Environmental Science
Lecture 19

Oil Pollution

If you look at Oil pollution, the discharge of oily mixtures in the sea is basically prohibited. Any kind of ships especially fishing trolleys, oil tankers or any other commodity ships that commute across seas and oceans, they all have a tendency to discharge oil because of the machinery that is run on the ship and this charge is permitted only to a certain level. Discharge of any oily mixtures are allowed while in transit provided these shipping vessels have an operation, some kind of filtering or separating equipment that ensures the oil content is less than 15 parts of oil to 1 part of water which is basically 15 PPM. For nearly 15 parts of oil to 1 million parts of water is the ratio that's permitted. All fishing vessels over 400 tonnes, it's compulsory that they have this kind of equipment in place. They also need to meet other standards which is set by the international maritime organisation. We need to also reduce the potential of any kind of oil discharge. Any leakage of fuel oil, lubricating oil and cooling water should be dealt with as soon as it is detected. Incase any kind of leakage is there, there should be some kind of an alarm system that sounds in order to be aware of any kind of leakage happening. A drip tray should be fitted out under all engines with a kind of suitable drainage mechanism to a holding tank or a drum which can be disposed later once the ship is ashore. Ensuring the engine rooms and other machinery spaces are fitted with some plumbing so that any leakage is collected within the sump instead of entering the water body. Ensure propeller shaft is in good working order. High efficiency bypass oil filters can be installed that would help extend the life of the engine oil as well as decrease the frequent oil changes.

Moving on to Garbage pollution, obviously when a ship is on a journey or has been commuting for many months and especially fishing trolleys, there is going to be a certain kind of garbage that is getting disposed but it cannot be disposed mid sea, wherever they want. There has to be a suitable procedure, collected on a whole and then released. The main items which usually cause problem and are completely prohibited are troll and fishing nets. They tend to suffocate aquatic animals and catch on to the fins of these huge fish or sometimes even small fish killing them literally. Synthetic rope, plastic sheeting, six pack holders which is basically made up of aluminium or plastic to hold drinks, fibreglass, strapping bands, plastic 'ice' bags, bait gaskets, electrical or electronic equipment. disposable eating utensils, that's another huge hazard especially let it be styrofoam, plastic, all of these are very dangerous to aquatic life and floats that are used in rescue machines.

Accidental Loss or discharge of Fishing gear - Lost fishing gear may harm the marine environment or create even navigational hazards which will further create maritime and other maritime accidents may be triggered because of these navigational hazards. Usually sometimes

these fishing nets create this illusion on the face of the water. The ships sometimes, the propellers get caught in it, which will stop and cause leakages of oil again which will harm the marine environment. Many marine animals including target fish species die as a result of becoming entangled in or ingesting discarded plastic packing straps; netting of all kinds. Plastics which shatter into smaller fragments are also mistaken for food or ingested accidentally and they cut the internal organs of the fish. Garbage such as rope and plastic material can also get caught in propeller shafts as well as block water intakes causing major damage and expensive repairs as well.

Garbage waste management onboard - every fishing vessel of 100 gross tonnage and above and every fishing vessel certified to carry 15 or more persons is also now required to carry a garbage management plan. The Garbage management plan contains procedures for collecting, storing, processing and disposing of garbage, including the use of appropriate garbage handling equipment such as storage containers, compactors and incinerators. All of these are encompassed in the garbage plan and without having a suitable plan and action, they cannot set sail. This includes appropriate garbage, organic garbage as well as handling certain equipments such as storage containers, compactors or incinerators. Moving on to Industries; we need to improve sewage disposal facilities and disposal systems. Marine monitoring and regulations. Treat wastes, oils and other chemical discharge before discharging into the sea. Effective solid waste disposal and treatment. We need to refrain from construction of illegal seaside ports or harbours. What can the government do in this kind of context? First thing is obviously creating awareness, we need to provide education to general public as well as the industries and the workers in these industries. Port management authorities must examine ships and portside factories from harmful emissions. We need to prevent illegal sand mining and theft along coastal reefs. What happens when the sand keeps getting muddled? The shore gets eroded, it affects marine environment, marine life as well as the stability of the coast as well. Quick action force to prevent the spread of oil slicks and ocean fires. Setting aside funds for preventing marine conservation. Proper maintenance of all beaches. Simultaneously when the government is doing the legislation portion of it, what is the role of the scientific community? They need to go about with the cultivation of marine bacterial plants that enhance degradation of organic pollutants, Protection and enhancement of coral reefs, neutralization of acidic or basic emissions to maintain the pH of the water because if the water goes imbalanced, it's going to affect marine life. Marine life encompassing plants as well as animals. Computer modelling of dispersion of pollutants. Remote sensing of marine pollution. Analytical Quality Control Services for marine pollution monitoring, Risk assessment and management of marine pollution. We need to be aware where are the possible ways that the water body is getting polluted, how it can be curved and the second we realize it is getting polluted, we ought to nip it in the bud rather than let it bloom and grow.

