Tackling water pollution & Noise pollution

Dr. Brajesh Kumar Dubey

Associate Professor

Environmental Engineering and Management Division

Department of Civil Engineering

Indian Institute of Technology Kharagpur

Topic Covered

Tackling water pollution:

- Overview of water pollution mitigation measures
- Applicable wastewater discharge standards (new standard by the National Green Tribunal)

Noise Pollution:

- Sources and effects of noise
- quantification of noise pollution (Leq, LAeq, etc.);
- Control and regulation rules in India

Prevention steps taken for water pollution

-To indulge ***awareness*** to the public

-Use ***environmentally household*** products

-***Turn off the tap*** when running water is not necessary

-***Avoid leakages*** from drainage pipe lines

-***No dumping waste*** from industry in the water resources

-***Avoid over*** dosage of ***pesticides*** and ***fertilizers***

-**Don't throw** the ***non degradable substances*** to rivers, lakes or ocean

-Pre-***treatment*** of industrial ***wastewater*** before leaving to water bodies

Prevention steps taken for water pollution

Rivers ***should not be used for washing*** clothes or bathing animal

Harvesting of Rainwater to meet water requirements

Dams and embankments must be created

The rivers must not be contaminated

The dead bodies, plastics and other non degradable substances should not be thrown in sea, lakes and rivers

Avoid ***afforestration***

Greatly reduce nonpoint runoff

Prevent groundwater contamination

3 R's to Prevent water pollution

Refuse: say no to pollution

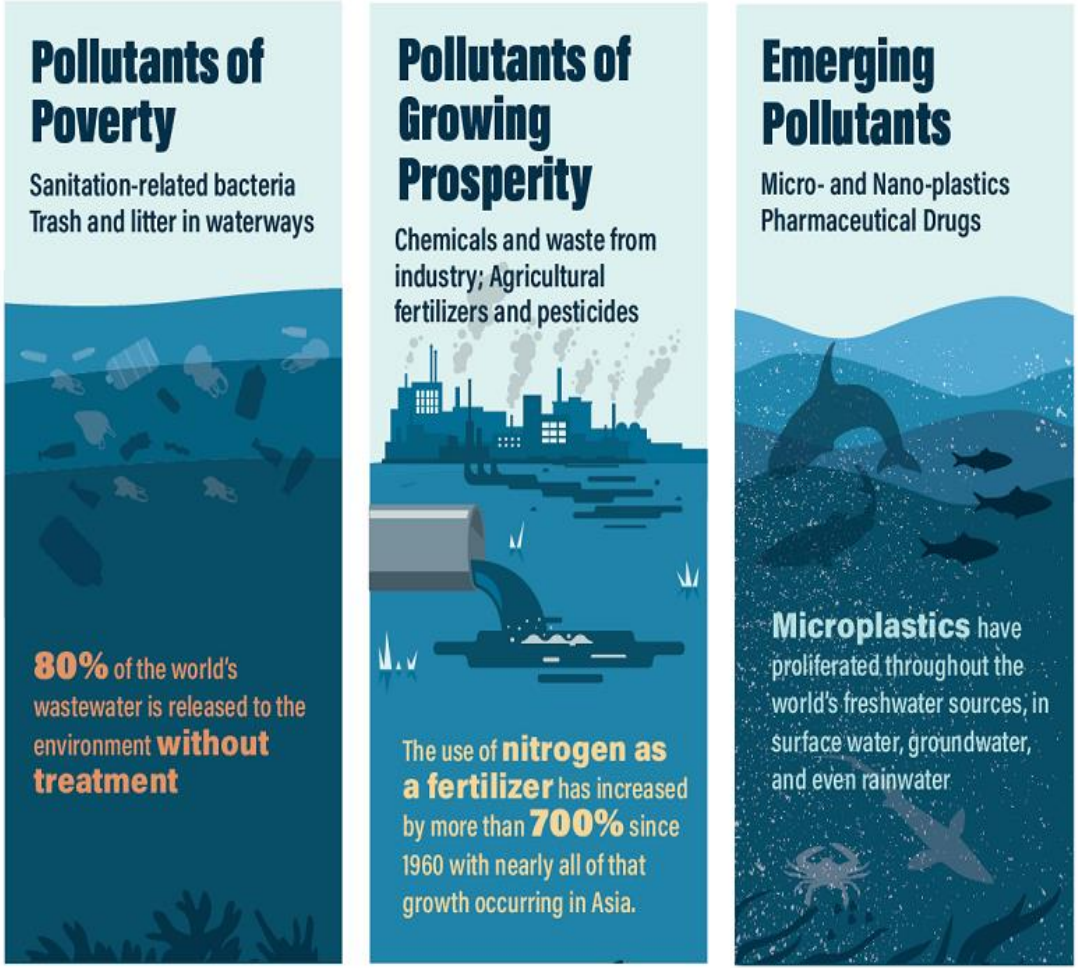
Recycle: Recycle water

Reduce: Minimize use of water

3 R's to Prevent water pollution

REFUSE:

SAY NO TO POLLUTION



Source:
HTTPs://www.worldbank.org/en/news/infographic/2019/08/

3 R's to Prevent water pollution

RECYCLE:

RECYCLE THE WATER

Source:
https://visual.ly/community/Infographics/environment/wastewater-recycle-infographic

CALIFORNIANS ARE READY FOR RECYCLED WATER*

Residents eager for long-term solutions to water scarcity

NEARLY 90% of Californians believe the state should **continue to invest** in recycled water for drinking water even if El Niño brings the expected rainfall.

12%

Only 12% will be less concerned about conserving water if El Niño brings the expected rainfall.

76%

of survey respondents believe recycled water **should be used** as a long-term solution, regardless of drought.

87%

of respondents **SUPPORT** using recycled water as an additional source of water.

VERY SUPPORTIVE | SOMEWHAT SUPPORTIVE

are **willing to use** recycled water in their everyday lives.

EDUCATION

is a **key component** in securing support for recycled water across the state.

