Action on Emission Standards Roadmap and Controls on Vehicular Emissions
Hanoi city, Vietnam

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Outline

1. A Glance on Hanoi City
2. Challenges
3. Key Intervention Measures
4. Approaches to be taken
A Glance on Hanoi City
About Hanoi city

- A capital of Vietnam
- Land area: 3,344.6 km$^2$ and is 16 meters above mean sea level.
- It has a humid tropical climate and is highly influenced by tropical monsoons and is characterized by four seasons.
- Administration: Hanoi is one of 5 centrally governed cites. It has 12 urban districts, one town, and 17 suburban districts
- Population: 7 millions (*GSO, 2014*)
- Limited road network: 7 – 8% of urban land area
Main Sources of Air Pollution in Hanoi

- Fast increase in the number of automobiles and motorbikes; poor maintenance
- Booming of construction sector
- Inefficiency of emission treatment systems in many industrial facilities
- Outdated technology and low quality fuels usage in craft villages

Estimated emission rates of different sectors in Vietnam

Source: State of Environmental Report 2013: Air Quality, MONRE
Challenges
Increased Private Vehicles

- Hanoi city holds the nation’s 2nd biggest volume of roadway motor vehicles
- Number of private vehicles is on rapid increase (15%/year)
- As of 2013, Hanoi had 370,000 private cars, 1,300 passenger buses, 14,000 taxis, 4.6 million motorcycles. Aside, around 50,000 vehicles from other provinces running into inner city
- Motorcycles account for 78% of vehicular trips, while bus network meets nearly 10% travel demands, 8% users of private cars and only 2% use bicycles (Source: Molt C. 2010)
**Fleet Composition by Road Class in Hanoi, 2014**

Road Class 1: Urban highway  
Road Class 2: Urban arterial + Inter-urban roads  
Road Class 3: Inter-area main road  
Road Class 4: Area roads

Source: Traffic survey campaign in Hanoi by CETIA, 2014
Air Pollution Status

- Dust concentration in residential areas nearby traffic routes, construction sites, and industrial zones is high.
- Annual mean of PM$_{10}$ in Hanoi exceeds Vietnam Regulations.
- Air pollutants’ concentrations at traffic hot spots (CO, SO$_2$, NOx, VOC, TSP) are usually found at high levels, specially in rush hours.
- In 2013, air quality monitoring results showed 237 days of “unhealthy”, 21 “very unhealthy”, and one day of “hazardous” levels (Based on Vietnam AQI).

PM Pollution: An outstanding issue in urban air quality

Emission rate of contaminants generated by country’s road vehicles in 2011

- Motorbikes
- Bus, trucks
- Cars (<7 seats)

Percentage of PM2.5/PM10 and PM1/PM10 by months during 2010 – 2013 in Nguyen Van Cu road-side station, Hanoi city

Source: State of Environmental Report 2013: Air Quality, MONRE
Spatial map of AQI in Hanoi city from 2010 – 2015 (Dry season)

Spatial map of AQI in Hanoi city from 2010 – 2015 (Wet season)

Key Intervention Measures
• **Stricter enforcement of in-use vehicle emissions standards**: Automobile emission inspection are obligatory for many years.

• A plan on inspection of motorcycle emissions is pending for government’s appraisal.

• **Cleaner vehicles and fuels**: NMT and electric cars for tourists, E-bikes, LPG taxis, E5 Gasoline
Reduction of traffic congestion and Improvement of traffic safety

Overpasses for pedestrians

Flyover bridges

Elevated Ring Roads
Scrappage of old dirty high fuel consumption vehicles

Age of road vehicles:
- Trucks: 25 years
- Passenger buses and cars with 10 seats and bigger ones: 20 years
- Taxis: 8 years
• Current public bus network is extended to 97 routes covering inner city, suburbs, and neighboring provinces

• Goal to 2020: 100 routes, 3.62 million people to travel by bus daily, or 25% of travel demand (A Project on Development of Public Passenger Transportation by Bus for 2011-2015 and Orientation to 2020, Hanoi People Committee, 2011)
Development of Mass Transit Networks

- Hanoi urban railway network – 6 lines (90/2008/QD-TTg)
- Line 3 of 13 km will be operated by end of 2016, while line 6 of 12.5 km will provide services in 2018

Future Mass Transit System in Hanoi
Source: (CODATU, 2012)
• The 1st pilot BRT route of 14.7 km is expected to operate by end of 2016.
• Conserve and improve recreation areas for citizens
• Awareness raising programs
“Ha Noi Transport Planning by 2030 with a vision towards 2050” (PM, Apr. 2016)

- **Nine urban railway lines** by 2050
- **Monorails** will be developed to support the urban railway system
- **Eight Bus Rapid Transit (BTR)** routes
- **Three excessive routes** of metro or monorail
- **Five railway bridges** across the Red River.
# National Ambient Air Quality Standards and AQI

<table>
<thead>
<tr>
<th>No</th>
<th>Parameter</th>
<th>1 hour</th>
<th>8 hour</th>
<th>24 hour</th>
<th>1 year</th>
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<tbody>
<tr>
<td>1</td>
<td>SO₂</td>
<td>350</td>
<td>-</td>
<td>125</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>CO</td>
<td>30,000</td>
<td>10,000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>NO₃</td>
<td>200</td>
<td>-</td>
<td>100</td>
<td>40</td>
</tr>
<tr>
<td>4</td>
<td>O₃</td>
<td>200</td>
<td>120</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>TSP</td>
<td>300</td>
<td>-</td>
<td>200</td>
<td>100</td>
</tr>
<tr>
<td>6</td>
<td>PM10</td>
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<td>150</td>
<td>50</td>
</tr>
<tr>
<td>7</td>
<td>PM2.5</td>
<td>-</td>
<td>-</td>
<td>50</td>
<td>25</td>
</tr>
<tr>
<td>8</td>
<td>Pb</td>
<td>-</td>
<td>-</td>
<td>1,5</td>
<td>0,5</td>
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</table>