Noise Pollution - Cause and Effect

Noise pollution is a derivative of basic sound. Sound is a vibration that propagates as a mechanical wave of pressure and displacement, through some sort of medium usually air or water. Sound refers to only those vibrations with frequencies that are within the range of hearing for humans. The difference between sound and noise. Noise is basically any unwanted sound. It is measured in dB units. Anything pleasing and within the range of human hearing is considered sound and anything beyond this range causing some kind of discomfort to humans is referred to as noise. Characteristics of noise - Sound pressure, Frequency, Duration, time of the day, location and intermittency. All of these factors decide when it is noise. When someone is driving and someone else honks, that can be considered noise but it is quintessential noise. At the same time, at 4 am and if the same horn is blared, that is noise and unnecessary. All of these elements decide what kind of noise is it; when, where and how frequent these noises occur. The different kind of noises that exist; continuous, variable or intermittent, impulse or impact, these are the kinds of noise which affect analysis now. You have chemical noise as well as Instrumental noise. If you see, this is variable noise, a simple example of a factory; continuous noise - similarly in a factory when you have a particular machinery chugging out, say it runs for 10 hours or 12 hours straight and the workers are made to earmuffs to prevent their hearing from getting destroyed and Impulse noise is like the shot of a gun. It needn't be continuous but when it occurs, it's quite strong and it is piercing.

Instrumental Noise you have; thermal noise, flicker noise, shot noise and environmental noise. Moving on to Noise Pollution; noise pollution refers to a type of energy pollution in which distracting, irritating or damaging sounds are freely audible. In this type of pollution, the contaminants are not physical particles but waves which interfere with the naturally occurring waves of a similar type in the same environment. Noise pollution is considered very subjective because for some people music could be noise vs some people who will enjoy music. Noise pollution as such has two different degrees, one is the kind that is completely subjective and the one where there is recorded evidence of it causing a lot of harm.

Sources of Noise Pollution; Household Sources, Social Events, Commercial and industrial activities and transportation. Usually household sources are the subjective noises, like grinder or a mixer running, television blaring, all of these are manageable sources of pollution. Social events again does not occur continuously but now and then. Commercial and Industrial activities, it could have a threshold which may cross and cause irreversible damage. Transportation again like I just mentioned, it could be avoided but it is quintessential at the same time. The time and the areas where transportation noises can be regulated. Like hospitals and schools it can be curbed. Areas like that it can be reduced but cannot be avoided completely. We look at household sources, the typical ones that you see are Food mixers,

grinders, washing machines, dryers, air conditioners, televisions, loudspeakers and even pet animals. These are usual sources within households. Social events encompass places of worship, discos and other gigs, parties and markets where people sell goods with loudspeaker. When these events are not often, they are termed as a nuisance rather than noise pollution. This is the bearable context.

Commercial and Industrial activities, this could be; Printing presses, manufacturing industries and construction sites. Sources of construction noise - Pneumatic Hammers, Air Compressors , Bulldozers, Loaders, Dump Trucks and Pavement breakers. Sources of Industry noise you have fans, motors and compressors that are mounted outside. These interior noise sources have significant impacts on industrial workers, among whom noise induced hearing loss is unfortunately considered common and an occupational hazard. Not all of them are comfortable wearing earmuffs and sometimes ear muffs do not help all decibels of noise. In transportation you have Road traffic noise, Aircraft noise and noise from Railroads. The typical transportations that we use.

