

Seminar Report

Environmental Community Awareness Seminar Series

Transboundary Air Pollution



Prepared by

Asta-Ja Research and Development Centre (Asta-Ja RDC) Kathmandu, Nepal

Supported by

**Non-Resident Nepali Association National Coordination Council (NRNA NCC) USA,
Community Environment Academy, and Asta-Ja USA**

24th November 2019

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1. Background

Air pollution has been emerging as a major threat to the whole ecosystem. It directly or indirectly affects the quality of human health. Nepal, especially Kathmandu, in the current situation, is observing rapid urbanization and various infrastructure development activities. As a result of various human activities, air pollution is increasing at an enormous rate inside Kathmandu Valley. Furthermore, Rapid urbanization, unplanned development activities, smoke from brick kilns, ongoing road widening drives and construction works, transboundary air pollution, chemical uses in agriculture, poor and failing septic systems, exposed ground surfaces and increasing number of vehicles have contributed to making Kathmandu one of the most polluted cities in the world.

Air pollution has been a huge burden to the residents of Kathmandu, threatening the lives of thousands of people every year. The scenario is obvious to worsen in the coming years if immediate preventive measures are not taken in a timely manner. It is of utmost urgency to educate the common people on harmful aspects of air pollution and take necessary precautions to prevent its deadly consequences. The solution to Kathmandu's air pollution can be achieved only when the government takes the leading role in addressing the situation and everyone is responsible for taking actions in reducing air pollution. Lately, many governmental and non-governmental organizations and International Agencies are taking great initiatives and putting their efforts in controlling the air pollution. However, the pace of the implementation of pollution corrective measures is very slow. Local communities have very low level of environmental awareness, if any. Hence, it is urgent to raise community awareness against air pollution and environmental degradation in the country. Young students can provide big support in fighting air pollution while taking initiatives on their own and spreading the words of air pollution to the local communities.

India is also struggling for managing its environmental air quality. Major cities of India like Delhi, Raipur, Gwalior, and Lucknow are listed among the world's top 10 polluted cities and altogether 37 Indian cities feature in a list of 100 most polluted cities. Delhi, the capital of India, is classed as the world's most polluted capital city with air pollution parameters 30 times higher than WHO's recommended upper limit

With the purpose of contributing to the governmental campaign of making urban and rural areas environmental pollution free, Asta-Ja Research and Development Centre (Asta-Ja RDC), Kathmandu, Nepal, organized the 8th seminar "Transboundary Air Pollution" as part of the on-going 'Environmental Community Awareness Seminar Series' on 24th November, 2019 with funding support from Community Environment Academy & Non-Resident Nepali Association National Coordination Council (NRNA NCC) USA and technical support from Asta-Ja USA. The seminar was hosted in Ganeshman Singh Multiple Campus Kalanki, Kathmandu. Students from 10+2 and Bachelor level, the Lecturer & Administrative Staffs of the College, and Board of Director from Asta-Ja RDC were actively involved in presentation, discussion, and interaction sessions.

Major objective of the seminar was to provide students with basic knowledge and understanding of air pollution, sources and impacts of air pollution, and important air pollution control measures. The seminar consisted of PowerPoint presentations, discussions, interactions, and feedback collection sessions. The seminar was a great success. Expected outcomes of the seminar include that the students will be able to evaluate the main causes of air pollution, analyze any existing pollution reduction technologies, and create their own model, technology and innovation which may eventually help in controlling air pollution.

2. Seminar objectives and Target groups

The overall objective of the seminar series is to raise community awareness on transboundary environmental pollution targeting primarily student communities representing both Colleges and High Schools. Special emphasis has been given to the effects of Global Climate Change on the environment in Kathmandu valley. Students will acquire basic knowledge about air pollutants, understand the sources and effects of air pollution, and they will use their knowledge in minimizing or controlling air pollution. Students will be able to analyze existing air pollution control strategies and develop their own model, technologies or strategies for future implementation.

3. The Seminar on Transboundary Air Pollution

The Eighth seminar in this series was held on the topic of “**Transboundary Air Pollution**” on 24th November 2019. 74 students of undergraduate & 10+2 studies covering Bachelors in BSW, Management stream participated the seminar along with College management team and members of Asta-Ja RDC. The seminar was held at Ganeshman Singh Multiple Campus, Kalanki Kathmandu. **Dr. Shanti Kala Subedi**, Chief Research & Innovation Unit of Himalaya College of Engineering, Lalitpur, was the resource person for the seminar. Dr. Subedi has a long experience in environmental programs, and teaching, research and training and consultancy services particularly in the field of Engineering, Rural Community Development, and environment management in Nepal. Asta-Ja RDC Executive Member Mr. Bishnu Dayal Singh coordinated and facilitated the seminar. Mr Singh also highlighted about the activities of Asta-Ja with their success stories. Mr. Shailesh Nepal, Lecturer of Ganeshman Singh Multiple Campus, Kalanki, Kathmandu highlighted issues of air pollution and thanked the Asta-Ja RDC team for hosting the event in Ganeshman Singh Multiple Campus, Kalanki, Kathmandu. Office Coordinator of Asta-Ja, Mr. Hari Bhusal provided logistics management support.

