



# CH1203 Industrial Pollution Prevention and Control

Balasubramanian S

Department of Chemical Engineering  
SRM University

# Topics Covered

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- 1 Sustainability
- 2 Environmental Regulations
- 3 Pollution
- 4 Air pollution control methods
- 5 Principles of water treatment



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- 1 Sustainability
- 2 Environmental Regulations
- 3 **Pollution**
- 4 Air pollution control methods
- 5 Principles of water treatment



# Topics Covered

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## Pollution

- Definition of Pollutant and Pollution
  - Classification of Pollution
  - Air Pollution
  - Land Pollution
  - Noise Pollution
  - Standards
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# Topics Covered

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## Pollution

- Definition of Pollutant and Pollution
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  - Air Pollution
  - **Land Pollution**
  - Noise Pollution
  - Standards
-

# Land Pollution

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## **About land Pollution**

- When we talk about air or water pollution the reactions garnered are stronger.
  - Because we see the effects caused by the pollutants and their extent very clearly.
  - It is normal human psychology to believe in what you see at first?
  - Our land on the other hand is also polluted.
  - We may not see the effects with clarity but land is being polluted and abused.
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# Land Pollution

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## **About land Pollution**

- Land pollution means the degradation or destruction of earth's surface and soil, directly or indirectly as result of human activities.
- Some of the activities includes the development of cities and industrialization
- In other words, Anthropogenic activities that lessens the quality and/or productivity of the land

# Land Pollution

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## **About land Pollution**

- The increase in number of barren land plots and the decreasing number of forest cover is at an alarming ratio.
  - Moreover the extension of cities and towns due to increasing population leads to further exploitation of the land
  - Due to lack of green cover, the land gets affected in several ways like soil erosion occurs washing away the fertile portions of the land. Or even landside are the best examples.
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# Land Pollution

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## Causes of land Pollution

- ① Deforestation and soil erosion
  - ② Agricultural activities
  - ③ Mining activities
  - ④ Over crowded land fills
  - ⑤ Industrialization
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# Land Pollution

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## Effects of land Pollution

- ① Soil pollution
- ② Distraction for tourists
- ③ Effect on wild life
- ④ Human health
- ⑤ Global warming

# Land Pollution

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## Effects of land Pollution

- ① **Soil pollution** – the upper layer of the soil is damaged because of over use of fertilizers, soil erosion caused by running water and pesticides use.
- ② **Distraction for tourists** – city losses its attraction as tourist destination. Because land fills do not look good when you move around the city.

# Land Pollution

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## Effects of land Pollution

- ③ **Effect on wild life** – Animals has suffered and they face a serious threat with regards to loss of habitat and natural environment. The constant human activity on the land resulted in land pollution; forcing the animals to move further way and adapt to new regions or die trying to adjust.

# Land Pollution

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## Effects of land Pollution

- ④ **Human health** – The land when contaminated with toxic chemicals and pesticides leads to problem of skin cancer and human respiratory system. Toxic chemicals can reach human body through foods and vegetables that we eat as they are grown in a polluted soil.

# Land Pollution

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## Effects of land Pollution

- ⑤ **Global warming** – When deforestation leads to a steep imbalance in rain cycle. Distributed rain cycles affects many things. To start with the green cover is reduced. Trees and plants help balance CO<sub>2</sub> without them we are facing various problems like global warming and the green house effect, irregular rainfall and flash floods.

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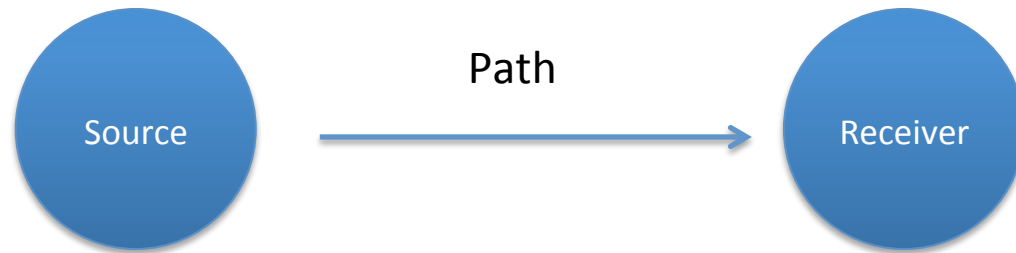
## Noise Pollution – *What ?*

