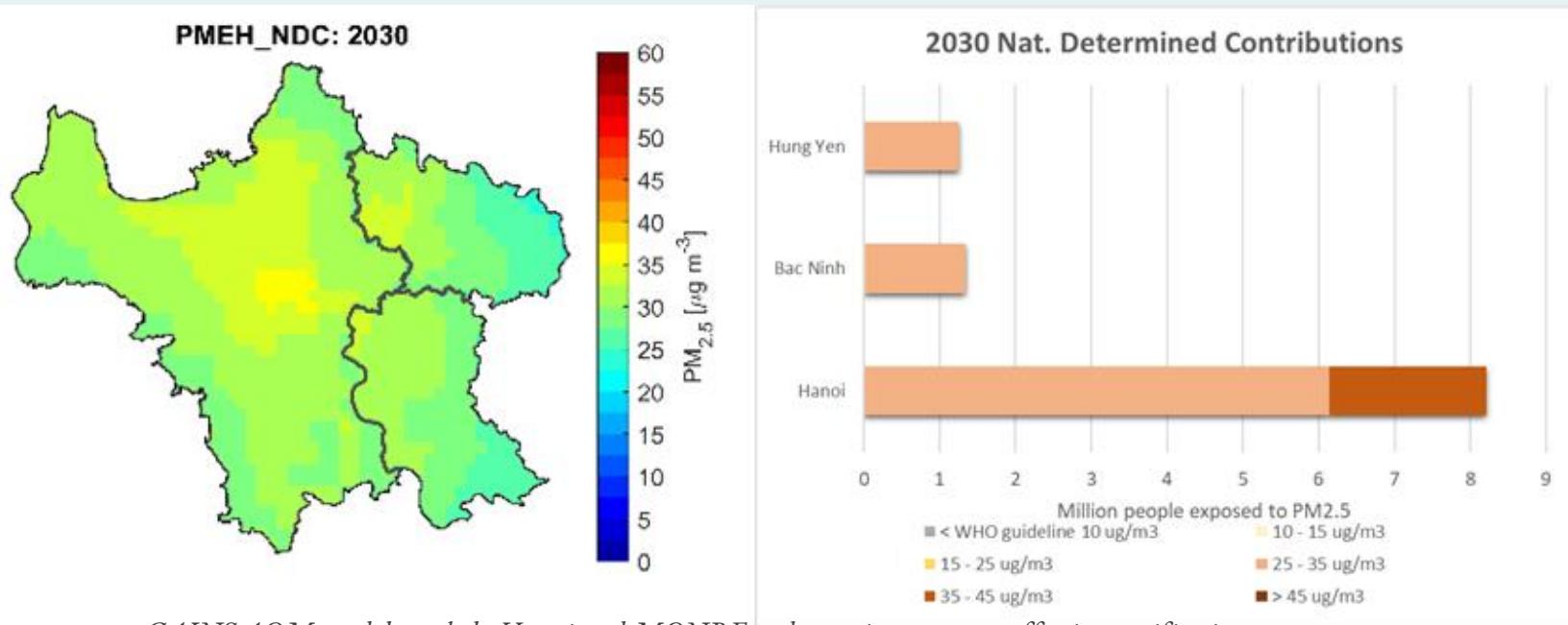
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POLICY RECOMMENDATIONS TO REDUCE AIR POLLUTION IN HANOI



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_{2.5} and SO₂ 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_{2.5} 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_{2.5} 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 5µg/m³ of 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*