4. Presentation outlines (contents)

The PowerPoint presentation from Dr. Shanti Kala Subedi included:

1. Air pollution, major pollutants,
2. Type & sources of Transboundary air pollution
 - Type of Air pollution** (Indoor Air pollution, Outdoor air pollution)
 - Sources of air pollution** (Mobile sources, Stationary sources, Natural and Anthropogenic Sources)
3. Causes and effects of air pollution
4. Air pollution in Kathmandu valley
5. Air pollution in Delhi, India
6. Preventive measures
7. Local, national and international initiation
8. Future challenges and opportunities

In the presentation, Dr. Shanti Kala Subedi highlighted importance of clean environment to human and other creatures and their interrelationships. Further, students were briefed on why development works often conflict with environmental conservation and take it as a burden. The session mainly focused on

environmental Transboundary air pollution and their types, Sources of air pollution, Effects of air pollution, Air pollution in Kathmandu Valley & New Delhi, India, Preventive Measures, and Initiation from the Government of Nepal. The seminar had also emphasized on legal and practical measures on Air Pollution in Nepal with current problems and management options. The role and responsibilities for different stakeholders were also shared among the participants and also shared different pictures to trigger the participant's opinion in favor of air pollution protection.

Key messages communicated to the participants included were:

- Environment is an integral part of human life; it should be protected to save the creatures on earth.
- Environment protection and development activities cannot be separated from each other. The sustainable development emphasizes of wise and limited use of resources from the earth.
- Environmental air pollution is increasing day by day and it has alarming impacts on human health.
- The main key messages included were Sources of air pollution, Effects of air pollution, Air pollution in Kathmandu Valley and Delhi, India, Transboundary pollution impact, Preventive Measures, Initiation from the Government of Nepal (Govt. acts and laws for the reduction of air pollution).
- Being responsible is the key to manage Transboundary air pollution; it further needs citizen's awareness enhancement.

5. Discussion:

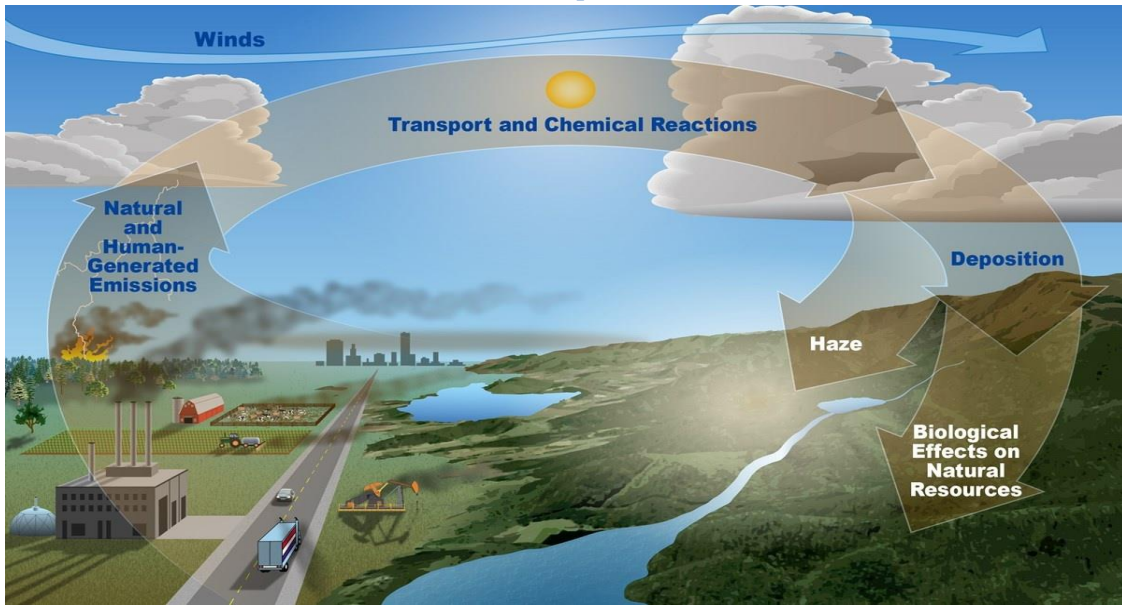
Floor was open for discussion following PowerPoint presentation from the resource person. Questions asked by the participant students during the discussion session are presented below. The resource person responded very well to all the questions and concerns raised by the student participants in the seminar and also gave possible solution.

- How is urbanization & construction of road affecting air pollution problem in Kathmandu and Nepal?
- How can we manage Old / outdated vehicles which are major cause of emission in Kathmandu valley?
- How can we manage air pollution from Brick Kiln?
- How can we mitigate the impacts of transboundary air pollution?
- What can we do from our side to reduce air pollution in Kathmandu valley?

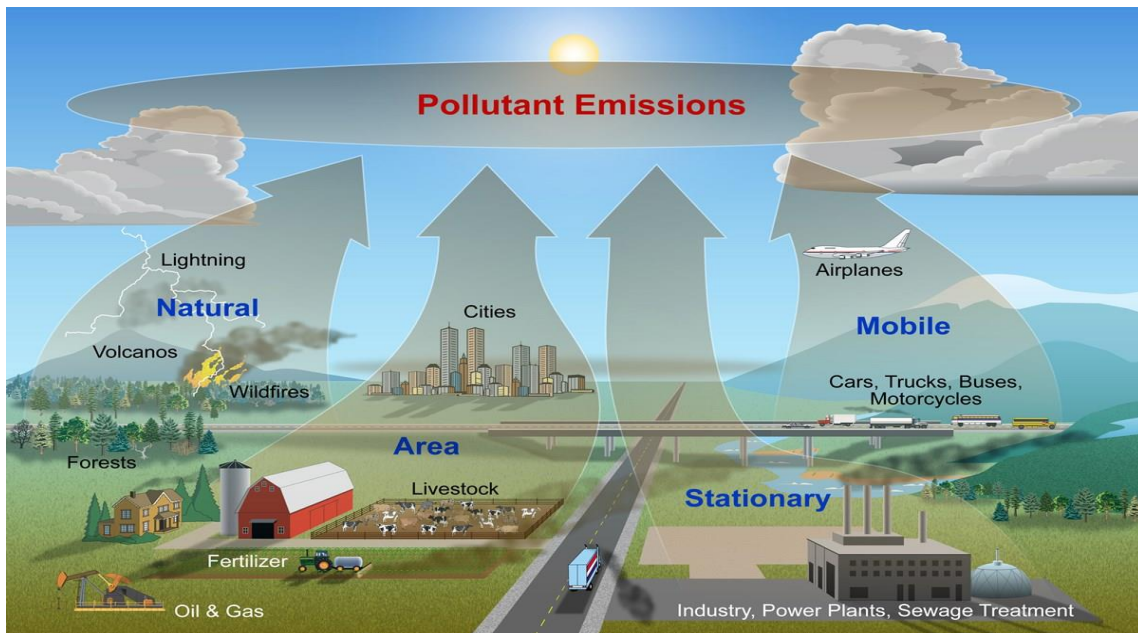
6. Conclusion:

The seminar was very successful in conveying the message of Transboundary Air Pollution effectively and clearly along with impacts of air pollution on public health to the participants. Air pollution may also cause harm to other living organisms such as animals and food crops, and may damage the natural or built environment. The seminar was very helpful to student participants in gaining knowledge about air pollutants, understanding sources and effects of air pollution, and identifying important remedial measures for pollution control. Participants realized the responsibility of all stakeholders including students and common citizens in supporting environmental awareness programs undertaken by various agencies and the Government of Nepal for meeting the goal of clean, green and prosperous Kathmandu valley.

Annexes 1: Air Pollution related photos



Picture 1: Air pollution basic causes



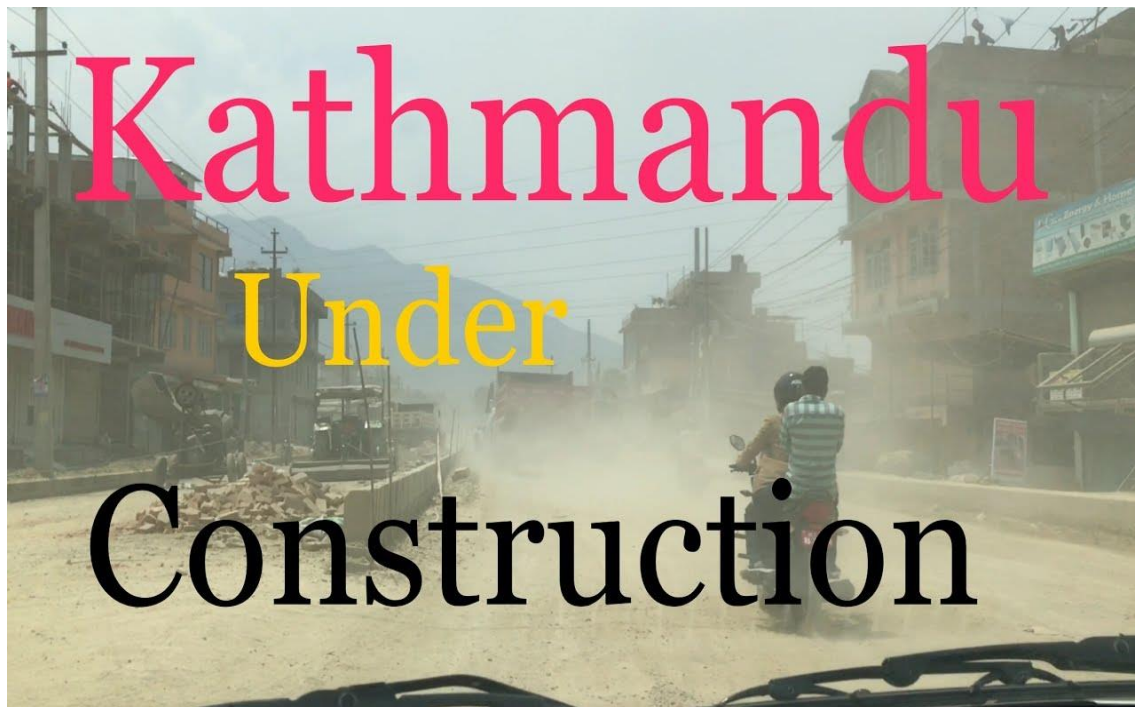
Picture 2: Sources of Air Pollution



Picture 3: Air Pollution in Kathmandu valley



Picture 4: Kathmanduites breathing unhealthy air



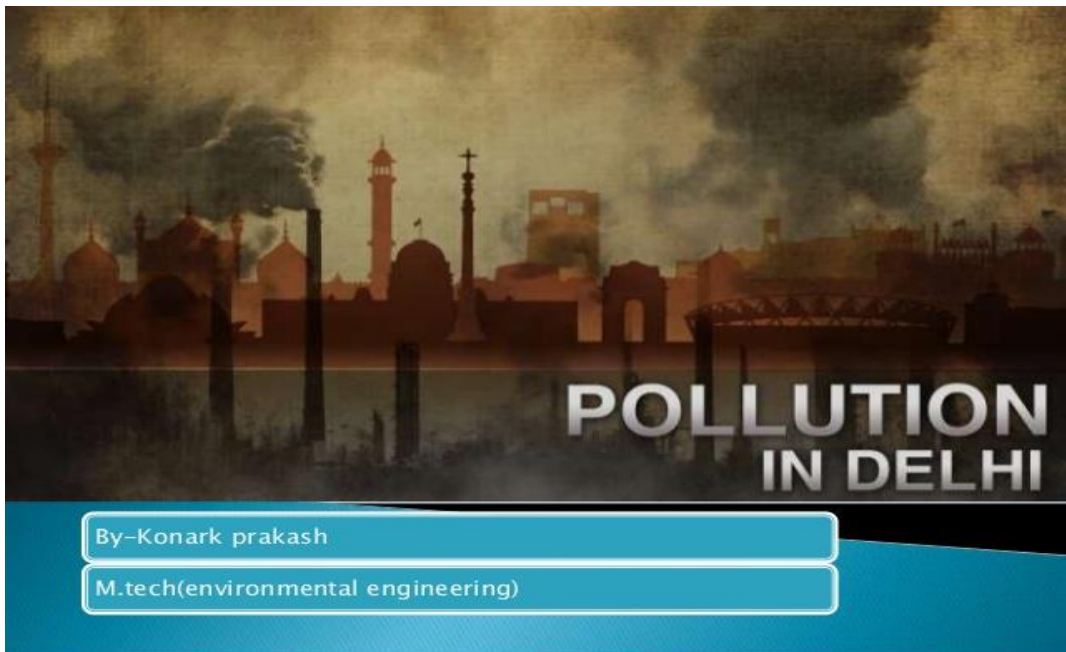
Picture 5: Air pollution in Kathmandu valley by underconstructing road condition



