Seminar Report

Environmental Community Awareness Seminar Series

DUSTY AIR

Prepared by

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

Supported by

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Introduction

Air pollution is a slow poison that makes people ill and ultimately kill them. Air pollution is increasing in Kathmandu valley, mainly due to over increasing population, rapid urbanization, infrastructure development, poor traffic management, and valley shaped geographical settings.

The sources of air pollution are both anthropogenic and natural. Anthropogenic causes are being minimized taking many preventive and control measures. 'Right to live in fresh and clean environment' is one of the fundamental rights of citizen mentioned in Nepal's Constitution 2072. Therefore, everyone is responsible for taking action 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 problem of 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 control to the local communities.

Asta-Ja Research and Development Centre (Asta-Ja RDC), Kathmandu, Nepal, organized the second seminar "Dusty Air" as part of the on-going '*Environmental Community Awareness Seminar Series'* on 27th April 2019. The seminar was hosted in Himalaya College of Engineering, affiliated with Tribhuban University, Chyasal, Lalitpur. Students from Bachelor of Electronic Engineering, the Principal of the College, the Chairman of the College, and Board of Directors 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.

Air pollution can be defined as the presence of toxic chemicals or compounds, called pollutants, in the air at levels that pose a health risk. Air pollution occurs when harmful or excessive quantities of substances including gases, particles, and biological molecules are introduced into earth's atmosphere. It may cause diseases, allergies and even death to humans. It may also cause harm to other living organisms such as animals and food crops, and may damage the natural or built environment. Both human activity and natural processes can generate air pollution.

Pollutants are classified as primary or secondary. Primary pollutants are usually produced by processes such as ash from a volcanic eruption. Other examples include carbon monoxide (CO) gas from motor vehicle exhausts or sulphur dioxide (SO) released from the factories. Secondary pollutants are not emitted directly, but they form in the air when primary pollutants react or interact. Ground level ozone is a prominent example of secondary pollutants. Some pollutants may be both primary and secondary: they are both emitted directly and formed from other primary pollutants. Good air circulation between indoors and outdoors is essential to reduce the health risks of breathing the air. Comparatively, indoor air poses more health risks than the outdoor air.

According to the 2014, World Health Organization report, air pollution in 2012 caused the deaths of around 7 million people worldwide.

The common pollutant

1. Carbon Dioxide (CO_2): CO_2 currently forms about 410 parts per million (ppm) of earth's atmosphere, compared to about 280 ppm in pre-industrial times, and billions of metric tons of CO2 are emitted annually by burning of fossil fuels. CO2 increase in earth's atmosphere has been accelerating.

2. Sulphur Dioxide (SOx): particularly sulphur dioxide is a chemical compound with the formula SO_2. SO2 is produced by volcanoes and in various industrial processes. Coal and petroleum often contain sulphur compounds, and their combustion generates sulphur dioxide.

3. Nitrogen oxides (NOx), Nitrogen dioxide is a chemical compound with the formula NO_2. Particularly nitrogen dioxide, are expelled from high temperature combustion, and are also produced during thunderstorms by electric discharge. It is one of several nitrogen oxides.

4. CO (Carbon monoxide) is a product of combustion of fuel such as natural gas, coal or wood. Vehicular exhaust contributes to the majority of carbon monoxide let into our atmosphere. It creates a smog type formation in the air that has been linked to many lung diseases and disruptions to the natural environment and animals. In 2013, more than half of the carbon monoxide emitted into our atmosphere was from vehicle traffic in which burning one gallon of gas often emit over 20 pounds of carbon monoxide into the air.

5. Volatile organic compounds (VOC) are well-known outdoor air pollutants. They are categorized as either methane (CH_4) or non-methane (NMVOCs). Methane is an extremely efficient greenhouse gas which contributes to enhanced global warming. Other hydrocarbon VOCs are also significant greenhouse gases because of their role in creating ozone and prolonging the life of methane in the atmosphere. This effect varies depending on local air quality.
6. Ammonia (NH4): It is emitted mainly by agricultural waste. Ammonia is a compound with the formula NH_3. It is normally encountered as a gas with a characteristic pungent odor. Ammonia contributes significantly to the nutritional needs of terrestrial organisms by serving as a precursor to foodstuffs and fertilizers. Ammonia, either directly or indirectly, is also a building block for the synthesis of many pharmaceuticals. Although in wide use, ammonia is both caustic and hazardous. In the atmosphere, ammonia reacts with oxides of nitrogen and sulphur to form secondary particles.

