Oil Pollution

'It's Impact in the Environment-Imperative Study in reference of BP Oil Spill & Mumbai Oil Spill"

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Definition of oil pollution

When an accidental oil spill happens off shore, the beaches become unusable for a time and the affected marine wild life suffers. It takes a huge expenditure of time and money to clean it up. This problem is oil pollution. In fact, after the accidental off-shore oil spill on march 24, 1989 near valdez, alaska, the united states enacted the oil pollution act of 1990. This law establishes regulations that govern both the prevention and the response to oil pollution.

Identification

oil pollution happens when any kind of oil, or product that contains oil, contaminates a natural environment like a lake, river, ocean or other area on

earth. Not only does oil pollution make the water unusable until it is cleaned up, it kills many fish, birds and mammals, and can even release toxic fumes into the air that can be harmful to people.

Causes

Most oil pollution, around 46 percent worldwide, is caused by natural leaks, or seepages. Another 37 percent of oil pollution happens because oil is released into the oceans. Much of this is due to regular maintenance operations on ships that are at sea. The rest is the result of oil mixed with storm water that gets into the sewer systems before flowing into the ocean. Twelve percent of the world's oil pollution is due to accidents like the 1989 oil spill near valdez, alaska. Finally, oil pollution from spills that happen on off-shore oil rigs while drilling for oil accounts for around three percent of the world's oil pollution

Effects

Oil pollution harms sea birds when the oil touches their feathers making them unable to fly. The birds cannot remove the oil from their own bodies which makes them vulnerable to hypothermia because the oil prevents the feathers from helping to insulate them from extreme cold. Marine mammals like polar bears have similar problems with extreme cold whenever oil gets into their fur. Oil pollution also destroys smaller organisms in the water that birds, fish and marine animals eat. In addition to the destructive effects that oil pollution causes for the animals, it damages the environment, turning sand black, sticky and toxic. Finally, it makes the fish in the area temporarily unsafe for human consumption

Prevention/solution

Whenever oil pollutes the water, it must be physically removed both from the surface of the water as well as from the land in much the same way that a cook removes oils from the surface of a pot of soup. Unaddressed oil pollution may spread over an increasing surface area of water or it might disperse in smaller fragments as it breaks up and becomes carried by the currents. Some oils will eventually evaporate. Other oils mix, in the same process that one uses to make mayonnaise, emulsifying with the water. In the best case, the oil causing the pollution is a biodegradable kind which will eventually be absorbed into the natural environment without causing permanent harm.

Considerations

Many modern commodities are made from an oil base including plastic, asphalt, waxes, lubricants, fertilizers, paint and detergent. This does not even count the oil we use for fuel. Because oil pollution can be caused by both crude and refined oil as well as by products that contain oil, it is difficult to imagine a time when substantial amounts of oil won't be en route from one harbor to another. We will remain vulnerable to oil spills and the ensuing problems of oil pollution which is why regulations like the oil pollution act of august 1990 are so important to keeping our environment safe and clean for all of the earth's inhabitants.

Everybody has a contribution of oil pollution in overall society. Everybody contributes directly, by washing greasy hands and throwing away the water, by dripping oil from a leaky engine sump, by spilling some fuel when refilling an outboard motor, and in many other ways. Everybody also contributes indirectly, by making use of the products of the oil industry, including petrol and diesel for motors, kerosene For lamps, electricity that has been generated using fuel, and many plastic and chemical products that we use every day, or that are used to make things that we use every day. About six million tonnes of oil find their way into the sea each year Chronic pollution occurs everywhere, all the time. Lt results many small spills, most of them minor and insignificant if considered alone, but all contributing to a level of pollution that the environment cannot continue to contain. Lt has rendered many harbour and industrial areas lifeless, and puts many others under threat. Acute oil pollution results from accidents, and sometimes makes news. Lt may be catastrophic, particularly in an area that is environmentally sensitive. Most oil spills in the south pacific region are likely to occur during transportation, and most oil handling operations are carried out in port. Most large spills result from collision or grounding, which mostly occur in Ports or port approaches, and usually involve small vessels.

What is oil?

"oil" includes a large range of complex and diverse products. "crude" or unrefined oil is a natural substance, produced over millions of years by the decomposition of vegetable matter. Thus it is hardly surprising, although it is very fortunate, that many bacteria can ingest oil, and remove it from the Environment, and one of the ways of cleaning up an oil spill is to enable These bacteria to work as effectively as possible. Crude oil is a "dirty" oil, Since it contains tars and waxes, and it evaporates rapidly, since it also Contains petrol, kerosene, and other "light fractions", and this makes it Highly dangerous. Refined oils range from petrol, aeration fuel, and kerosene, to diesel fuel, and