The causes of noise pollution are typically poor urban planning, sounds from motor vehicles, sounds from musical instruments amplified, car alarms, office equipment, factory machinery, construction work, barking animals, appliances, audio instruments, loudspeakers and noise created by people themselves.

Effects of noise pollution - obviously we need to again consider the environment , so effects on environment which includes vegetation and property, on animals and humans as well. Effects on human if you look at it; hearing impairment, interference with spoken communication, decrease in efficiency, lack of concentration, fatigue, sleep disturbances and cardiovascular disturbances. Disturbance in mental health, Impaired task performance, negative social behaviour and annoyance reactions, abortion of foetuses, temporary or permanent deafness.

The typical sound level for human response - you can see the level we are looking at here. Abou 140 - 130 dB, the typical source is jet planes and rock music sometimes as well. It can cause traumatic injury and irreversible damage and is sometimes very painful. On the other extreme you have rustling of leaves, studio, all of those dB are within 10 - 20 dB, very quiet. We have a mid range of 70 - 80 dB which is truck, vacuum cleaners; which are considered very loud. Damage can happen if exposed for a long time to this noise continuously only. 70 dB is considered a threshold. Below 70 is considered completely safe and above 70, we need to be a little careful about the duration of exposure and the type of exposure.

The Damage risk criteria for hearing loss, this is occupational safety and health administration. Maximum allowable hours per day, if the dB level we are exposed to is 90, only 8 hours. This

applies basically to industry workers, factory workers. Even people who constantly work like traffic policeman who are surrounded by constant noise and if your work at a level of 150 levels is created, you can only work for 0.25 hours in a day. You need to take this strictly into consideration to avoid permanent damage to hearing organs.

Indian standards for ambient noise levels - a silent zone in the day time is about 50 and at night 40 dB. Silent zones are usually up to 100m around hospitals, schools and courts; these zones are declared by competent authorities , use of vehicle horns, loudspeakers and bursting of crackers are completely banned in these zones irrespective of let it be a festival time or one particular time, it is banned throughout the year, throughout the day and night. Now, if you move on to industrial area. Daytime they allow about 75 dB and at night 65 dB. Commercial area, day time is 65 dB and night time it is 55 dB and at a Residential area, daytime 55 dB is permitted and at night time, 45 dB. Typical diseases caused by noise pollution; High blood pressure, heart attack, cancer, asthma, coughing and wheezing, deafness, annoyance, stress, anxiety, reduced lung development, bronchitis, insomnia and arteriosclerosis. These are the typical organs that get hit. Your brains, the lung and the heart take a major hit. You have blood pressure, arteriosclerosis, heart attack, cancer, stroke, reduced lung development, all of these are the typical effects.

Moving on to the typical effects; it basically damages their nervous system, it alters the prey and predator detection because their hearing senses only warn them that a predator is on the prowl. If their hearing senses are tremendously affected, then they can be captured and eaten effectively. It creates problems in navigation. They become dangerous and begin attacking because they are on the defence. It raises their metabolism, reduction of usable habitat, death of certain species and that causes a lot of imbalance to the food chain. Genetic and evolutionary problems. It causes Hormone imbalance, Chronic stress, Panic and escape behaviour, abandonment of offspring, injury and loudness of interspecies communication because once they become deaf, they will start talking louder amongst each other and that will create noise again. All of these are repercussions of having the effect of noise pollution on animals. Moving on to the effect of environment; breakage of Earth Barrier, Poor quality of crops, Damages buildings, bridges and monuments. Weakens the edifice of the building.

How do we go about controlling noise pollution? First is to control it very much at the source, then you have an option of controlling it in the transmission path and finally when you know noise is going to be there, you ought to use proper protective equipment. This particularly applies to people who are working in such environments like traffic workers as well as factory workers. Controlling its source, we need to reduce the noise levels from domestic sectors, maintenance of automobiles, use of economic instruments, control over vibrations, low

speaking voice, prohibition on usage of loudspeakers, selection of machinery and maintenance of machines.