89%

of California residents are **more willing** to use recycled water after learning about the treatment process.

LABELS MATTER:

Referring to reused water as **"purified water"** garners stronger support for its use as an additional local water supply than **"recycled water"** or **"reclaimed water."**

89% of Californians agree that the drought has made them **more supportive** of **RECYCLED WATER.**

Source: HTTPs://waterpolls.org/recycled-water-public-opinion/

REDUCE:

MINIMIZE THE USE OF WATER

Source: HTTPs://wateruseitwisely.com/100-ways-to-conserve/home-water-challenge/

Reduce Water Usage

Turn it off:
Turn off taps while brushing your teeth, soaping clothes and scrubbing vessels

Fix leaking tap:
Fixing leaking taps doesn't take much, but it can save a significant amount of water

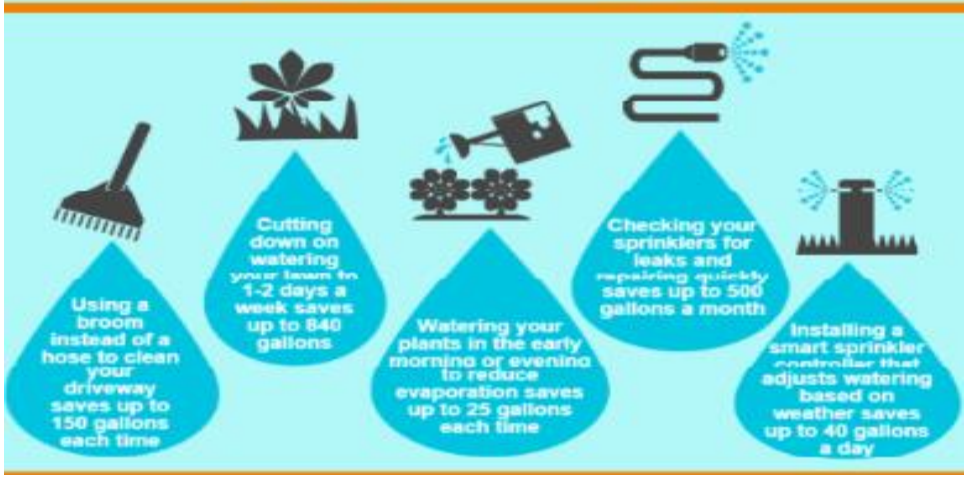
Take a bucket bath:
Using a bucket instead of a shower to bathe can reduce your water consumption by 80%

Recycle water:
Water treatment plants and rainwater harvesting systems can recycle water on a large scale - but to recycle water on your own, you can do simple things like using the water in which vegetables have been washed to water plants

Upgrade your equipment:
Install faucet aerators, low-flow showerheads, and toilets with smaller flush tanks

Use energy-efficient technology:
Energy star-rated dishwashers and washing machines use less water

Saving Water at Home



Source: HTTPs://www.solarschools.net/knowledge-bank/sustainability/reduce-reuse-recycle/reduce/water-usage

Mitigation measures for water pollution

-Comprehensive ***water management plan***

-Construction of proper ***storm drains and settling ponds***

-***Rain water harvesting*** structure

-***Effluent and sewage*** treatment plant

-***Regular monitoring*** of water and waste water

-***Reuse*** treated wastewater for Irrigation

-Discharge the effluents ***as per the standards***

-The ***environmental Protection agency*** also has a list of simple things you can do at home to stop water pollution

Wastewater discharge standards by NGT

The Tribunal also noted that the proposed standards as per Draft Notification dated 24.11.2015 issued by Ministry of Environment, Forest & Climate Change (MoEF & CC) are sought to be diluted by the impugned Notification as follows:

Sr. No.	Parameters	Old Norms 1986	Draft Norms Nov., 15	MoEF& CC Notification October 2017
1.	Biochemical Oxygen Demand (BOD) (mg/l)	<30	<10	<30 and <20 (metro cities)
2.	Chemical Oxygen Demand (COD) (mg/l)	<250	50	No limit
3.	Total Suspended Solids (TSS) (mg/l)	<100	<20	<100 and <50 (metro cities)
4.	Total Nitrogen (mg/l)	<100	<10	No limit
5.	Ammonical Nitrogen (mg/l)	<50	<5	No limit
6.	Total Phosphorus (mg/l)	No limit	No limit	No limit
7.	Fecal Coliform MPN/100 ml	No limit	<100	<1000

Source: http://www.indiaenvironmentportal.org.in/files/file/revised-standards-STPs-NGT-Order.pdf

Wastewater discharge standards by NGT

Sl. No.	Industry	Parameters	Standards (Applicable to all mode of disposal)			
1	2	3	4			
	Sewage Treatment Plants (STPs)		Mega and Metropolitan Cities	Class I Cities	Others	Deep Marine Outfall
		pH	5.5-9.0	5.5-9.0	5.5-9.0	5.5-9.0
		Bio-Chemical Oxygen Demand (BOD)	10	20	30	30
		Total Suspended Solids (TSS)	20	30	50	50

Source: http://www.indiaenvironmentportal.org.in/files/file/revised-standards-STPs-NGT-Order.pdf

Wastewater discharge standards by NGT

		Chemical Oxygen Demand (COD)	*50*	*100*	*150*	*150*
		Nitrogen-Total	*10*	*15*	*-*	*-*
		Phosphorus-Total(For Discharge into Ponds, Lakes)	*1.0*	*1.0*	*1.0*	
		Fecal Coliform (FC) (Most Probable	*Desireable-100 Permissible-*	*Desireable-230 Permissi*	*Desireable-1000 Permissible-*	*Desirable-1000 Permissibl*

Source: http://www.indiaenvironmentportal.org.in/files/file/revised-standards-STPs-NGT-Order.pdf

Wastewater discharge standards by NGT

		Number per 100 mililiter, MPN/100 ml	230	ble-1000	10,000	e-10,000

Note:

(i) Mega-Metropolitan Cities have population more than 1 crore, Metropolitan Cities-Population more than 10 Lakhs and Class-1 Population more than 1 Lakh.