heavy oils such as lubricating And boiler oil. These are transported from the refineries to the consumers, And regular supplies come lo almost every island in the south pacific. The Light oils are highly volatile, and so present a high fire danger. They are Also highly toxic. The heavy oils are much less dangerous, but they may Be very dirty and persistent. Oil in the pacific –south Crude oil is transported across the pacific from south east Asia to the West coast of the united states. Refined oils are delivered into the South pacific region, and then transported in smaller ships between Island groups and islands. Oil spills may occur anywhere in this system, perhaps from accidents when loading or discharging, or from washing of tanks, or from pumping bilges. Quite apart from this tanker traffic, other ships use oils as fuel and lubricants, And some ships carry drums of oil as hold or deck cargo. These are all Potential sources of spillage. Oil is also able to seep into the Environment from sources ashore. Industry requires oil as fuel, and Communities require electricity, which is often generated using diesel engines. Oil spillages can occur while The oil is being transported, used, or stored. Motor vehicles drip oil, and waste oil is often sprayed lo reduce dust from unsealed roads. All this oil works its way into the ground, where it contaminates well water, and the oil eventually reaches the sea. Effects of the oil spillage The principal effects of an oil spill are the danger of fire, the toxic effect Of the oil, and the physical coating of the environment. Their relative Importance depends on the type and amount of oil, and where it is spill. The danger of fire is greatest with light oils, and with crude oil. The
Extent and amount of toxic damage depends on the season of the year, And the stage of life that the various marine organisms have reached at the Time of the pollution. The lighter fractions of oil are soluble in sea water, Rendering it toxic to some organisms. Whereas adult fish may be able to Swim away, and avoid the toxic area, larvae, and less mobile creatures, may Have no such escape. They may be killed, or may experience changes in Their feeding or reproductive cycles that may materially affect the size and Species composition ol fish stocks. Fish, and especially litter feeders such As oysters and mussels, may become tainted, and unfit, or at least Unmarketable, as food. Physical coating of the sea surface Is not as much of a problem as physical coating of the shore. This is why clean-up effort is directed at preventing oil from getting ashore if at All possible. Sea birds have a major problem if they become coated with Oil. The oil infiltrates their feathers, which lose their insulating properties. Oil on birds' legs may be transcended to eggs, preventing the embryo chicks from obtaining oxygen through the shells. Seabirds may ingest oil, with Toxic effects, and may pass on contaminated food to their chicks. Sea birds, diving birds especially, are major losers from oil spills. Physical coating of the shore is the major long-term effect of an oil spill, The actual effect of a particular spill depending on the weather and type Of coastline. One of the big problems in tackling an oil spill clean-up is to Decide if the cleaning procedures will help, or whether the combination of Oil and cleaning material will cause more

environmental damage than the oil alone. For example, a sandy shore may look much better after chemical cleaning, or after mechanical removal Of the oily sand, but there will be fewer worms and shellfish there than if the oil had been left alone. This is why it is so important lo have a contingency plan, prepared in advance. The plan Should indicate areas that have high priority for cleaning, and specify the type of cleaning to be used, as well as indicating those areas that are to be left alone if polluted.

What happens to oil spills

If nothing is done to collect or disperse it, an oil spill will spread. The rate of spread depends on the weather, the temperature, and the type of oil. A tonne of crude oil will Take about ten minutes to form. A slick about half a millimetre thick, and about 50 metres in diameter, but this figure will vary widely for different oils. The slick will move downwind, at about 3% of the wind speed, and will also be carried by tides and currents. As the oil spreads the more volatile components evaporate. The rate and amount of loss by evaporation depends enormously on the type of oil. Light refined oils will virtually all Evaporate. Crude oil may lose half or more of its volume by evaporation over a period of days. Heavy oils will lose very little. Evaporation is a big help to cleaning up a spill, but, Particularly in a confined area, it presents a major hazard of explosion and fire. A very small proportion of oil vapour mixed with air can form an explosive mixture. Some of the lighter elements of an oil spill will dissolve in the water. This May render the water toxic to marine life in the vicinity. Lf the oil is agitated and mixed with the water, for example by a rough sea, then much of the oil may be dispersed in tiny droplets through the water, perhaps down as far as 30 metres. This is known as an "oil in water emulsion". Lt is very beneficial , since it enormously increases the surface area of the oil, which enables bacteria to attack and degrade the oil much more quickly. Another sort of emulsion. Called a "water in oil emulsion", is not nearly so desirable. Lt is a thick, sticky mixture, which barely loads, and is called "chocolate mousse". Mousse forms a sheet several inches thick, which down bacterial action and evaporation, and clogs up collecting devices. Lt may come ashore, where it collects sand and debris, and forms "tar balls", which are very stable, and may last for years. The bacteria which attack and Oxidise the spilt oil are found in large numbers in polluted areas, and multiply rapidly when oil is spilt. Because of the beneficial effect of these bacteria, any dispersants or detergents used to clean up the oil Should be biodegradable. Bacteria will also attack sunken or sediment oil, And their effect is then much slower. Bacterial action means that a given environment may be able to cope with a certain level of chronic pollution, but it too much pollution is introduced, the environment may no longer manage, and plants and animals will die. Action to take One of the first, most important things to be done is to collect samples of the spilt oil,