Picture 6: Air pollution from brick factory (Kathmandu's Silent Killer)



Picture 7: Delhi Air Pollution



Picture 8: Air Pollution in Delhi

Annexes 2: Event photos



Picture 9: Presentation on Trans-boundary Air Pollution seminar



Picture 10: Students Participating on 'Trans-boundary Air Pollution seminar'



Picture 11: Discussion on Trans-boundary Air Pollution.



Picture 12: Attendees in 'Environmental Community Awareness Seminar'

Transboundary Air Pollution

Organized by Asta-Ja RDC, Kathmandu

24th November, 2019

Dr. Shanti Kala Subedi

Chief, research and Innovation Unit

Himalaya College of Engineering , Balkumari,
Nepal

Presentation outline

- ▶ Definition
- ▶ Composition of pollutants
- ▶ Air pollution
- ▶ In Kathmandu Nepal
- ▶ In Delhi India
- ▶ Effects
- ▶ Solution effort and initiation from person to national and international level

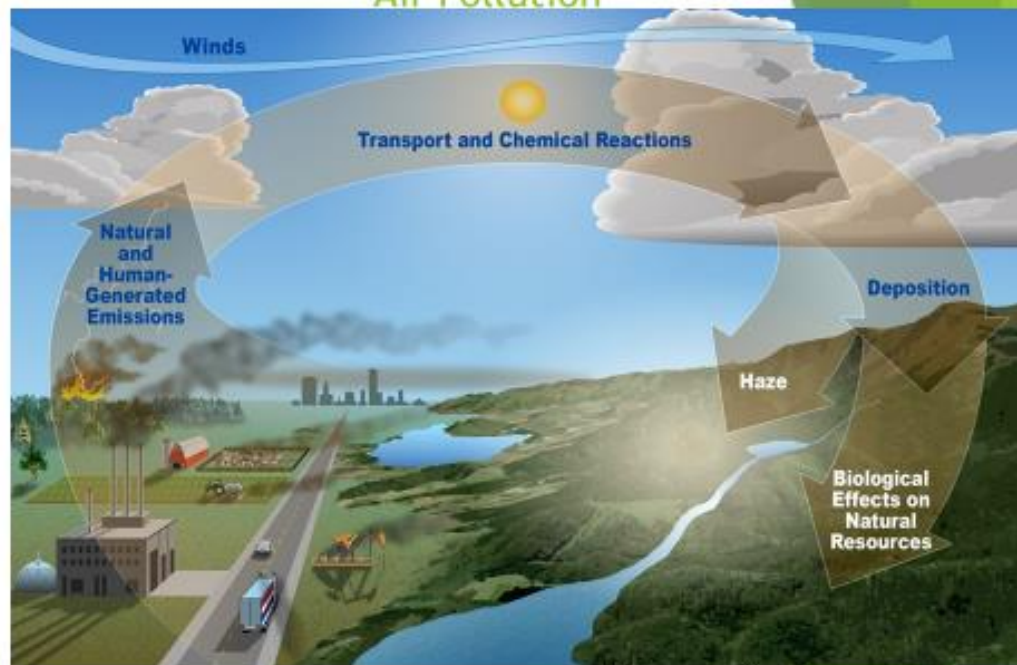
Composition of Fresh Air

Clear
IAS

Permanent Gases of the Atmosphere

Constituent	Percent by Volume	Concentration in Parts Per Million (PPM)
Nitrogen (N ₂)	78.084	780,840.0
Oxygen (O ₂)	20.946	209,460.0
Argon (Ar)	0.934	9,340.0
Carbon dioxide (CO ₂)	0.036	360.0
Neon (Ne)	0.00182	18.2
Helium (He)	0.000524	5.24
Krypton (Kr)	0.000114	1.14
Hydrogen (H ₂)	0.00005	0.5

Air Pollution



2019

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Air pollution in Kathmandu Valley



Air Pollution



Factory making air pollution

Causes of air pollution

1, Burning of Fossil Fuels:

SO₂ from burning of coal, petroleum and other factory

CO caused by improper or incomplete combustion

NO₂ that is produced from both natural and anthropogenic processes.

2. Waste and deforestation

NH₃, CH₄- Waste management system -

Road construction (dusty and mostly ongoing)

CO, CO₂, SO₂- from Brick kilns

CO₂ emission : Deforestation: cutting off trees for road extension, carbon sequestration,

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Air pollution in Kathmandu Valley

Causes of air pollution....

3. **Exhaust from factories and industries** release large amount of carbon monoxide, hydrocarbons, organic compounds, and chemicals

- ▶ Petroleum refineries also release hydrocarbons and various other chemicals that pollute the air and also cause land pollution
- ▶ **Agricultural activities:** Ammonia NH₃ is a very common by product from agriculture related activities and is one of the most hazardous gases in the atmosphere. Use of insecticides, pesticides and fertilizers in agricultural activities has grown quite a lot. They emit harmful chemicals into the air and can also cause water pollution.