(ii) All value in mg/l except for pH and Fecal Coliform.

(iii) These standards will be applicable for discharge into water bodies as well as for land disposal/ applications.

(iv) These Standards shall apply to all new STPs for which construction is yet to be initiated.

(v) The existing/under construction STPs shall achieve these standards within 07 years from the date of notification.

(vi) In case where the marine outfall provides a minimum initial dilution of 150 times at the point of discharge and a minimum dilution of 1500 times at a point 100m away from discharge point, then norms for deep sea marine discharge shall be applied.

(vii) Reuse/Recycling of treated effluent shall be encouraged.

(viii) State Pollution Control Boards/Pollution Control Committees may make these norms more stringent taking into account the local conditions.

"

Source: http://www.indiaenvironmentportal.org.in/files/file/revised-standards-STPs-NGT-Order.pdf

National Green Tribunal Orders Stricter Norms For Effluent Discharge From Sewage Treatment Plants In Cities

Perusing a report that claims that 323 out of 351 rivers in the country are polluted, the National Green Tribunal said that the water quality standards and norms are required to be stricter and must be applied to both new and existing Sewer Treatment Plants

New Delhi: The National Green Tribunal (NGT) has directed the Ministry of Environment and Forests (MoEF) to issue stricter norms for effluent discharge from sewage treatment plants (STPs). The green panel said standards for effluent discharge, recommended for mega and metropolitan cities will also apply to the rest of the country and directed the MoEF to issue a notification in this regard within a month. A bench headed by NGT Chairperson Justice Adarsh Kumar Goel noted that the relaxed standards will deteriorate the water quality and degrade the environment.

Also Read: Waste Management: Single Agency Should Maintain Stormwater Drains, Suggests IIT-Delhi

The NGT bench said it will be a retrograde step and the dilution will also affect the human life and water quality of the rivers. It said the water quality standards are required to be the same for the population of major cities or other cities. The tribunal directed that the standards will apply not only for new STPs but also for existing/under construction STPs without any delay and "giving of seven years' time stands disapproved". The bench said,

> No justification has been shown for different standards for persons living in cities other than mega and metropolitan cities. Major population of this country will be affected by diluted standards and only persons in mega and metropolitan cities will have comparatively better standards without any valid reason or distinction. We may note that filters, UV filters, etc. are facilities mainly available in major cities and not in smaller cities or villages where the standards are proposed to be diluted.

Source: HTTPs://swachhindia.ndtv.com/national-green-tribunal-orders-stricter-norms-for-effluent-discharge-from-sewage-treatment-plants-in-big-cities-33946/

Noise Pollution

Introduction

What is a ***sound***?

Sound is created when something vibrates and sends waves of energy into our ears

What is ***noise***?

Noise is unwanted sound considered unpleasant, loud or disruptive to hearing

"From ***physics*** perspective ***sound and noise is indistinguishable*** as both are vibration through a medium where as ***the difference arises*** when ***the brain receives and perceives a sound***"

Noise Pollution

Pollution means any contamination of air, soil, water and environment. , Even loud noise and sound is also a part of pollution."

"The word noise comes from the Latin word noxia meaning "injury" or "hurt" ." Noise is an unwanted, unpleasant and annoying sound caused by vibration of the matter.

Vibrations impinge on the ear drum of a human or animal and setup a nervous disturbance, which we call sound. When the effects of sound are undesirable that it may be termed as "Noise".

What is noise pollution

-Sound that is unwanted or disrupts one's quality of life is called as noise. When there is lot of noise in the environment, it is termed as noise pollution.

-Sound becomes undesirable when it disturbs the normal activities such as working, sleeping, and during conversations.

- It is an underrated environmental problem because of the fact that we can't see, smell, or taste it.

-World Health Organization stated that "Noise must be recognized as a major threat to human well-being"

Noise Pollution

"***Noise pollution*** or environmental noise is ***displeasing human-, animal- or machine-created*** sound that ***disrupts*** the activity or balance of human or animal life."

" The term "noise pollution" has been recently used ***to signify the hazard of sounds*** which are consequence of modern day development, ***leading to health hazards of different type***."

Sources of noise pollution

- Street and traffic Noise
- Rail roads
- Airplanes
- Constructions
- Consumer products
- Industrial machinery and process
- Firecrackers
- Loudspeaker and Public Address system

Source of Noise Pollution

- ***Transportation systems*** are the ***main source*** of noise pollution in urban areas.
- Construction of ***buildings, highways and streets cause a lot of noise***, due to the usage of air compressors, bulldozers, loaders, dump trucks, and pavement breakers.
- ***Industrial noise*** also adds to the already unfavorable state of noise pollution.

Classification of Noise Pollution

There are 2 kinds of noise pollution.

A.Community Noise/ Environmental Noise (*non industrial noise pollution).*

- Air craft noise
- Roadway noise pollution
- Under water noise pollution

B. Occupational Noise(*industrial noise pollution)*

Community Noise and Under water Noise

Community noise (also called ***environmental noise***, ***residential noise*** or ***domestic noise***) is defined as ***noise emitted*** from ***all sources***, except at the industrial workplace. Main sources of community noise include road, rail and air traffic, construction and public work, and the neighborhood.

Typical neighborhood noise comes from live or recorded music; from sporting events including motor sports; from playgrounds and car parks; and from domestic animals such as barking dogs.

Underwater Noise Pollution UNP is intense ***human-generated*** noise in the ***marine environment***. It is caused by use of ***explosives, oceanographic experiments, geophysical research, underwater construction, ship traffic***, seismic surveys for oil and related activities.

Air craft and Roadside Noise Pollution

Air Craft Pollution

Noise from planes ***flying over residential areas impairs people's ability to work***, learn in school and sleep, and consequently also results in lowered property values in affected areas. As passenger volume increases and new and larger airports are built, noise is becoming even more of a concern.