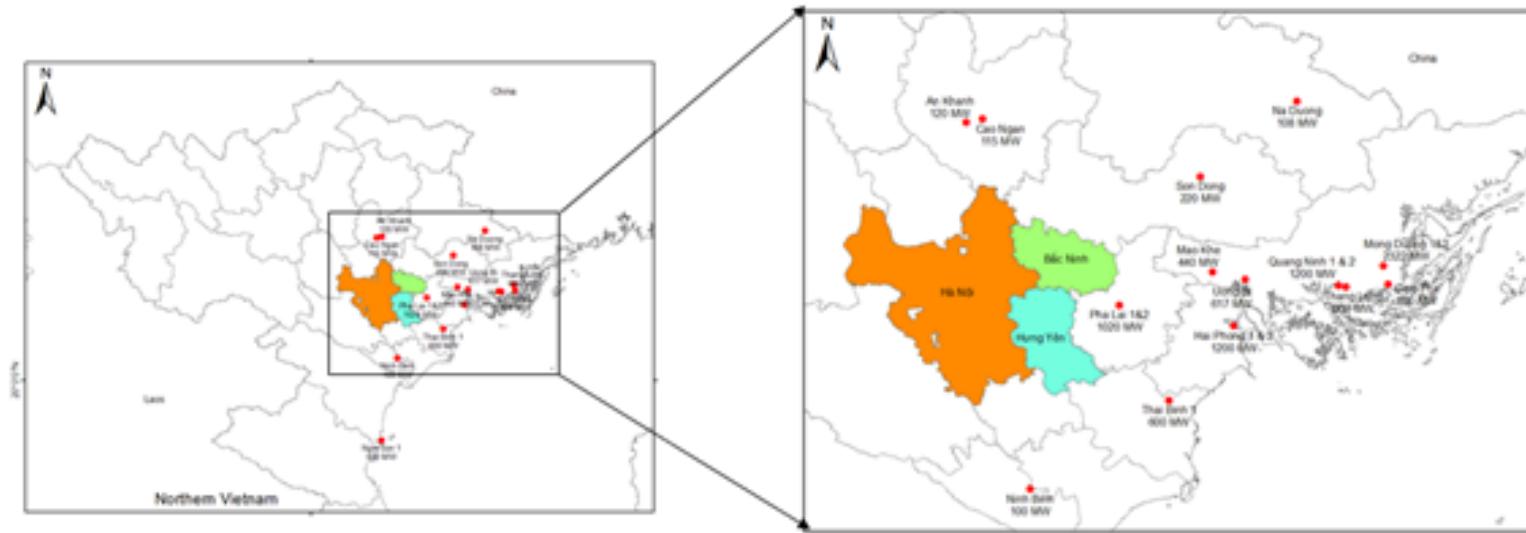
5

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.

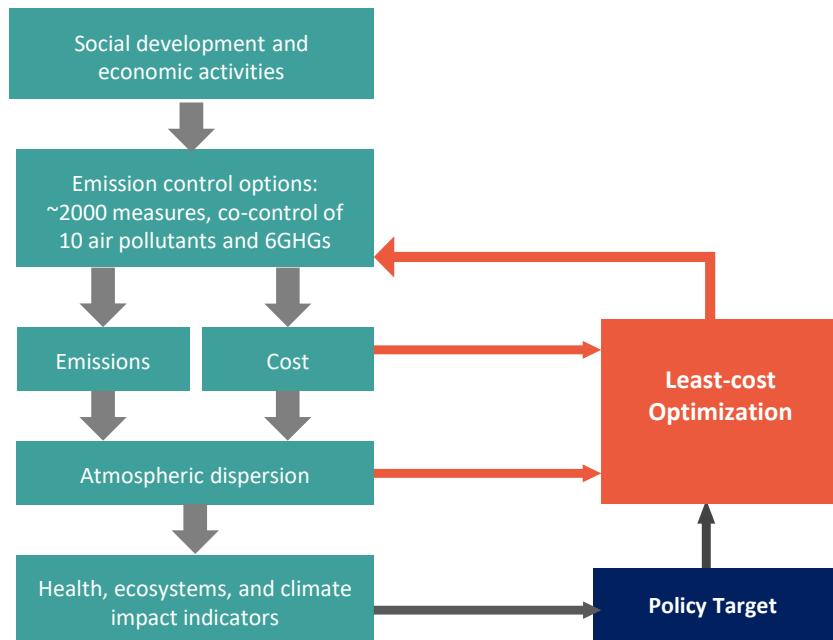
The implementation of newly introduced policies and the NDC will bring significant co-benefit for GHG emission reduction, in addition to air pollution reduction.



Annex

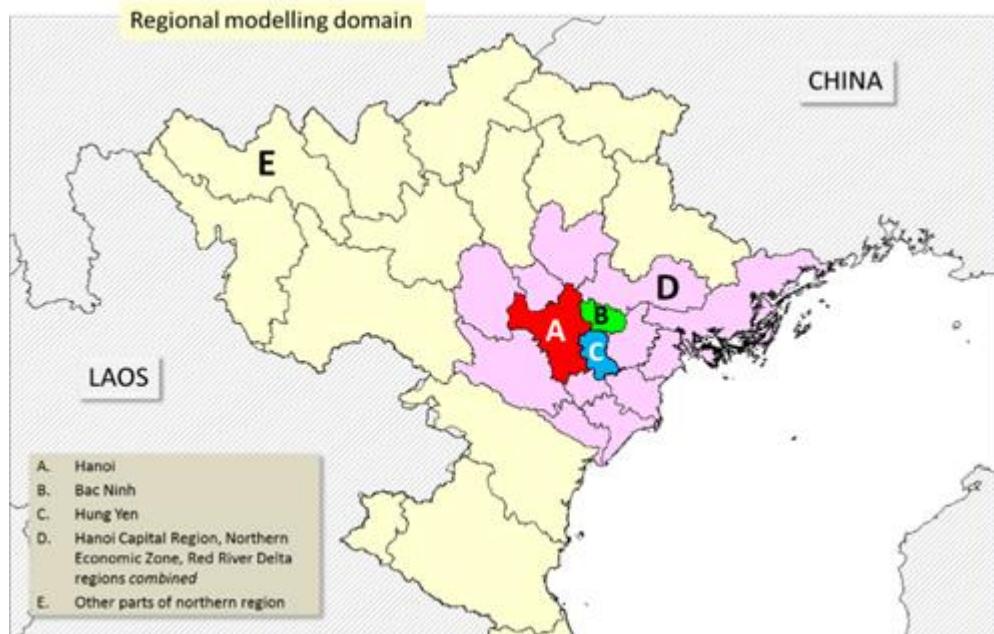
The analysis conducted for this assessment employs the Greenhouse gas – Air pollution Interactions and Synergies (GAINS) model tool

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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