1. Seminar objectives

The overall objective of the seminar series was to raise community awareness on Air pollution in Kathmandu Valley, targeting primarily student communities representing both Colleges and High Schools. 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.

2. Presentation outlines (contents)

The PowerPoint presentation from Dr. Shanti Kala Subedi included:

1. Air pollution, major pollutants
2. Causes and effects of air pollution
3. Air pollution in Kathmandu valley
4. Preventive measures
5. Government's initiation
6. Future challenges and opportunities

3. Methodology used

Following methodologies were used in order to enhance the effectiveness of the seminar program:

Power point presentation, discussion and interaction.

Dr. Shanti Kala Subedi, Chief Research & Innovation Unit of Himalaya College of Engineering, Lalitpur, was the resource person for the seminar. Dr. Shanti has a long teaching, research, training and consultancy services experience particularly in the

field of Engineering, Rural Community Development, Engineering Modelling and environment (air pollution).

About 1.5 hour long session was taken for presentation. The session was followed by student Interaction program with feedback collection activity. Students were given a sheet of paper to write their expected outcome before the session started, and asked to write down feedbacks at the end of session for post evaluation. The evaluation data showed that above 95% of total students got approximately 99% fulfilling of their learning expectation. Presentation PowerPoint is given annex-3

4. Student's Learning Expectations

1. Definition of Air pollution.
2. Environment status of Kathmandu Valley.
3. Causes/sources/reason of air pollution
4. Effect of air pollution on environments & human health
5. Reduction measures
6. Government policy to control air pollution
7. Government & private sector action for pollution control
8. Different pictures or video relating to it and discussion about its prevention.
9. How can we motivate others for pollution control?
10. Opportunity for the next generation.

5. Participants of the second seminar on 'Dusty Air'

In total, 35 individuals from Bachelor in Electronics Engineering students, College Principal, Director, Department Head, staffs from HCOE, and three officials from Asta-Ja RDC participated the seminar.

After self-introduction by participants, Mr. Bishnu Dayal Singh, Asta-Ja RDC Executive Member, delivered welcome note, shared the objectives of the seminar, and coordinated/facilitated the seminar.

General Secretary of Asta-Ja RDC, Dr. Bishnu Chapagain, highlighted the importance of seminar on raising community awareness for addressing the problem of air pollution in Kathmandu valley. He also highlighted Asta-Ja program objectives, goal and its principals, and answered the questions raised in relation to Asta- Ja program.

Er. Madan Sharma, the Principal of Himalaya College of Engineering, highlighted issues of air pollution in Kathmandu and thanked the Asta-Ja RDC team for hosting this event in Himalaya College of Engineering, Chyasal, Lalitpur.

6. Sources of air pollution

Anthropogenic (man-made) sources

- Mobile sources include motor vehicles, marine vessels, and aircraft.
- Stationary sources include smoke stacks of fossil fuel power stations
- Controlled burn practices in agriculture and forest management.
- Waste deposition in landfills,
- Methane, which generates from land fill, is highly flammable and may form explosive mixtures with air. Methane is also an asphyxiate and may displace oxygen in an enclosed space. Asphyxia or suffocation may result if the oxygen concentration is reduced to below 19.5% by displacement.
- Fertilized farmland may be a major source of nitrogen oxides.

Natural sources

- Dust from natural sources, usually large areas of land with little or no vegetation
- Methane, emitted by the digestion of food by animals, for example cattle
- Smoke and carbon monoxide from wildfires.
- Vegetation, in some regions, emits environmentally significant amounts of Volatile organic compounds (VOCs) on warmer days.
- Volcanic activity, which produces sulphur chlorine, and ash particulates

7. Effects of air pollution

Health Problems

- 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.
- The World Health Organization estimated in 2014 that every year air pollution causes the premature death of some 7 million people worldwide, out of which- 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**.**

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
- (PM2.5) in urban areas of Nepal was noted to be 140μg/m3 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 PM2.5 values were 120 μg/m3 and 40 μg/m3 2*times higher than the WHO targeted value.