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Air Pollutants

A. Source of origin:

Natural like volcanic activity, dust, sea-salt, forest fires, lightning, soil outgassing etc.

Anthropogenic include stationary point sources (e.g. emission from industries), mobile sources (e.g. vehicular emission, marine vessels, airplanes etc.), waste disposal landfills, open burning etc.

B. Method of origin :

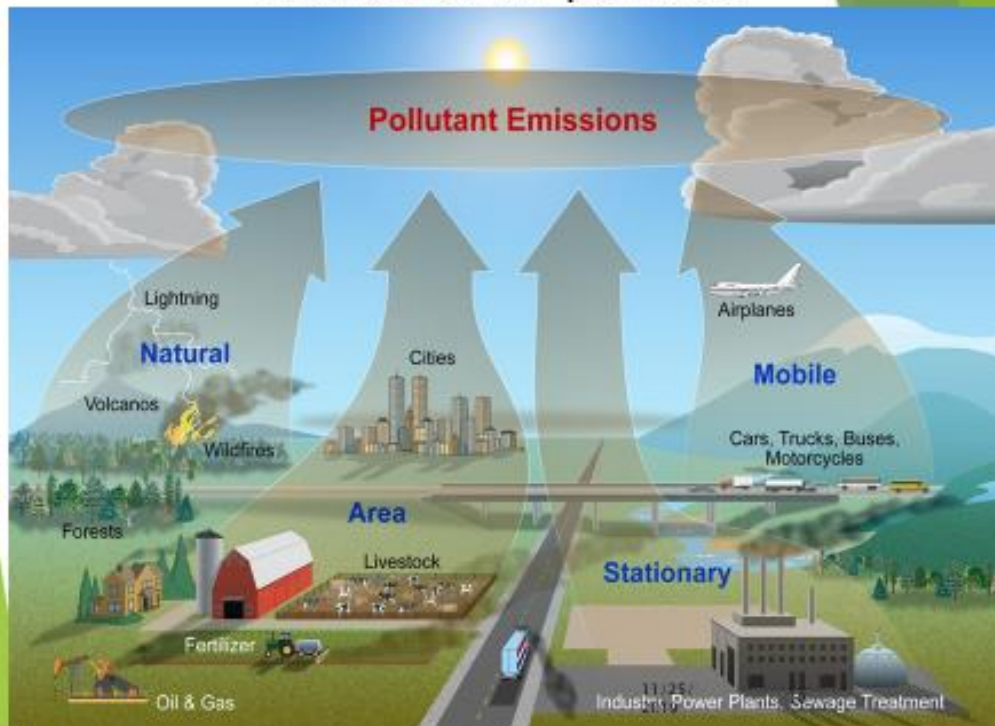
▶ Primary air pollutants :

Emitted directly from any emission source in the atmosphere are termed as primary air pollutants, e.g. sulphur dioxide (SO₂), carbon monoxide (CO), lead (Pb), ammonia (NH₃) etc.

▶ Secondary air pollutants

Formed by the reactions between primary air pollutants and normal atmospheric constituents. In some of the cases, these pollutants are formed by utilizing the solar energy, e.g. ozone, peroxyacetyl nitrate (PAN), smog etc.

Sources of air pollution



Air pollution in Kathmandu Valley

c. Chemical composition

1. **Organic air pollutants:** hydrocarbons, aldehydes, ketones, amines, and alcohols etc.

2. **Inorganic air pollutants:** carbon compounds (CO and carbonates), nitrogen compounds (NOX and NH3), sulphur compounds (H2S, SO2, SO3, H2SO4), halogen compounds (HF, HCl etc.), fly ash, silica etc.

D. State of the matters

1. **Gaseous air pollutants:** Pollutants which are in the form of gas are termed as gaseous air pollutants, e.g. SO2, NOX, O3, CO etc. 2.

2. **Particulate air pollutants:** Particulate air pollutants or particulate matter (PM) can be defined as the microscopic solid or liquid matter suspended in the earth's atmosphere. There are various subtypes of particulate matter: PM10 and PM 2.5

▶ Like: WHO standard PM10 - 120 µg/m³, PM20 - 40 µg/m³

Emission Sources & Its Major effects

Criteria/pollutants	Sulfur dioxide (SO2)	Nitrogen dioxide (NO2)	Particulate matter (PM)	Carbon monoxide (CO)	Ozone (O3)
Emission sources					
• Natural sources	Volcanic emissions	Lightning, forest fires etc.	Windblown dust, pollen spores, photochemically produced particles	Animal metabolism, forest fires, volcanic activity	Present in stratosphere - 50 km height
• Anthropogenic sources	Burning of fossil fuels, metal smelting, petroleum refining etc	Burning of fossil fuels, biomass and high temperature combustion processes	Vehicular emissions, Industrial combustion processes, commercial and residential combustion, construction industries	Burning of carbonaceous fuels, emission from IC engines	Hydrocarbons and NOX upon reacting with sunlight results in O3 formation
Major effects					
• Health effects	Respiratory problems, heart and lung disorders, visual impairment	Pulmonary disorders, increased susceptibility to respiratory infections	Respiratory problems, liver fibrosis, lung/liver cancer, heart stroke, bone problems	Anoxemia leading to various cardiovascular problems. Infants, pregnant women, and elderly people are at higher risk	Respiratory problems, asthma, bronchitis etc.
• Environment effects	Acid rain	ozone formation in troposphere	Visibility reduction		Respiratory problems, asthma, bronchitis etc.