<table>
<thead>
<tr>
<th>AQI range</th>
<th>Air quality</th>
<th>Impact to Human health</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 50</td>
<td>Good</td>
<td>No impact to human health.</td>
</tr>
<tr>
<td>51 – 100</td>
<td>moderate</td>
<td>Sensitive group should limit their time outside.</td>
</tr>
<tr>
<td>101 – 200</td>
<td>Unhealthy</td>
<td>Sensitive group should limit their time outside.</td>
</tr>
<tr>
<td>201 – 300</td>
<td>Very unhealthy</td>
<td>Sensitive group should avoid staying outside. Other people limit their time outside.</td>
</tr>
<tr>
<td>Trên 300</td>
<td>Hazardous</td>
<td>Everyone should stay in door.</td>
</tr>
</tbody>
</table>

QCVN 05:2013/BTNMT – National Technical Regulation on Ambient Air Quality

Levels of AQIs and impacts to human health

Source: National State of Environmental Report 2013: Air Quality, MONRE
# Emission Limits for In-Used Automobiles (TCVN 6438: 2005)

<table>
<thead>
<tr>
<th>Pollutants in exhaust gas</th>
<th>Vehicles fitted with spark ignition engines</th>
<th>Vehicles fitted with compression ignition engines</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Automobiles</td>
<td>Mopeds/motorcycles</td>
</tr>
<tr>
<td></td>
<td>Limit 1*</td>
<td>Limit 1*</td>
</tr>
<tr>
<td></td>
<td>Limit 2</td>
<td>Limit 2</td>
</tr>
<tr>
<td></td>
<td>Limit 3</td>
<td>Limit 3</td>
</tr>
<tr>
<td>CO (% volume)</td>
<td>4.5</td>
<td>3.5</td>
</tr>
<tr>
<td></td>
<td>3.5</td>
<td>3.0</td>
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<td></td>
<td>4.5</td>
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<tr>
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<tr>
<td>HC (ppm volume):</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>- Four -stroke engines</td>
<td>1.200</td>
<td>800</td>
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<tr>
<td></td>
<td>600</td>
<td>1.500</td>
</tr>
<tr>
<td></td>
<td>1.200</td>
<td>-</td>
</tr>
<tr>
<td>- Two -stroke engines</td>
<td>7.800</td>
<td>7.800</td>
</tr>
<tr>
<td></td>
<td>7.800</td>
<td>10.000</td>
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<tr>
<td></td>
<td>7.800</td>
<td>-</td>
</tr>
<tr>
<td>- Special engines (**)</td>
<td>3.300</td>
<td>3.300</td>
</tr>
<tr>
<td></td>
<td>3.300</td>
<td>-</td>
</tr>
<tr>
<td>Smoke opacity (% HSU)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Notes:**

* Limit 1 is currently applied nationwide

** Special engines include Wankel engines and a number of other engines with special structures different from those of piston engines which are widely used.
<table>
<thead>
<tr>
<th>TYPE OF VEHICLES</th>
<th>EURO 2</th>
<th>EURO 3</th>
<th>EURO 4</th>
<th>EURO 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automobiles</td>
<td>Jul 1\textsuperscript{st}, 2007</td>
<td>Jump over =&gt;</td>
<td>Jan 1\textsuperscript{st}, 2017</td>
<td>Jan 1\textsuperscript{st}, 2022</td>
</tr>
<tr>
<td>Motorcycle</td>
<td>Jul 1\textsuperscript{st}, 2007</td>
<td>Jan 1\textsuperscript{st}, 2017</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>
National Standards on Fuel Consumption (FC) and Fuel Efficiency (FE)

- Road Vehicle - Two-Wheeled Motorcycles and Mopeds - Limit of Fuel Consumption (FC) and Fuel Efficiency (FE) and Method for Determination (TCVN 7356:2014)
- Road Vehicle – Passenger Cars - Limit of Fuel Consumption and Fuel Efficiency (FE) and Method for Determination (TCVN 9854:2013)
- Mandatory Energy Labeling for up to 7 seat cars from 1 Jan. 2015
Fuel Quality

• Vietnam currently uses unleaded gasoline. Sulfur level regulation is 500 ppm for both gasoline and diesel, and 2.5% Benzen for gasoline (equivalent to Euro 2)
• National technical regulation on fuel quality equivalent to Euro 3 & Euro 4 came into effect from 1 Jan. 2016, but its application has been delayed
Key Approaches To Be Taken
Approaches To Be Taken

• Further improvement of urban public transport system
• Facilitation of NMT
• Facilitation of use of alternative fuels and environmentally friendly vehicles
• Implementation of energy efficiency measures in transport sector
• More stringent control of sidewalks occupation for private businesses and cars/motobikes parking
Approaches To Be Taken

• Improvement of traffic congestion specially in inner city
• Reduction of the growth of private vehicles, specially motorcycles and 5-seat cars
• Implementation of periodical emission inspection for in-used motorcycles in Hanoi
• Stricter inspection of exhausted gases from buses and trucks
• Implementation of a roadmap for Euro 3, Euro 4 and Euro 5
Approaches To Be Taken

• Enhancement of air quality monitoring network

• Raising public awareness by mass media, mobilizing public participation in environmental events, e.g. A Car Free Day in a certain street, cyclocrosses, annual Earth Hours, and so on.
THANKS YOU!