Acid Rain

Harmful gases like nitrogen oxides and sulfur oxides are released into the atmosphere during the burning of fossil fuels. When it rains, water droplets combine with these air pollutants, become acidic and then fall on the ground in the form of acid rain. Acid rain can cause great damage to human, animals and crops.

8. Air pollution in Kathmandu Valley

Why Kathmandu valley is vulnerable to air pollution

- High population growth rate (4.78% in 2017) and dense population 13,225 per km2 (CBS 2011).
- Increasing number/type of vehicles (number of registered vehicles were 14,000 in 2001, and increased to 8,00,000 in 2015.
- Rapid urbanization and infrastructure development.
- Valley/cup shaped topographical settings causing stagnated air unable to flow outside
- Traffic management (roadways and airways)
- Poor waste management system/ road side garbage and wastes make air flow dirty
- Road construction - mostly ongoing- always make road dusty.
- Pesticides and fertilizers used in agricultural production.
- Brick kilns emits smokes, and
- Deforestation and cutting off roadside trees for road extension.

9. Preventive Measures

Initiation and action from an individual users

- **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

- **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.

- **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.

Initiation from the Government of Nepal

Government law and act

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 Policy2016.

Work force for implementation

- Task Force on Air Pollution Control in Kathmandu valley, 2073
- High Level Committee on Probing and Solving the Issues on 20 year Old Vehicles, 2058
- Committee on Implementation of the Order of supreme Court on Phase out of 20 Year Old Vehicles, 2058/59
- Committee on Review of Vehicle Emission Standard and Monitoring Mechanism 2060.
- Relocation of Brick Industries from Kathmandu Valley 2060

10. Discussions:

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.

SN	Question raised	Discussion on potential solution options
1	Electric poles and electricity distribution lines are seems very unmanaged and dangerous in Kathmandu valley, how can we support to minimize them?	Students can develop, explore and apply digital systems and recommend to the Government to adopt or to give priority for such issues
2.	Old / outdated vehicles are major cause of emission in Kathmandu valley, how can we manage that?	It is already included in Government environment policy, we can do follow up for rapid implementation
3	Can we use electric and hybrid vehicles?	Yes, but might have a charging problem. We can support to construct charging ports in some stations where appropriate
4.	How can we manage air pollution from Brick Kiln?	Some of the old kilns/ ovens are already replaced in Brick Factories in Bhaktapur. Removal of unnecessary small brick factories and cement factory in Kath are appreciative work. It is already under Government policy.
5	Will the brooming system initiating from Municipality effective and sustainable?	At least it is being initiating…lets think what can we do to make it more effective like by watering … remote controlled garbage collection system etc.
6	What can we do from our side to reduce air pollution in Kathmandu valley?	• Do some project works about digital electric supply system, electric and hybrid vehicle use, traffic management, road development etc. • Use public vehicles instead of personal vehicle • Use energy efficient electrical and electronic appliances at home and offices to minimize energy and emission • Switch off power stations when not in use. • Does some research work about the issues, publish and recommend to the government to apply it. • Give pressure and support to local community. local govt and national govt to make environment friendly transportation, electronic , infrastructure and water supply and sanitation facilities etc, from their level.

11. Conclusion:

Air pollution is increasing in Kathmandu valley, mainly due to over increasing population, rapid urbanization, infrastructure development, poor traffic management, and valley shaped geographical settings.

The seminar was very successful in conveying the message of 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.