Transboundary air pollution

Transboundary air pollution (generated in one country and impacting in others) makes a major contribution to acidification and summer smog (caused by **tropospheric ozone**), and also to **eutrophication** of soil and water and dispersion of hazardous substances.

The main sources of this pollution are energy use and transport in which international shipping is of growing importance.

Major emission reductions for sulphurdioxide and nitrogen dioxide adopted under the Convention on Long-Range Transboundary Air Pollution (CLRTAP) and EU legislation have reduced the harmful effects of transboundary air pollution.

Projected further reductions fall short of EU targets for 2000 and 2010 and further initiatives are needed in the framework of integrated abatement strategies.

In 2017, 92% of the world's population still lived in areas where PM_{2.5} exceeds the WHO guideline for healthy air; 54% still lived in areas exceeding the WHO's least-stringent interim target, often by substantial margins. Household burning of solid fuels – coal, wood, charcoal, dung, and other forms of biomass – remains an important source of exposure to particulate matter, especially in low- and middle-income countries in South Asia and sub-Saharan Africa.

The majority of tropospheric ozone formation occurs when nitrogen oxides (NO_x), carbon monoxide (CO) and volatile organic compounds (VOCs), such as xylene, react in the atmosphere in the presence of sunlight.

NO_x and VOCs are called ozone precursors. Motor vehicle exhaust, industrial emissions, and chemical solvents are the major anthropogenic sources of these chemicals. Ozone concentrations are creeping upward globally, with particularly pronounced growth in rapidly developing countries like China.

Less-developed countries face a double burden from household and ambient air pollution.

Transboundary pollution impact

Climate change

- ▶ Climate impacts in one country will create risks and opportunities in others due to cross-border connectivity (in trade, people, finance and biophysical ecosystems). For the same reasons, adaptation measures in one part of the world can have positive and/or negative effects in other places by affecting cross-border links and flows.
- ▶ Adopting a transboundary view of climate risk, which explicitly recognises the interconnections between people, ecosystems and economies in a globalised world, changes the scope and nature of the adaptation challenge and creates opportunities to reinvigorate international cooperation on adaptation.

Eutrophication

- ▶ is the process through which lakes, streams, or bays become overloaded with nutrient-rich water. When this occurs, large blooms of algae and aquatic plants occur, fed by the excess nitrogen and phosphorus. When the algae die, microorganisms in the water begin feeding on the remains as part of the decomposition process and consequently use up the available oxygen in the water. This leaves little oxygen for fish and other aquatic animals, resulting in the suffocation of aquatic life.
- ▶ The majority of tropospheric ozone formation occurs when nitrogen oxides (NO_x), carbon monoxide (CO) and volatile organic compounds (VOCs), such as xylene, react in the atmosphere in the presence of sunlight.
- ▶ NO_x and VOCs are called ozone precursors.
- ▶ Motor vehicle exhaust, industrial emissions, and chemical solvents are the major anthropogenic sources of these chemicals.

Air pollution status

Air pollution contributed to almost 5 million deaths globally – nearly 1 in every 10 – in 2017.

Air pollution exposure is linked with increased hospitalizations, disability, and early death from respiratory diseases, heart disease, stroke, lung cancer, and diabetes, as well as communicable diseases like pneumonia.

Air pollution exposure is linked with increased hospitalizations, disability, and early death from respiratory diseases, heart disease, stroke, lung cancer, and diabetes, as well as communicable diseases like pneumonia.

PM2.5 pollution contributed to nearly 3 million early deaths in 2017. More than half of this disease burden fell on people living in China and India.

Indoor air pollution

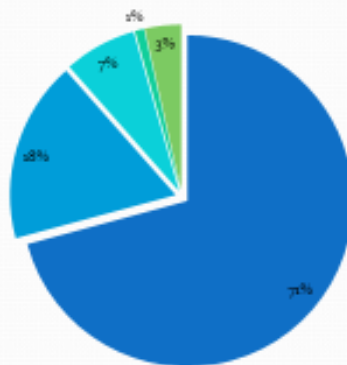
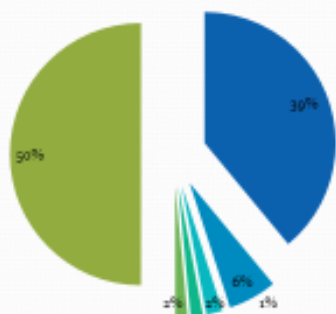
- ▶ Biomass Burning
- ▶ Mold and pollen
- ▶ Tobacco smoke
- ▶ Household products and pesticides
- ▶ Gases such as radon and carbon monoxide
- ▶ Materials used in the building such as asbestos, formaldehyde and lead

Outdoor air pollution

- ▶ Deforestation
 - ▶ Transport
 - ▶ Industry
 - ▶ Brick factory
 - ▶ Ozone layer
- Impact: Health , Climate change, Global warming

Fuel use pattern

- Biomass
- Petroleum product
- Residential
- Transport
- Industrial
- coal
- Grid electricity
- Agricultural
- Commercial
- Renewables
- Total energy consumption



Total consumption 11.3 Mtoe (2015)

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Air pollution in Kathmandu valley

Kathmandu is vulnerable for Air Pollution :

- ▶ Population (4.78% growth rate in 2017)
- ▶ CBS 2011, Dense population 13,225 per km²
- ▶ Increasing number/type of vehicles (14000 in 2001 to 8,00,000 in 2015)
- ▶ Rapid urbanization and infrastructure development
- ▶ Topographical settings (Valley/ cup shaped)
- ▶ Traffic management (roadways and airways)
- ▶ Waste management system
- ▶ Road construction (dusty and mostly ongoing)
- ▶ Agro-farming system (pesticides and fertilizers used)
- ▶ Brick kilns
- ▶ Deforestation: cutting off trees for road extension : - carbon sequestration,