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- Sound is a form of energy which is emitted by vibrating body and on reaching ear causes the sensation of hearing through nerves.
- Sounds produced by all vibrating bodies are not audible
- The frequency limits of audibility are from 20 Hz to 20,000 Hz
- A noise problem generally consists of three inter-related elements
  - ① Source
  - ② Path
  - ③ receiver

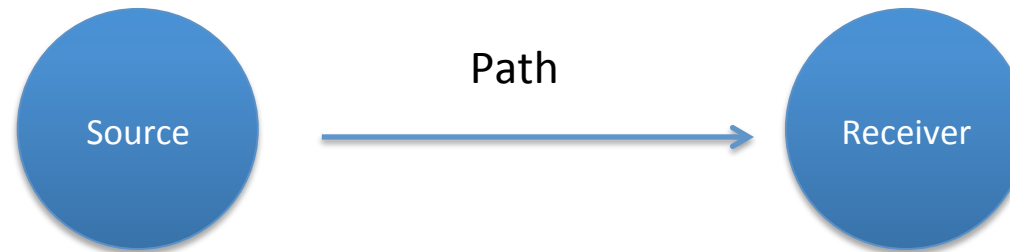
## Noise Pollution – *What ?*

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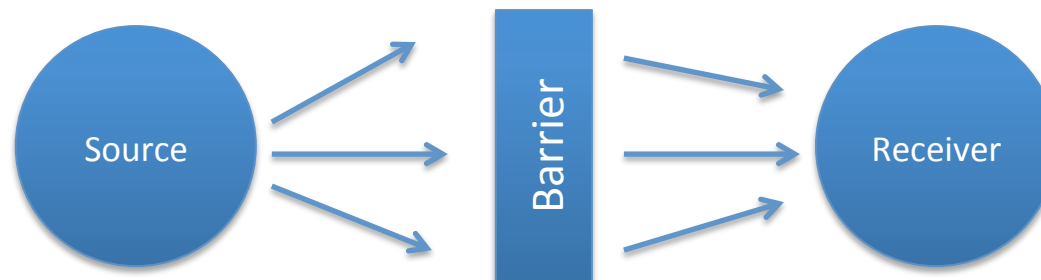


- The transmission path is usually atmosphere through which the sound is propagated, but can include the structural materials of any building containing the receiver.
- A healthy human ear can hear sound frequency ranging from 20Hz to 20,000 Hz.

## Noise Pollution – *What ?*



- The transmission path is usually atmosphere through which the sound is propagated, but can include the structural materials of any building containing the receiver.



## Noise Pollution – *Classification*

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- Noise may be continuous or intermittent (or periodic)
- High frequency or low frequency
- Sounds of frequencies less than 20 Hz called as infrasonics
- Sounds of frequencies more than 20,000 Hz are called ultrasonics

## Noise Pollution – *Measurement*

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- Decibel dB
- Frequency

Decibel – The intensity of sound is measured in Sound Pressure Level (SPL) and common unit is dB.

The pressure exerted at a point due to a sound producing source is called sound pressure.

The ambient (A) noise levels are measured in weighted SPL and abbreviated as dB(A)

## Noise Pollution – *Measurement*

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If the SPL,  $L_1$  in dB is measured at  $r_1$  meters, then sound pressure level,  $L_2$  in dB at  $r_2$  meters is given by

$$L_2 = L_1 - 20 \log_{10} (r_2/r_1) \quad (a)$$

If the sound levels are measured in terms of pressure, then the SPL is given by

$$L_p = 20 \log_{10} (P/P_0) \text{ dB(A)} \quad (b)$$

$P_0$  is the reference pressure

## Noise Pollution – *Measurement*

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Day night equivalent ambient noise levels can be expressed as

$$L_{dn}, \text{dB(A)} = 10 \log \left[ \frac{1}{24} \times (10^{L_d/10}) + \frac{9}{24} (10^{L_n+10}/10) \right]$$

Where  $L_d$  = day-equivalent noise levels (from 6 AM – 9 PM)

$L_n$  = night-equivalent noise levels (from 9 PM – 6 AM), dB (A)

## Noise Pollution – *Measurement*

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### Frequency analysis of noise

- Frequency analysis allows us to separate main components of signals by dividing the frequency range of interest into smaller frequency bands using set of filters.
- We may distinguish noises or sound that consists of regularly repeated or periodic sounds and those that consists od aperiodic sounds.
- The simplest periodic sound is pure tone i.e. a pressure disturbance that fluctuates sinusoidally at a particular frequency.