Now-a-days , the problem of ***low flying military aircraft*** has added a ***new dimension to community annoyance***, as the nation seeks to improve its nap-of the- earth aircraft operations over national parks, and other areas previously unaffected by aircraft noise has claimed national attention over recent years

Air craft and Roadside Noise Pollution

Roadside Pollution

Roadway noise is the ***collective sound energy***. It contributes more to environmental noise exposure than any other noise source and is constituted chiefly ***of engine , tire, aerodynamic and braking elements*** .In other Western countries as well as Lesser developed countries, roadway noise is expected to contribute a proportionately large noise share of the total societal pollution. In the city, the ***main sources of traffic noise*** are the ***motors and exhaust system of autos, smaller trucks, buses and motorcycles.***

Measurement of Noise

-The two most important measurement of noise are, ***sound pressure and sound intensity***

-These are measured in ***different units and the scale of the magnitude*** is different and very large in relation to noise

-The ***unit*** of measurement of ***sound is decibel(dB).***

It is the ratio expressed as logarithmic scale relative to a reference sound pressure level

$$\text{Sound Intensity Level} = 10 \log_{10} \frac{\text{intensity measured(Io)}}{\text{Reference intensity(I)}}$$

Measurement of Noise

-The reference intensity used is the "***threshold of hearing***" which is a sound that can be first heard at sound pressure of 2×10^5 N/M^2 of a sound intensity of 10-12 W/M^2

-It is quite important to note that ***doubling of sound pressure*** produces an ***increase of 6dB***

-Doubling of sound intensity produces an increase of 3 decibels, which is implicit in the logarithmic scale for sound measurement

-**Sound level meters** measure sound pressure level and are commonly used in noise pollution studies for the quantification of almost any noise, but especially for industrial, environmental and aircraft noise

Measurement of Noise

"A decibel is the standard for the measurement of noise"

20 db is ***whisper***.

40 db the noise in a ***quiet office***.

60 db is ***normal conversation***.

80 db is the level at which sound becomes physically painful and that can be termed ***as noise***

The gadgets used to measure noise are ***noise level meter, noise dosimeter and impulse-sound level meter***. Noise dosimeter can be worn by the person and works better than noise level meter.

Measurement of Noise

Noise Dosimeter

-A ***noise dosimeter*** is a specialized sound level matter intended specifically ***to measure the noise exposure*** of a person integrated over a period of time.

-Dosimeters can function as personal or area noise monitors.

-The noise dosimeter also known as the ***does badge*** which is a ***small lightweight***, ***cable-free*** that can be worn on the shoulder for minimal inconvenience.

-It works by ***storing sound level measurements*** to provide an ***average noise exposure*** reading for a specific period such as an eight hours workday.

-The ***data*** can be read via ***a special dose badge reader*** or simply transferred to a PC for analysis.

-It also provides an effective way to monitor and record long term personal noise exposure.

Measurement of Noise

Current dosimeters are designed to provide the user with ***parameters such as noise dose, time-weighted average, sound exposure level***, as well as peak maximum and minimum sound pressure levels.

Noise Level meter

A noise level meter is used for ***measurement of sound*** that travels through air. It is commonly a ***hand-held instrument*** with a microphone. The diaphragm of the microphone responds to changes in air pressure caused by sound waves.

Measurement of Noise

Sound power level(L_W)

Sound power or acoustic power is the rate at which sound energy is ***emitted reflected, transmitted or received per unit time***

Sound power level is derived and expressed as

$$L_W = \frac{1}{2}\ln\left(\frac{P}{P_0}\right)\text{Np} = \log_{10}\left(\frac{P}{P_0}\right)\text{B} = 10\log_{10}\left(\frac{P}{P_0}\right)\text{dB}$$

Sound Intensity level(L_I)

Sound intensity is defined as the ***sound power per unit area***

Sound intensity level is derived and expressed as

$$L_I = \frac{1}{2}\ln\left(\frac{I}{I_0}\right)\text{Np} = \log_{10}\left(\frac{I}{I_0}\right)\text{B} = 10\log_{10}\left(\frac{I}{I_0}\right)\text{dB}$$

Measurement of Noise

Sound pressure level (SPL)(L_p)

Sound pressure or acoustic pressure is the ***local pressure deviation from the ambient*** (average or equilibrium) atmospheric pressure, caused by a sound wave.

Sound pressure level is expressed as

$$L_p = \ln\left(\frac{p}{p_0}\right) \text{Np} = 2\log_{10}\left(\frac{p}{p_0}\right) \text{B} = 20\log_{10}\left(\frac{p}{p_0}\right) \text{dB}$$

To measure noise, ***the average pressure level of the sound*** is ***measured*** for a particular ***amount of time by a weighting scale***

Occupational Noise

The many and varied sources of noise is industrial machinery and processes include: ***rotors, gears, turbulent fluid flow, impact processes, electrical machines, internal combustion engines, pneumatic equipment, drilling, crushing, blasting, pumps and compressors***. Furthermore, the emitted sounds are reflected from **floors, ceiling and equipment.**

Occupational exposure limits specify the ***maximum sound pressure levels*** and exposure times to which nearly all workers may be repeatedly exposed without adverse effect on their ability to hear and understand normal speech. An occupational exposure limit of 85 dB for 8 hours should protect most people against a permanent hearing impairment induced by noise after 40 years of occupational exposure.

Noise in building

Apartment dwellers are often annoyed by noise in their homes, especially when the building is not well designed and constructed. In this case, internal building noise from plumbing, boilers, generators, air conditioners, and fans, can be audible and annoying

Noise from Consumer products

Certain household equipment, such as vacuum cleaners, mixers and some kitchen appliances are noisemakers of the house. Though they do not cause too much of problem, their effect cannot be neglected.

.

Noise in building

Loud Speakers

Use of loud speakers / public address systems in ***functions, meetings, religious places*** in open areas is a source of serious nuisance

Fire crackers

Use of ***firecrackers with high noise level*** may harm the human hearing system. Especially sensitive are small children.