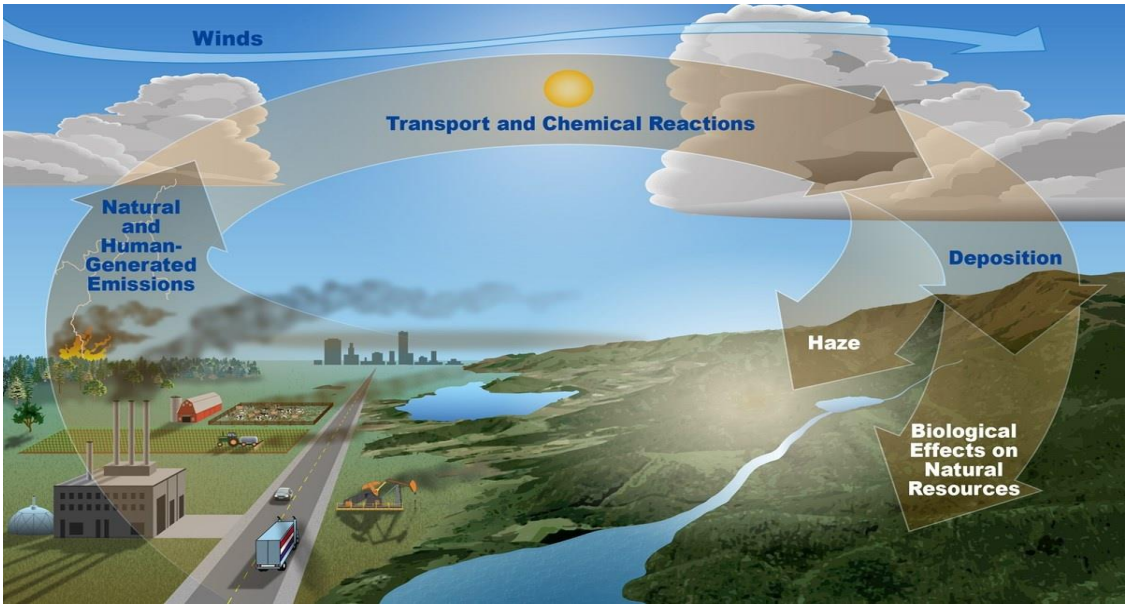
The seminar was very helpful to student participants in gaining knowledge about air pollutants, understanding sources and effects of air pollution, and identifying important remedial measures for pollution control. Participants realized the responsibility of all stakeholders including students and common 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.

References

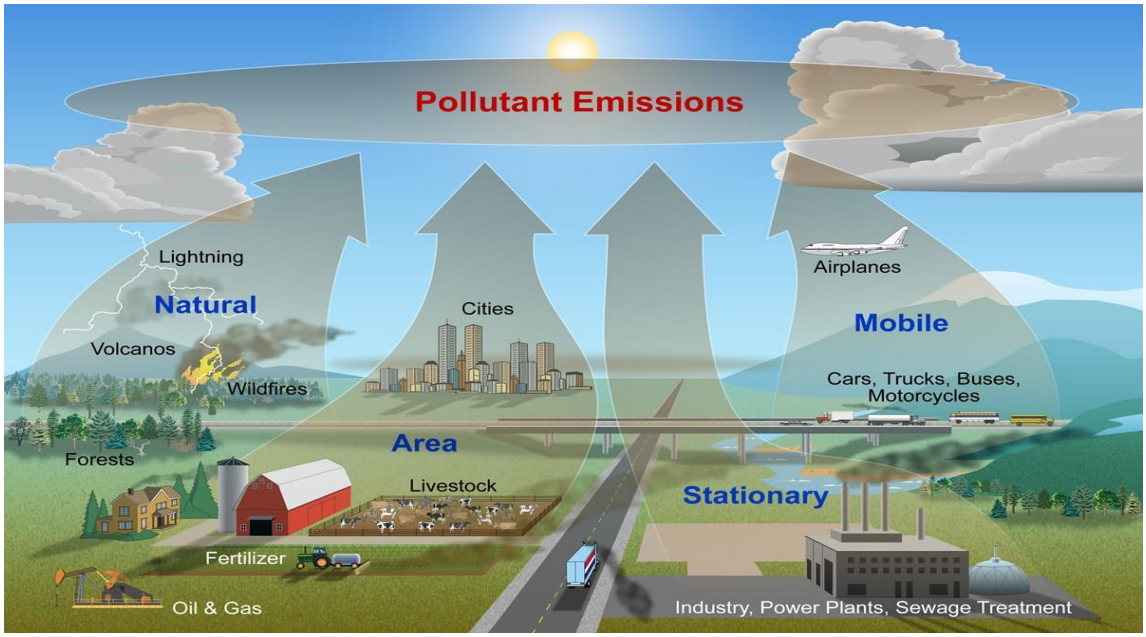
1. *"Graphic: The relentless rise of carbon dioxide". Climate Change: Vital Signs of the Planet. NASA.*
2. *"How much of U.S. carbon dioxide emissions are associated with electricity generation?". Retrieved 2016-12-16.*
3. *"Full Mauna Loa CO2 record". Earth System Research Laboratory. Retrieved 10 January 2017.*
4. Houghton, J.T., ed. (2001). *Climate change 2001: the scientific basis : contribution of Working Group I to the third assessment report of the Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press. ISBN 978-0521807678. OCLC 46634335.
5. *"The Effect of Changing Background Emissions on External Cost Estimates for Secondary Particulates". Open environmental sciences. 2008*
6. The Threat of Ambient Air Pollution in Kathmandu, Nepal https://www.researchgate.net/publication/326302180_The_Threat_of_Ambient_Air_Pollution_in_Kathmandu_Nepal
7. Situation Analysis of Ambient Air Pollution and Respiratory Health Effects in Kathmandu Valley 2015. https://www.researchgate.net/publication/311582369_Situation_Analysis_of_Ambient_Air_Pollution_and_Respiratory_Health_Effects_in_Kathmandu_Valley_2015
8. A Strategic Approach for Air pollution Reduction in Kathmandu Valley https://www.sei.org/publications/strategic-approach-air-pollution-reduction-kathmandu-valley/
9. Air Pollution Inside Public Transport Vehicles of Kathmandu Valley