## Noise Pollution – *Sources*

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Lower the frequency longer the wavelength

i.e.  $\text{Wavelength} = \text{Velocity of sound} \div \text{frequency}$

### **Various sources of noise**

- ① Domestic – movement of utensils, cutting, hammering, peeling vegetables and so on
- ② Natural – shores, birds/animals, wind movement, sea tide, water falls, tree leaves and so on
- ③ Commercial
- ④ Industrial

## Noise Pollution – *Sources*

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Typical noise level of some point sources

Source	Noise level (dB)
Air compressors	95 – 104
110 kVA diesel generator	95
Lathe machine	87
Milling machine	112
Gas cutting	96
Steam turbine (12,500 kW)	108
Riveting	95

## Noise Pollution – *Measurement devices*

Equipment	Area of usage or applications
1. Sound level meter	Type – 0 Laboratory reference standards
	Type – 1 Lab and field use in specific controlled environment
	Type – 2 General field use
	Type – 3 Noise survey
2. Impulse meters	For measurement of impulse noise levels e.g hammer blows
3. Frequency analyzers	For detailed design and engineering
4. Noise dosimeters	Used to find out noise levels in working environment
4. Graphic recorders	Plots SPL as function of time on moving paper chart attached to sound level meter

## Noise Pollution – *Control*

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The techniques employed for noise control can be broadly classified as:

- ① Control at source
- ② Control in the transmission path
- ③ Using protective instruments

## Noise Pollution – *Control*

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The techniques employed for noise control can be broadly classified as:

- ① Control at source –
  - a) reducing noise levels from the domestic sectors
  - b) maintenance of automobiles
  - c) control over vibrations
  - d) low voice speaking
  - e) prohibition of usage of loud speakers
  - f) selection of machinery
  - g) maintenance of machine

## Noise Pollution – *Control*

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The techniques employed for noise control can be broadly classified as:

- ② Control in transmission path
  - source
    - a) installation of barriers
    - b) design of building incorporating the use of suitable noise absorbing material
    - c) control over vibrations
    - d) low voice speaking
    - e) prohibition of usage of loud speakers
    - f) selection of machinery
    - g) maintenance of machine

## Noise Pollution – *Control*

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The techniques employed for noise control can be broadly classified as:

- ③ Use of protective equipment's such as earmuffs and ear plugs

## Noise Pollution – *Effects*

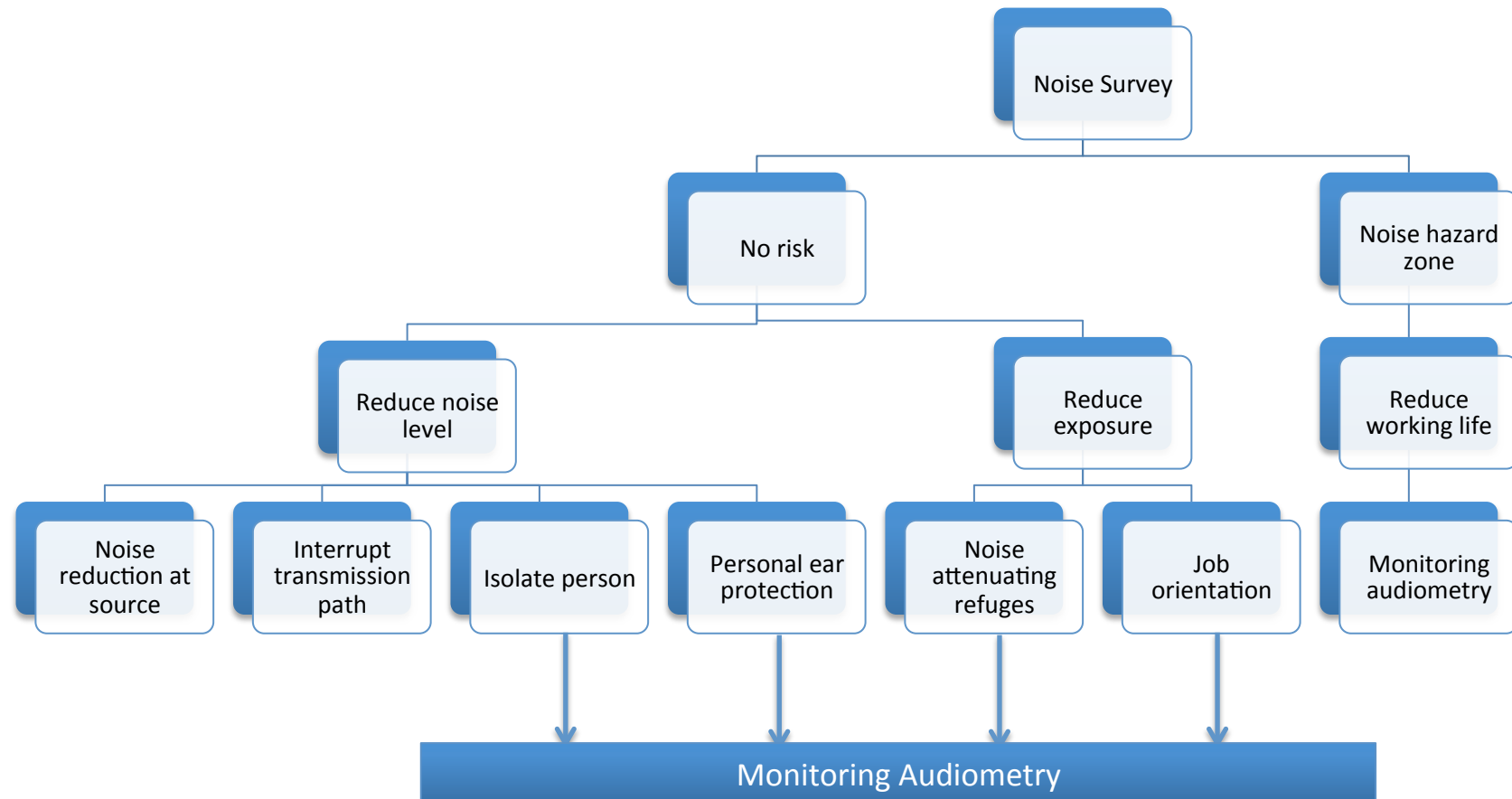
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Some of the adverse effects of noise on human and living organisms are:

- ① **Annoyance** – the aperiodic sound due to irregular occurrences causes displeasure to hearing and causes annoyance.
- ② **Physiological effects** – increased heart beat rate and breathing amplitude
- ③ **Loss of hearing** – long exposure to high sound levels causes loss of hearing
- ④ **Working performance** - the working performance of labors will be affected as they will lose their concentration.



# Noise Pollution – *Strategy for industries*



## Standards

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Indian Standards for drinking (or) potable water. The details of permissible limits of various constituents of water are given in the **BUREAU OF INDIAN STANDARD**

[http://bis.org.in/sf/fad/FAD25\(2047\)C.pdf](http://bis.org.in/sf/fad/FAD25(2047)C.pdf)

The standard prescribes the requirements, test methods and sampling procedure for ascertaining the suitability of water for drinking purpose.

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## Standards

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Indian Standards for drinking (or) irrigation or agriculture water. The details of permissible limits of various constituents of water are given in the **BUREAU OF INDIAN STANDARD**

<https://law.resource.org/pub/in/bis/S06/is.11624.1986.pdf>

This standard prescribes the guidelines for assessing the quality of irrigation water.

## *References*

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[http://discovery.bits-pilani.ac.in/dlpd/courses/coursecontent/coursematerial%5Cetz362%5Cnoise\\_pollution\\_notes.pdf](http://discovery.bits-pilani.ac.in/dlpd/courses/coursecontent/coursematerial%5Cetz362%5Cnoise_pollution_notes.pdf)