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Air pollution in Kathmandu Valley

Effects of air pollution

▶ Health Impact

- ▶ 1. Indoor air pollution: Household cleaning products, painting supplies emit toxic chemicals in the air and cause air pollution. Have you ever noticed that once you paint walls of your house, it creates some sort of smell which makes it literally impossible for you to breathe.
- ▶ Suspended particulate matter popular by its acronym SPM, is another cause of pollution. Referring to the particles afloat in the air, SPM is usually caused by dust, combustion etc.
- ▶ 2. Respiratory and heart problems:
 - ▶ Allergies, respiratory and cardiovascular diseases as well as lung damage.
 - ▶ Several millions are known to have died due to direct or indirect effects of air pollution.
 - ▶ 60% of deaths premature death cardiovascular diseases have caused a maximum death of 22% followed by chronic respiratory diseases 13%, cancer 8%, and other NCDs 14%.
 - ▶ Children in areas exposed to air pollutants are commonly suffer from pneumonia and asthma.

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Effects of air pollution

▶ 3. Status against WHO standard

- ▶ In 2016, Environmental Performance Index (EPI) of Nepal's air quality ranked 177th out of 180 countries
- ▶ Kathmandu is ranked one of the most polluted cities
- ▶ (PM_{2.5}) in urban areas of Nepal was noted to be 140 $\mu\text{g}/\text{m}^3$ which is 10 times higher than the desirable value.
- ▶ Ministry of Science and Technology, in 2012, carried "National Ambient Air Quality. Test. The targeted PM₁₀ and PM_{2.5} values were 120 $\mu\text{g}/\text{m}^3$ and 40 $\mu\text{g}/\text{m}^3$ 2*times higher than the WHO targeted value.
- ▶ Effect on Wildlife: Just like humans, animals also face some devastating affects of air pollution. Toxic chemicals present in the air can force wildlife species to move to new place and change their habitat. The toxic pollutants deposit over the surface of the water and can also affect sea animals.

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Effects of air pollution

Environmental impact

1. **Global warming:** With increased temperatures world wide, increase in sea levels and melting of ice from colder regions and icebergs, displacement and loss of habitat have already signaled an impending disaster if actions for preservation and normalization aren't undertaken soon.
2. **Depletion of Ozone layer:** Ozone exists in earth's stratosphere and is responsible for protecting humans from harmful ultraviolet (UV) rays. Earth's ozone layer is depleting due to the presence of chlorofluorocarbons, hydro chlorofluorocarbons in the atmosphere. As ozone layer will go thin, it will emit harmful rays back on earth and can cause skin and eye related problems. UV rays also have the capability to affect crops.

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Effects of air pollution

► Environment impact contd....

- 3. Acid Rain: Harmful gases like nitrogen oxides and sulfur oxides are released into the atmosphere during the burning of fossil fuels. When it rains, the water droplets combines with these air pollutants, becomes acidic and then falls on the ground in the form of acid rain. Acid rain can cause great damage to human, animals and crops.
- 4. Mining operations: Mining is a process wherein minerals below the earth are extracted using large equipments. During the process dust and chemicals are released in the air causing massive air pollution. This is one of the reason which is responsible for the deteriorating health conditions of workers and nearby residents.

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Air pollution in Kathmandu Valley

Preventive Measures

► At local level :

- Use of energy efficient appliances like; Light bulb, vehicles, other electronic devices
- Understand the concept of **Reduce, Reuse and Recycle**
- Use public transports
- Power savers' mode; turn off lights in non-use time
- Water treatment plant- river cleaning campaign
- Plantation green belt on road sides
- Eco-friendly infrastructures, and favorable internal working environment

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Air pollution in Kathmandu Valley



Gurugram, a city about 30km southwest of India's capital New Delhi, had the worst pollution levels globally in 2018.

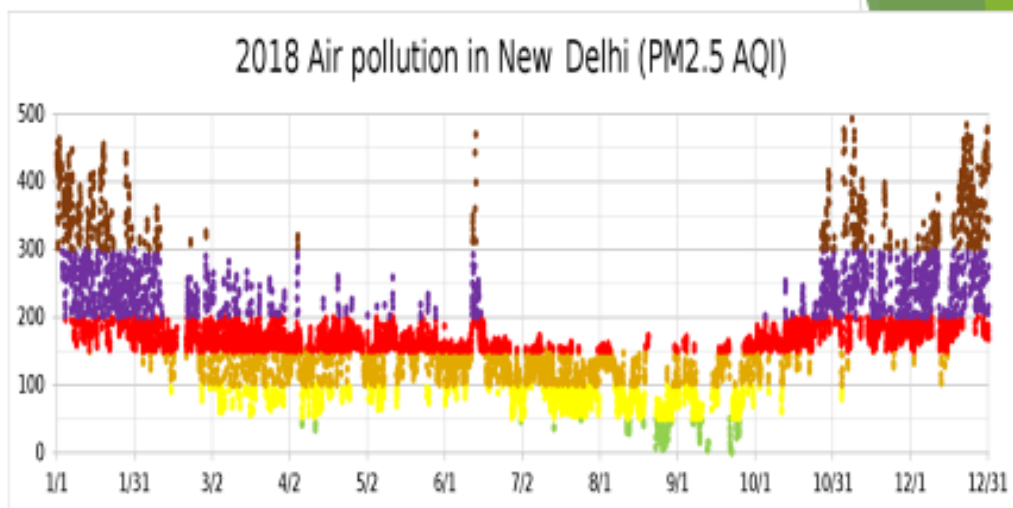
New Delhi, home to more than 20 million people, was ranked at 11, making it the world's most polluted capital, ahead of Dhaka, in Bangladesh, and Kabul, in Afghanistan.