so that the source of The spill may be identified from analysis. Samples should be labelled with the time and place of collection, And must be kept in glass containers, not *metal* cans or plastic bottles. No action at all to clean up the oil May be the best decision. Lf the oil is at sea, and not likely to come ashore, then it may be sufficient to keep a watch on if, and allow natural processes of dispersion and biodegradation to take their course. However, in many cases it will be necessary to take some action to contain, divert, or disperse the oil. The golden rules are to prevent the oil from coming ashore if at all possible, and to make every effort to physically it from the sea or from the shores, it despite all efforts it gets ashore), rather than disperse it Chemically. Burning the oil is not likely to be effective, at sea or ashore. The light Fractions will burn, but these would have evaporated anyway, and the tarry residue will remain. At sea, the film spreads out so thinly that it is cooled very effectively by the sea, and so Does not burn completely. Ashore, the heat will melt the tarry residue, and enable it to soak into the beach, which will make it very hard to remove. In relatively calm waters, oilcan be contained by the use of booms. Booms may be fixed in positions to protect sensitive areas of coastline, or they can be towed between two boats, to collect the oil for easier removal. Oil may escape both over and under a boom, and in a strong Current, or in rough seas, a boom's effectiveness will deteriorate markedly. Nevertheless, in lagoons and sheltered waters, booms are an important part of the clean-up armoury, and the availability of booms In the area should be noted in the contingency plan. Some booms are absorbent, and some can absorb up to 20 times their own weight of oil. In emergency, coconut husks can be held in a listing net and used as a Boom, or vines can be laid on the water to contain and soak up the oil. When the oil has been contained by a boom, it should be collected and removed if possible. Since oil floats, and sticks to things, it should be possible to skim il from the surface. In practice, since the oil film is often very thin, and the sea surface is often very rough, this is not so easy. Some skimmers expose a large surface to the oil, to which it sticks, and from which it is then scraped off . Others operate as centrifugal separators, or incorporate a weir, intended to remove the oil directly from the Oil/water interface. They work well in banks, but not so well in waves. They collect a mixture of oil and water, which then has to settle out. They tend to get clogged with mousse, tar balls, and floating debris, Nevertheless, skimmers of suitable size and type can collect a good proportion of the floating oil. Oil may be sunk using physical agents, or dispersed using chemical agents. Sand spread on the oil will collect some of it, and sink it. Of course, it may float free later. The method is not suitable where oil on the sea bed would affect bottom-living fish, or foul fishing gear. Chemical dispersal of oil is widely Used, and has been controversial, especially in earlier days, when the dispersants used were highly toxic. Even now, a judgment has to be made, before using chemical dispersants, that the toxicity of the oil and the dispersants will not be greater than that of the oil alone.

Chemical dispersants, together with agitation of the water surface, emerge the oil to form small particles, and thus promote the formation of an oil in water emulsion. The natural movement of the sea then spreads these oil particles through a huge volume of water, and as the surface area of the oil has also been increased enormously, the bacteria are able to Attack it much more effectively.

Oil on the shore

Lf the oil gels ashore, it is not going to be easy to clean it up. The choice of treatment will depend on the type of oil, and the type of shoreline. Careless or unskilled removal or treatment of oil may do more damage Than the oil alone. Vehicular traffic can damage beaches and dunes. Washing down with fresh water will Reduce the salinity of tidal pools, and may kill all the animals in them. Areas that there is no need to clean should not be cleaned, unless the oil might be lifted off and deposited somewhere else. A bathing beach should only be cleaned if it is required for use. There is no point in cleaning up a beach, if more oil will come ashore and foul it again. The contingency plan should Specify which areas have priority for cleaning, and the methods to be Used. People involved with fisheries and tourism should examine the whole area concerned, to establish priorities and agree the clean-up methods to be used. Disposal of oily material must be considered, or oil May seep into the ground, and into water supplies, or back into the sea. Mechanical removal is already the Best way to dispose of oil on the shore, provided it can be done sensitively. On a sandy beach, Removal is fairly easy. Be careful that vehicles do not damage the beach, and do not spread oil lo clean areas. It may be necessary to bring in clean sand to replace what has been removed. Bulldozers, front end Loaders, and tractors can all be used, as can hand rakes and shovels. A pebble beach is harder lo clean. And mechanical removal of a considerable depth of shingle may be necessary. On a rocky shore, the oil must be removed by hand, perhaps with the aid of dispersants. Mud that and mangroves are very difficult, and cannot be cleaned mechanically. Mudflats should be left at one.

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