Problems of Noise Pollution

Noise pollution makes men more irritable. The effect of noise pollution is multifaceted & inter related. The effects of Noise Pollution on Human Being, Animal and property are as follows:

-Hearing Impairment

-It Decreases the Efficiency of A Man

-Lack of concentration Abortion is caused

-Pupil Dilation Mental Illness

-It Causes Heart Attack digestive problems

-Temporary or permanent Deafness

aggressive behavior

-Effect on vegetation Poor quality of Crops

-Effect on animal Effect on

property sleep interference Speech

interference

Effects of Noise Pollution

LACK OF CONCENTRATION

For better quality of work there should be concentration, Noise causes lack of concentration. In big cities, mostly all the offices are on main road. The noise of traffic or the loud speakers of different types of horns divert the attention of the people working in offices. Deficits in concentration can lead to accidents.

FATIGUE

Because of Noise Pollution, people cannot concentrate on their work. Thus they have to give their more time for completing the work and they feel tiring

ABORTION

There should be cool and calm atmosphere during the pregnancy. Unpleasant sounds make a lady of irritative nature. Sudden Noise causes abortion in females.

Effects of Noise Pollution

PUPIL DILATION

Noise Pollution causes dilation of the pupil of the eye

IT CAUSES MENTAL ILLNESS

Noise Pollution causes certain diseases in human. It attacks on the person's peace of mind. The noises are recognized as major contributing factors in accelerating the already existing tensions of modern living. These tensions result in certain disease like blood pressure or mental illness etc.

IT CAUSES HEART ATTACK

Noise Pollution causes Increase in the rate of heart-beat, increased cholesterol level and Constriction of blood vessels which leads to blood pressure that resulted in heart attack.

Effects of Noise Pollution

Noise can trigger both endocrine and autonomic nervous system responses that affect the cardiovascular system and thus may be a risk factor for cardiovascular. high levels of stress hormones such as cortisol, adrenaline, and noradrenalin can lead to hypertension, stroke, heart failure, and immune problems.

Acute exposure to noise activates nervous and hormonal responses, leading to temporary increases in blood pressure, heart rate, and vasoconstriction.

SPEECH INTERFERENCE

Noise more than 50dB can be very difficult to hear and interpret and cause problems such as **partial deafness**. Some effects may lead to increased accidents, disruption of communication in the classroom, and impaired academic performance.

Effects of Noise Pollution

DIGESTIVE PROBLEM

Noise Pollution causes digestive spasms and stomach disorders

TEMPORARY OR PERMANENT DEAFNESS

The effect of nose on audition is well recognized. Mechanics, locomotive drivers, telephone operators etc. All have their hearing Impairment as a result of noise at the place of work. Physicist, physicians & psychologists are of the view that continued exposure to noise level above. 80 to 100 db is unsafe, loud noise causes temporary or permanent deafness.

AGGRESSIVE BEHAVIOR

Noise above 80 dB may increase aggressive behavior. Annoyance is defined as a feeling of displeasure associated with any agent or condition believed by an individual to adversely affect him or her.

Noise Mitigation

"**Noise mitigation** is a set of strategies to **reduce noise pollution**."

- Construction of **sound proof rooms** for noisy machines in industries.
- Use of horns with ***jarring sounds to be banned***. No motor vehicle should be fitted with multitioned horn giving a succession of different note or with any other sound producing device giving an unduly harsh, shrill , loud or alarming noise on other similar vehicles of such sound signals.
- Every motor vehicle shall be ***fitted with a device (silencer).***
- Noise producing industries, aerodromes, and railway stations to be ***shifted away*** from the inhabited areas.
- Proper ***law should be enforced*** to check the misuse of loudspeakers and public announcements systems. ***Loud speakers*** are banned from 10pm to 6am.
- ***Growing green plants/trees along roadside*** to reduce noise pollution as they absorb sound.

Noise Mitigation

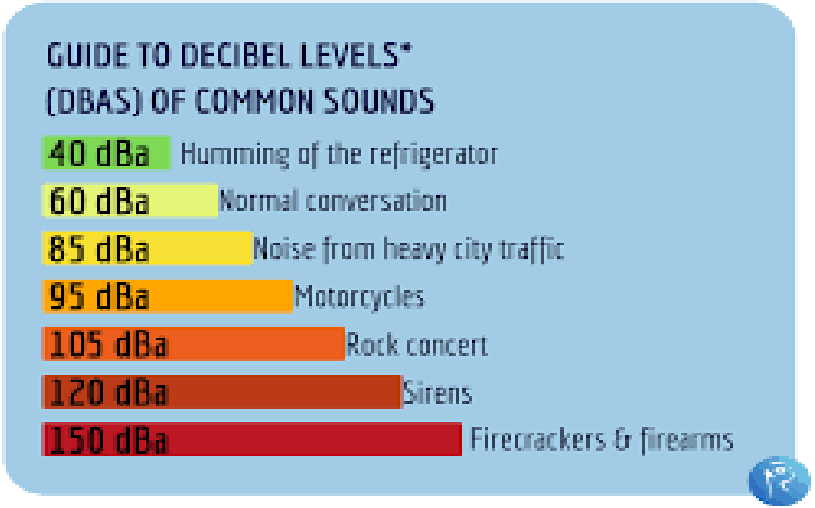
- To avoid noise-induced hearing loss, pay attention to the noises around you and ***turn down the volume whenever possible.***
- ***Avoid*** or limit time spent in ***noisy sports events***.
- ***Wear*** adequate ***hearing protection***, such as foam ear plugs or ear muffs, when you must be in a noisy environment or when using loud equipment.
- We must constantly check up on the appliances we use at home. Most of them have rubber insulations that act for soundproofing. But over time, this insulation may wear out, and that is when the noise pollution will begin. ***Keep track of which appliances*** need maintenance, and replace insulations if needed
- Noise is also made by the escape of exhaust gases from the engine, therefore every motor vehicle should be so constructed and ***maintained as not to cause undue noise*** when in motion.
- Before buying a home, see how far it is from the local airport.