10. https://www.researchgate.net/publication/321680151_Air_pollution_inside_public_transport_vehicles_of_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: air pollution from unmanaged traffic lanes, and protection measures

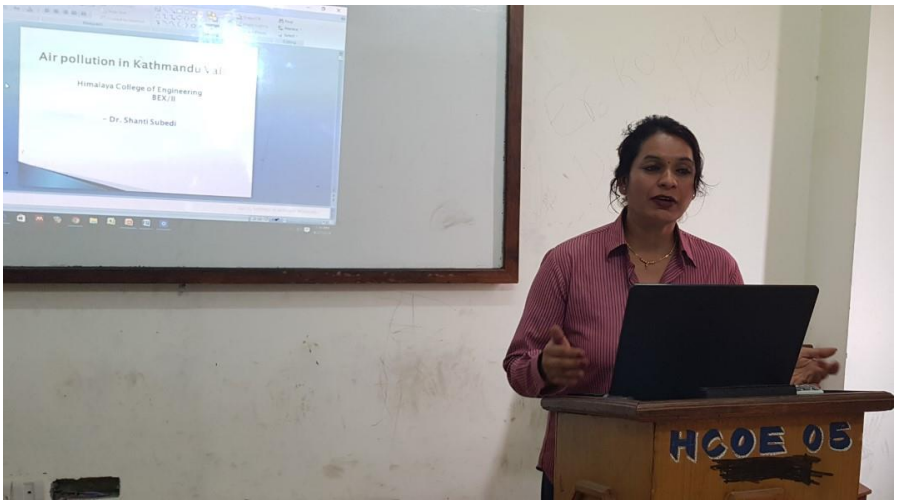
Picture 5: Air pollution in Kathmandu valley by underconstructing road condition

Picture 6: Air pollution from brick factory, Bhaktapur, Nepal

Annexes 2: Event photos

Picture 7: Listening to Dr. Bishnu Prasad Chapagain, General Secretory, Asta-Ja, in seminar opening ceremony

Picture 8: Listening to Mr. Bishnu Dayal Singh, Board of Director, Asta-Ja, during seminar opening ceremony



Picture 9: Presentation on 'Air Pollution in Kathmandu Valley'

Picture 10: Presentation on 'Air Pollution in Kathmandu Valley'

Picture 10: Attendees in 'Environmental Community Awareness Seminar'