Control in the transmission path; Installation of barriers, Installation of panels and enclosures an green belt development. Naturally, plants are the best absorbers of sound and if you have a number of houses on the main road, having tall trees helps reduce noise pollution and air pollution as well.

Using Protective equipment - Job rotation. Like we just saw the number of hours permitted, that has to be strictly adhered to. You cannot just exceed the number of hours. You need to ensure there is a shift system and that is strictly followed. Exposure reduction, Hearing protection and protection at the receiver end. Similar noise control techniques occur as Sound insulation, Sound Absorption, Vibration damping, Vibration isolation, Urban planning so that zones can be made such that there is a silent zone, industrial zone and residential zone. All of these are segregated properly and any overlap that occurs does not cause any health issues. Public education and awareness.

Moving on, how do you control noise pollution at the receiver's end? For people working in noisy areas, ear protection aids like plugs, muffs, noise helmets, headphones, should be provided as its an occupational exposure. At the source, this is only possible if working methods are improvised. We have to design machines to replace noisy ones. Machinery looking at costs should not be just left without any maintenance. They have to constantly oiled, maintained, repaired and serviced to ensure they are working at the best optimum level. Proper lubrication and better maintenance of machines. Installing noisy machines with sound absorbing materials. Using Silencer to control noise from automobiles, etc.

How can zoning help? Increased distane between source and receiver by zoning of noisy industrial areas like bus stands, railway stations, away from the silent zones near residential areas, educational institutions and hospitals. Sound insulations can be done by constructing windows with more than one pane of glass and filling the gap with sound absorbing material. Acoustic tiles, perforated plywood can be fixed on wall ceilings, floors to reduce noise.

What is the strategy about going about and controlling noise? Planting bushes and trees in and around sound generated sources in 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 earplugs and earmuffs for hearing protection. Similar to automobiles, lubrication of the machinery should be done to minimize noise generation. Soundproof doors and windows can be installed to block unwanted noise from the outside.

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. Community development or urban management should be done with long-term planning, along with an aim to reduce noise pollution and if at all we know it is going to be there, how do we go about reducing the exposure at the receiving end? Social awareness programs should be taken up to educate the public about the causes and effects of noise pollution.

Besides planting of trees, there has to be strict legislative measures that need to be enforced to control the nuisance of noise pollution. Some of these measures are; Minimum use of loudspeakers, near silence zones, Banning pressure horns in automobiles, Framing a separate noise pollution act. These are the typical standards in the CPCB standards of noise level - in a rural area of 25 - 35 sub urban is about 30-40 dB. residential within an urban area is upto to 45 dB. Urban which covers both residential as well as business is up to 50 dB. City and industry has a range between 50 and 60 dB. The main problem with noise pollution is it's not given the same importance as that of air and other kinds of environmental pollution. It is only now when it's reached a level where we are not able to recognize it. We don't have adequate awareness with respect to noise pollution. First, besides having controlling measures, there has to be certain awareness programmes that are conducted at schools and education institutions, factories where these workers are employed, there should be made aware that they are working in a noise pollution area. They have to take certain precautions, if not these are the risks of working in such a place. Most of them are labourers who do not realize the risks of working in such a noisy place. It causes a series of health issues, environmental issues which will transcend to other realms within the ecological cycle eventually. Noise pollution has to be taken more seriously at a legislative level to create more strict laws and has to be taken seriously at an awareness level as well as to create proper controlling measures to ensure that noise pollution does exceed the existing standards that have been mentioned by different authorities across the globe.

To go about protecting our healthy life, we have to recognize that noise pollution is first a very crucial type of pollution that affects not only humans, but also animals and the environment. We need to come up with a law on noise pollution in each state and overall in the country. At the end of this lecture, we have looked into Marine pollution, the main causes being oil pollution and garbage pollution. Noise pollution the cause and effect of it and measures to control noise pollution.