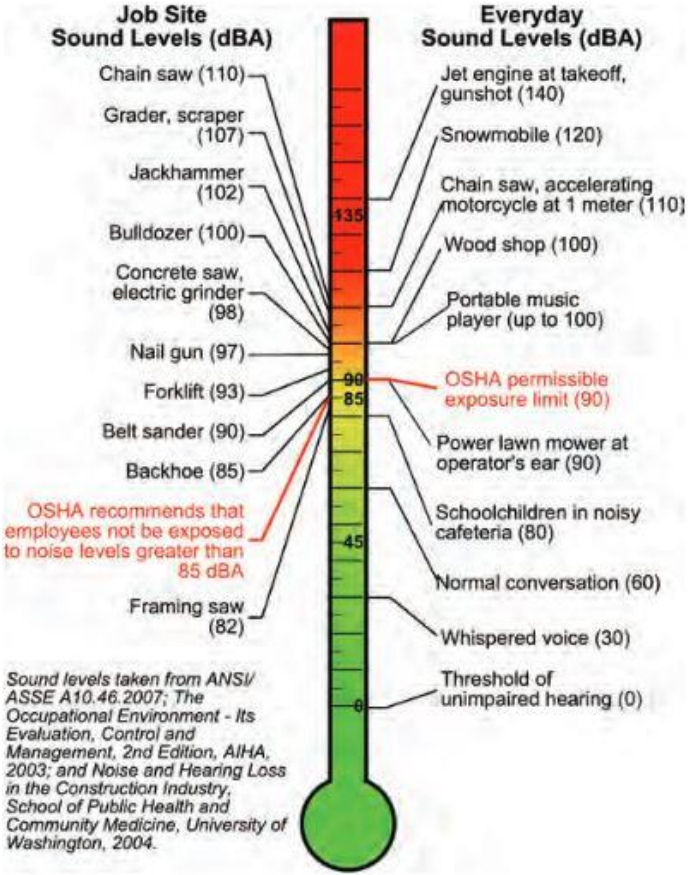
Effects of Noise Pollution

- ***Irreversible hearing*** loss.
- ***Blood pressure rise*** of 5 to 10 mmHg on 8 hrs of exposure to even 70 db of sound level.
- Hearing loss begins at ***80- 90 dbA.*** 140 dbA is painful and 180 dbA can even kill a person.
- Amplified rock music is 120 dbA.
- Most of the ***electronic vehicles and motors*** are above ***80 dbA level***.
- High noise levels may ***interfere with the natural cycles of animals***, including feeding behavior, breeding rituals and migration paths.
- There are about 25000 hair cells in our ear which create wave in our ear, responding to different ***levels of frequencies***.
- With ***increasing levels of sound*** the cells get destroyed ***decreasing our ability to hear*** the high frequency sound

Level of Tolerance

- ***Normal level*** of tolerance is ***80dbA***.
- Sound level ***below and above*** this is considered to be as ***noise pollution.***





Symptoms of Occupational hearing loss

- Feeling of ***fullness*** in the ear.
- Sounds may seem ***muffled***.
- ***Cannot hear*** high frequency sounds.
- ***Ringing in the ears*** while listening to the high frequency sounds.
- Loud noise for a long period of time, or ***sudden burst of sound*** can cause occupational hearing loss.
- Hearing that does not return after an ***acute noise injury*** is called a ***permanent threshold shift.***

Actions taken and to be taken

- There are a variety of ***effective strategies for mitigating adverse sound*** levels

  -use of ***noise barriers***

  -limitation of ***vehicle speeds***

  -***alteration*** of ***roadway surface*** texture.

  -limitation of ***heavy duty*** vehicles

  -use of ***traffic controls*** that smooth vehicle flow to ***reduce braking*** and acceleration, innovative tire design and other

Health Effects

- According to the USEPA, there are direct links between noise and health. Also, noise pollution adversely ***affects the lives of millions of people***.
- Noise pollution can damage ***physiological and psychological health***.
- ***High blood pressure, stress related illness***, sleep disruption, hearing loss, and productivity loss are the problems related to noise pollution.
- It can also cause ***memory loss, severe depression, and panic attacks.***

Solution for Noise pollution

- ***Planting bushes and trees*** in and around sound generating sources is an effective solution for noise pollution

- Regular ***servicing and tuning of automobiles*** can effectively reduce the noise pollution.
- Buildings can be designed with suitable ***noise absorbing material for the walls, windows, and ceilings.***
- Workers should be provided with equipments such ***as ear plugs and earmuffs*** for hearing protection.

Solution for Noise Pollution

- Similar to automobiles, lubrication of the machinery and servicing should be done to ***minimize noise generation***.
- ***Soundproof doors*** and windows can be installed to ***block unwanted noise*** from outside.
- Community development or urban management should be done with ***long- term planning,*** along with an aim to reduce noise pollution.
- ***Social awareness programs*** should be taken up to educate the public about the causes and effects of noise pollution.
- Regulations should be imposed ***to restrict the usage of play loudspeakers*** in crowded areas and public places.
- Factories and industries should be located ***far from the residential*** areas.

Legislation for noise pollution

- ***Noise Regulation Rules under the Environment (Protection) Act of 1986.***
- Features Industrial- 75db
- Commercial- 65 db Residential zones-

  55 db Zones of silence
- No public address system after 10:00 pm and before 06:00 am.

The Noise Pollution (Regulation and Control) Rules, 2000

The increasing ambient noise levels in public places from various sources, inter-alia, industrial activity, construction activity, *(fire crackers, sound producing instruments)1*, ***generator sets, loud speakers, public address systems, music systems, vehicular horns and other mechanical devices have deleterious effects on human health and the psychological well being of the people, it is considered necessary to regulate and control noise producing and generating sources with the objective of maintaining the ambient air quality standards in respect of noise;***

The ambient air quality standards in respect of noise for different areas/zones shall be such as specified in the Schedule annexed to these rules.