Air Pollution in Delhi

- ▶ As per the AQI bulletin (January 2016), PM_{2.5} is the prominent pollutant in Delhi and neighbouring areas which continuously exceeds the standard [4]. In the months of May - October, the AQI shows that air quality is moderately polluted. However, after October, the situation becomes worse. The average AQI in the month of January was recorded as very poor to severe. Maximum value of PM_{2.5} is recorded as 296 µg/m³ during January 2016 (at IHBAS, Dilshad Garden) which is far above the prescribed standard limit (60 µg/m³).
- ▶ There are a number of sources responsible for the particulate matter such as transport, road dust, gaseous combustion etc. Moreover, the sources / natural causes also get influenced by the meteorological conditions prevailing in the neighbouring areas.

Causes of air pollution

- ▶ Vehicular pollution alone contributes about 72% of the total air pollution load in Delhi as estimated using emission factor and activity-based approach recommended by IPCC
- ▶ However, present study finds that it is not only the vehicular pollution, rather, domestic pollution, industrial emission, road dust, and garbage burning also have a large share in Delhi's total pollution load. Furthermore, construction of infrastructure including large residential complexes potentially contributes to the Delhi's air pollution load.
- ▶ Apart from the vehicular and industrial emissions, local climatic and seasonal factors also affect the air quality of Delhi



AQI Associated health impacts

The Air Quality Index is based on measurement of particulate matter (PM_{2.5} and PM₁₀), Ozone (O₃), Nitrogen Dioxide (NO₂), Sulfur Dioxide (SO₂) and Carbon Monoxide (CO) emissions.

- ▶ Good (0 - 50): Minimal impact
- ▶ Satisfactory (51 - 100): Minor breathing discomfort to sensitive people
- ▶ Moderately polluted (101 - 200): Breathing discomfort to people with lungs, asthma, and heart diseases
- ▶ Poor (201 - 300): Breathing discomfort to most people on prolonged exposure
- ▶ Very poor (301 - 400): Respiratory illness on prolonged exposure
- ▶ Severe (401 - 500): Affects healthy people, and seriously impacts those with existing diseases

Measures adopted to improve the air quality of Delhi

- ▶ The average AQI in the month of January was recorded as very poor to severe. Maximum value of PM_{2.5} is recorded as 296 µg/m³ during January 2016 which is far above the prescribed standard limit (60 µg/m³)
- ▶ Odd even scheme on the 4-wheelers plying on the roads
- ▶ Court directions : The directions included various significant issues such as control of vehicular emission, control of road dust and other fugitive emission, control of air pollution from biomass burning, control of industrial air pollution, control of air pollution from construction and demolition activities, etc.

Preventive Measures

1. Use renewable fuel and clean energy production

- ▶ The most basic solution for air pollution is to move away from fossil fuels, replacing them with alternative energies like solar, wind and geothermal.

2. Apply energy conservation and efficiency

- ▶ Producing clean energy is crucial. But equally important is to reduce our consumption of energy by adopting responsible habits and using more efficient devices.

Preventive Measures

5. Use Eco-friendly transportation

- ▶ Shifting to electric vehicles and hydrogen vehicles, and promoting shared mobility (i.e. carpooling, and public transports) could reduce air pollution.

6. Use green building

- ▶ From planning to demolition, green building aims to create environmentally responsible and resource-efficient structures to reduce their carbon footprint

- ### 7. Monitoring air pollution levels
- to detect pollution peaks, better control air pollution and eventually improve air quality.

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Govt. acts and laws

1. Environmental policy and legislative framework: Environmental Act 1996 and Regulation 1997,
2. National Climate Change Policy 2011,
3. National Low Carbon Economic Development Strategy (still in draft), and National Pollution Control Strategy and Action Plan
4. Transport Sector Policies and Legislations: National Transport Policy 2001, Transport Management Act 2049
5. Vehicles and Transport Management Rules 2054 (Nepalese calendar year), and National Sustainable Transport Strategy
6. (NSTS)(2015-2040)
7. Industry Sector Policies and legislations: Industrial Policy 2011, Foreign Direct Investment Policy 2015,
8. Land Industrial Enterprises Act(2073)
9. Energy sector Policies and Legislations: Hydropower development Policy 2001,
10. Rural Energy Policy 2006, and Renewable Energy Subsidy Policy 2016.

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Govt. acts and laws

- ▶ (i) Task Force on Air Pollution Control in Kathmandu valley, 2073
- ▶ (ii) High Level Committee on Probing and Solving the Issues on 20 year Old Vehicles, 2058
- ▶ (iii) Committee on Implementation of the Order of supreme CourtonPhaseoutof20YearOldVehicles, 2058/59
- ▶ (iv) Committee on Review of Vehicle Emission Standard and Monitoring Mechanism 2060.
- ▶ (v) Relocation of Brick Industries from Kathmandu Valley 2060

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Adopting a transboundary view of climate risk, which explicitly recognises the interconnections between people, ecosystems and economies in a globalised world, changes the scope and nature of the adaptation challenge and creates opportunities to reinvigorate international cooperation on adaptation.

HOW CAN I REDUCE INDOOR AIR POLLUTION?

If you're wondering what steps to take to prevent air pollution in your home you can start with making a checklist based on the common pollutants and see what you use in your property. From there you can replace or reduce the usage of that item. Increasing ventilation is always a good place to start.



Small changes, like replacing a log burning fire with a **'BIO FIRE'** can make all the difference.



If you're concerned about the level of air pollution in your property, an **AIR PURIFIER** can provide a reduced level of particulate matter count.



Building regulations in cities like London are pushing for the requirement of **AIR FILTERS** in commercial properties and workplaces.



Being **AWARE AND VIGILANT** of the impact air pollution has on health is key to creating a healthier, cleaner way of living.

Thank
you