(2) The State Government (shall categorize) ***the areas into industrial, commercial, residential or silence areas/zones for the purpose of implementation of noise standards for different areas***.

Ambient air Quality standards in respect of noise for different areas/zones

(3) The State Government ***shall take measures for abatement of noise*** including noise emanating ***from vehicular movements*** and ensure that the existing noise levels ***do not exceed*** the ambient air quality standards specified under these rules.

(4) All development authorities, local bodies and other concerned authorities while planning developmental activity or carrying out functions relating to town and country planning shall take into consideration ***all aspects of noise pollution as a parameter of quality of life to avoid noise menace*** and to achieve the objective of maintaining the ambient air quality standards in respect of noise.

(5) An area comprising ***not less than 100 meters around hospitals***, educational institutions and courts may be declared (by the State Government)14 as silence area/zone for the purpose of these rules.

Responsibility as to enforcement of noise pollution control measures

(1) The noise levels in any area/zone ***shall not exceed the ambient air quality standards in respect of noise*** as specified in the Schedule.

(2) The authority shall be responsible for the ***enforcement of noise pollution control measures*** and the due compliance of the ambient air quality standards in respect of noise.

(3) The respective State Pollution Control Boards or Pollution Control Committees in consultation with the Central Pollution Control Board shall ***collect, compile and publish technical and statistical data relating to noise pollution*** and measures devised for its effective prevention, control and abatement.

Restrictions on the use of loud speakers/public address system (and sound producing instruments)

(1)A loud speaker or **a public address system shall not be used except** after obtaining written permission from the authority.

(2) A loud speaker or a public address system or any sound producing instrument or a musical instrument or a sound amplifier shall **not be used at night time except in closed premises** for communication within, like auditoria, conference rooms, community halls or during a public emergency.

(3)The noise level at the boundary of the public place, where loudspeaker or public address system or any other noise source **is being used shall not exceed 10 dB** *(A) above the ambient noise standards for the area or 75 dB (A) whichever is lower;*

(4) The peripheral noise level of a privately owned sound system or a sound producing instrument **shall not, at the boundary of the private place, exceed by more than 5dB** *(A) the ambient noise standards specified for the area on which it is used.*

Restrictions on the use of horns, sound emitting construction equipments and bursting of fire crackers

(1) **No horn shall be used in silence zones** or during night time in residential areas except during a public emergency.

(2) **Sound emitting** fire **crackers shall not be burst** in silence zone or during night time.

(3) Sound **emitting construction equipments shall not be used or operated** during night time in residential areas and silence zones.

Consequences of any violation in silence zone/area

Whoever, in any place covered under the silence zone/area commits any of the following offence, he shall be liable for penalty under the provisions of the Act:

(i) whoever, plays *any music* or uses any ***sound amplifiers***,

(ii) whoever, ***beats*** a drum or tom-tom or blows a ***horn either musical or*** pressure, or trumpet or beats or sounds any instrument, or

(iii) whoever, exhibits ***any mimetic, musical or other performances*** of a nature to attract crowds.

[*(iv) whoever, **bursts sound emitting fire crackers**; or*

*(v) whoever, uses **a loud speaker or a public address** system.]*

Complaints to be made to the authority

(1) A person may, if the noise level exceeds the ambient noise standards by 10 dB(A) or more given in the corresponding columns against any area/zone *or, if there is a violation of any provision of these rules regarding restrictions imposed during night time,* make a complaint to the authority.

(2) The authority shall act on the complaint and take action against the violator in accordance with the provisions of these rules and any other law in force.

Power to prohibit etc. continuance of music sound or noise

(1) If the authority is satisfied from the report of an officer in-charge of a police station or other information received by him (including from the complainant)20 that it is necessary to do so in order to prevent annoyance, disturbance, discomfort or injury or risk of annoyance, disturbance, discomfort or injury to the public or to any person who dwell or occupy property on the vicinity, he may, by a written order issue such directions as he may consider necessary to any person for preventing, prohibiting, controlling or regulating:

(a) the incidence or continuance in or upon any premises of –

(i) sounds caused by playing, beating, clashing, blowing or use in any manner whatsoever of any instrument including loudspeakers, *(public address systems, horn, construction equipment, appliance or apparatus)22 or contrivance which is capable of producing or re-producing sound,*

Source: http://dstegoa.gov.in/Noise%20rules-10-08-2017.pdf

Power to prohibit etc. continuance of music sound or noise

(ii) any vocal or instrumental music

(iii) sound caused by bursting of sound emitting fire crackers, or

(b) the carrying on in or upon, any premises of any trade, avocation or operation or process resulting in or attended with noise.

The authority empowered under sub-rule (1) may, either on its own motion, or on the application of any person aggrieved by an order made under sub-rule (1), either rescind, modify or alter any such order: Provided that before any such application is disposed of, the said authority shall afford to the applicant an opportunity of appearing before it either in person or by a person representing him and showing cause against the order and shall, if it rejects any such application either wholly or in part, record its reasons for such rejection.

Source: http://dstegoa.gov.in/Noise%20rules-10-08-2017.pdf

Ambient Air Quality Standards in respect of Noise

SCHEDULE
(see rule 3(1) and 4(1)

Ambient Air Quality Standards in respect of Noise

Area Code	Category of Area/Zone	Limits in dB(A) Leq *	
		Day Time	NightTime
(A)	Industrial area	75	70
(B)	Commercial area	65	55
(C)	Residential area	55	45
(D)	Silence Zone	50	40

Note:- 1. ***Day time*** shall mean from ***6.00 a.m. to 10.00 p.m***.
2. ***Night time*** shall mean from ***10.00 p.m. to 6.00 a.m.***
3. Mixed categories of areas may be declared as one of the four above mentioned categories by the competent authority.
dB(A) Leq* denotes the time weighted ***average of the level of sound in decibels*** on scale A which is relatable to human hearing. A "***decibel***" is a unit in which ***noise is measured***. "A", in dB(A) Leq, denotes the frequency weighting in the measurement of noise and corresponds to frequency response characteristics of the human ear. Leq : It is an energy mean of the noise level, over a specified period.

Source: http://dstegoa.gov.in/Noise%20rules-10-08-2017.pdf

Problems on Noise Pollution

Q.1) The sound pressure level for a jet plane on the ground with sound pressure of 2000 μ bar should be

a) 60 db b) 100 db c) 140 db d) 180 db

Solution:

1 μ bar = $10^5 \mu$pa

SPL = L = $20 \log 10(\frac{p}{p_0})$

$= 20 \log 10(\frac{2000\ X\ 105}{20})$

= 140 Db

Ans: c

Q.2) A generator emitting a sound of pressure 800 μ bar . What is the noise produced by generator?

Solution:

1 μ bar = 10^5 μpa $\quad\quad$ p_0 = 20

p = 800 μ bar = 800 X 10^5 μ pa

$$SPL = L = 20 \log 10\left(\frac{p}{p_0}\right)$$

$$= 20 \log 10\left(\frac{800\ X\ 105}{20}\right)$$

= 132 dB

Problems on Noise Pollution

Q3. For noise measurement formula for sound pressure level (SPL) is $20 \log 10(\frac{p}{p_{ref}})$.

What will be the resultant noise in db if p is 0.00024 μ bar .

a) 0 b) 60 c) 30 d) 100

Solution:

1 μ bar = 10^5 μ pa

p = 0.0002 μ bar

= 0.0002 x 10^5 μ bar

p_{ref} = 20 μ pa

SPL = $20 \log 10(\frac{p}{p_{ref}})$

= $20 \log 10(\frac{0.0002\ X\ 10^5}{20})$.

= 0 db

Ans : a

Problems on Noise Pollution

Q4. The reference pressure used in the determination of sound pressure level is

a) 20 μ pa b) 20 db

c) 10 μ pa d) 10 db

Q5. If P represents the pressure of sound wave s Pref represents the reference pressure then sound pressure level (SPL) is equal to

a) $20 \log 10(\frac{p}{p_{ref}})$ b) $\frac{1}{20} \log 10(\frac{p}{p_{ref}})$

c) $20 \log 10(\frac{p_{ref}}{p})$ d) $\frac{1}{20} \log 10(\frac{p_{ref}}{p})$

Problems on Noise Pollution

Avg sound produced by single source (if it is emitting diff sound at diff time).

$$\bar{L} = 20 \log_{10} \frac{1}{N} \Sigma \left[10^{\frac{li}{20}} \right]$$

N = no of sound observations

Q6. A source emitting 80 db , 60 db, 100 db at different times in a day. What is average noise produced by the source in a day?

Solution:

$$\bar{L} = 20 \log_{10} \frac{1}{N} \Sigma \left[10^{\frac{li}{20}} \right]$$

N = 3 L1 = 80 L2 = 60 L3 =100

$$\bar{L} = 20 \log_{10} \frac{1}{3} \left[10^{\frac{80}{20}} + 10^{\frac{60}{20}} + 10^{\frac{100}{20}} \right]$$

= 91.36 db.

Problems on Noise Pollution

Avg sound produced by single source (if it is emitting diff sound at diff time).

$$\bar{L} = 20 \log_{10} \frac{1}{N} \Sigma \left[10^{\frac{li}{20}} \right]$$

N = no of sound observations

Q7. A source emitting 80 db , 60 db, 100 db at different times in a day. What is average noise produced by the source in a day?

Solution:

$$\bar{L} = 20 \log_{10} \frac{1}{N} \Sigma \left[10^{\frac{li}{20}} \right]$$

N = 3 L1 = 80 L2 = 60 L3 =100

$$\bar{L} = 20 \log_{10} \frac{1}{3} \left[10^{\frac{80}{20}} + 10^{\frac{60}{20}} + 10^{\frac{100}{20}} \right]$$

= 91.36 db.

Q8. While recording weighted sound levels, 4 reading have been taken at a site at different times of a day. These reading are 20,56, 66 and 42 db ref 20 μ pa. then the average sound level is

a) 56.8 db b) 46 db c) 66 db d) none.

Solution:

L1 = 20 L2 = 56 L3 = 66 L4 = 42

N = 4

$$\bar{L} = 20 \log_{10} \frac{1}{N} \Sigma \left[10^{\frac{li}{20}} \right]$$

$$\bar{L} = 20 \log_{10} \frac{1}{4} \left[10^{\frac{20}{20}} + 10^{\frac{56}{20}} + 10^{\frac{66}{20}} 10^{\frac{42}{20}} \right]$$

$$= 56.78 \text{ db.}$$

Ans : a

Problems on Noise Pollution

Leq = Leq represents the sound pressure level which is equivalent to a no of different sound pressure levels produced at a place for different time intervals.

$$Leq = 10 \log_{10} \Sigma \left[10^{\frac{li}{20}} \times T_i \right]$$

T_i = time duration of the different sound pressure levels expressed as a fraction of the total measuring or recording time.

Problems on Noise Pollution

Q9. A noise level of 80 db lasting for 10 min is followed by 60 db for 80 mins and 100 db for 5 mins one after the other. What is the equivalent continuous equal energy level leq for the 95 minutes period?

Solution:

L1 = 80 db t1 = 10 min $T1 = \frac{10}{95}$

L2 = 60 db t2 = 8 min $T\ 2 = \frac{80}{95}$

L3 = 100 db t3 = 5 min $T3 = \frac{5}{95}$

Leq =?

$$Leq = 10 \log_{10} \Sigma \left[10^{\frac{li}{20}} \times T_i \right]$$

$$= 10 \log_{10} \left[10^{\frac{li}{20}} \times T_i \right]$$

$$= 10 \log_{10} \left[10^{\frac{80}{10}} \times \frac{10}{95} + 10^{\frac{60}{10}} \times \frac{80}{95} + 10^{\frac{66}{20}} \times \frac{5}{95} \right]$$

$$= 87.30 \text{ db.}$$

THANK YOU