



# Green Schools Network

## ACTIVITY SHEET

December 2012

### Why talk about Oil Spills?



- In the 1990s, there were 361 spills of over 7 tonnes, resulting in 1,137,000 tonnes of oil lost; 73% of this amount was spilt in just 10 incidents.
- In the 2000s, there were 181 spills of over 7 tonnes, resulting in 210,000 tonnes of oil lost; 44% of this amount was spilt in just 2 incidents.

Why is this a cause of worry? Apart from ravaging the aquatic ecosystem, oil spills affect the local economy as well as the health and livelihood of the local community.

A huge amount of money is spent in cleaning up oil spills. What are the different ways of cleaning up oil spills? Are these methods effective? Is there something that can be done to reduce oil spills?

Oil spills have earned such notoriety that the world cannot but take note of their effects.

Name.....

School Name .....

Class..... Date .....

### GOBAR GYAN

The term 'oil spill' generally evokes the image of crude oil pouring out of an oil tanker at sea owing to accidental leakage, but it can be used to refer to any type of oil release. An oil spill is a type of pollution caused by the accidental release of any liquid petroleum hydrocarbon into the environment which may occur due to reasons such as mechanical failure or human error, which happen while releasing oil from a container or pipeline. Natural disasters such as earthquakes can also cause release of oil from reserves trapped beneath the ocean floor. Often, illegal waste oil dumping into oceans, particularly by organisations that do not want to invest in the cost of degrading their waste oils, also contributes to this increasing form of pollution.



Though the spills are usually associated with marine oil spills, where oil is released into the ocean or coastal waters, they may also occur on land. Most engines, such as those used in automobiles, run on petroleum-based fuel and lubricants. These substances are slowly released during operation, accumulating on roads or in the ground, where they can poison the surrounding soil. When it rains, these pollutants often end up in local streams and rivers, and ultimately in the ocean. Such oil spills are not as visually dramatic as those from a marine accident, but can do serious damage both to land and coastal areas.

**Activity 1: To Understand What Happens When Oil Spills in Water:** What do you think happens when oil spills in water? Do they mix or separate from each other? Let us replicate an oil spill & find out.

- **Material Required:** Bowl of clean water, vegetable oil (or any cooking oil), aluminium foil.
- **Procedure:** Shape the piece of foil into a small boat. Pour a little oil into it and gently place it in a bowl full of water. When you want to create your oil spill, tip the boat over. See how the oil contaminates the water and spreads.
- **Observations:** You will notice that the oil separates and sits on top of the water. This is because oil has a lower density than water. You will also find that the oil begins to dissipate at an almost exponential level. If you were to mimic rough waters, the oil would spread at a greater pace. The speed at which it spreads depends on how viscous the oil is. If it has a high viscosity, it will spread more slowly than if it has a low viscosity.



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## GOBAR GYAN

**Effects of an Oil Spill:** The effects of an oil spill can be devastating and affects both the economy as well as the environment. Let us see how:



Oil spills largely affect the plumage of birds and fur of mammals making them less able to adapt to temperature fluctuations and less buoyant in water. They become heavy and may find it difficult to fly. The birds then attempt to clean themselves by eating the oil slicks from their plumage which leads to irritation of their digestive tract, alteration of liver function and kidney damage which eventually leads to death of the bird.



Killer whales are poisoned when they feed on fish that has swam through the oil. The oil poisons them, and eventually they die. Sometimes, the oil blocks their blowhole (the holes through which they breathe) and they die. This has led to killer whales becoming an endangered species.



Apart from poisoning the liver or lungs of mammals, oils may also blind certain animals thereby reducing their ability to avoid predators and they may thus be killed, which can lead to that animal specie being endangered.



Industries that rely on clean seawater for routine operations can suffer because operations have to be stopped while the water is cleaned.

Plankton, oysters and other organisms dwelling near the seabed are generally the most affected by oil spills as the oil slick prevents sunlight from penetrating through to the bottom of the ocean. When microscopic plants cannot photosynthesize and manufacture their food, they cannot release oxygen for the bottom dwelling aquatic organisms, which leads to their death.



The fishing industry suffers badly when an oil spill occurs. Firstly because the fish are often covered in oil, or have swallowed oil making them poisonous thereby decreasing the catch of fish for fisherfolk. It is also difficult for boats to sail because the oil can damage them and the devices used to catch fish.

Oil, tar-balls, dead fish and birds all get washed up on the shores and the oil slick interferes in activities such as fishing, sailing, swimming, etc. The local tourist industry suffers because tourists are not interested in coming to a coastal area where they cannot do the activities as listed above.



Humans who have fish farming as a means of livelihood may have to relocate.

Thus, we see how the biodiversity of a place where a spill has occurred is greatly affected. The time taken for these damaged populations to recover depends on many factors and is highly variable.

### Activity 2: To Understand the effect of oil on birds/marine life:

- **Material Required:** Bowl of clean water, feather, oil, rubber duck or fish or other marine life bath toy.
- **Method:** Take the bowl of clean water and gently place the rubber toy and the feather on the surface. Note how the feather repels water, allowing it to float. Now gently pour some oil into the bowl. Avoid pouring directly over the toy or feather. What happens to the toy and the feather? Record your observations. Gently swirl the water around in the jar to stimulate waves. Record your observations. A nice way to do so is by taking photographs of each step of the experiment.
- **Observation:** Before swirling the water, you will observe that the oil floats on the top of the water (as seen in Activity1) and coats the feather as well as the bottom of the rubber duck. When you simulate waves, water and the layer of oil on top of it will splash onto the feather and the rubber duck. The duck gets coated with oil while the feather sinks to the bottom of the pan because the oily feather can no longer repel water.

**Discussion:** How do the results of this experiment apply to oil spills in real life? Do you think ocean life is affected by an oil spill? What do you think happens to animals that come to the surface to breathe, such as whale and dolphins? Do they get coated with oil as they surface? Discuss with your classmates.

## GOBAR GYAN

### Cleaning Oil Spills:

The petroleum industry undertakes several measures to reduce the likelihood of oil spills. These measures help protect both the environment and the oil companies themselves, which often lose a great deal of profit and public image in the event of a spill.

When a spill does occur, however, efforts to clean up the oil can be difficult and exhausting. Some take even years to clean up.

There are several methods currently available to clean up oil spills. These include:

**SKIMMERS AND VACUUMS:** Boats equipped with skimmers & vacuums are designed specifically for physically gathering & removing oil from water surfaces

**IN-SITU BURNING:** Is a name given to the burning off of the oil while it is still at sea. However, burning itself leads to other environmental concerns such as production of smoke, formation of residues, & safety concerns.

**DISPERSANTS:** Special chemicals that work like detergent to help break up oil so that bacteria & other natural organisms in the ocean can digest it. However, there are some limitations on chemical dispersants as they can cause damage themselves if they are not controlled.

**CLEANING OIL SPILLS**

**BIOREMEDIATION:** A process that uses microorganisms to feed off the oil partially degrading it initially into water soluble compounds & eventually into carbon dioxide & water. This can help clean up in a way that does not cause further harm to the area. The process is, however, too slow to prevent the majority of oil from reaching the shore line & can also be physically & biologically harmful in some habitats such as salt marshes.

**SORBENTS:** Materials that are used to absorb/ soak up the oil

Such reactive measures are imperfect, however, and these spills can still cause tremendous harm to both plants and animals. In some locations, entire populations of some species — including fish, marine mammals, and birds — have been killed. The reproductive systems of many animals can also be damaged by oil, making it that much more difficult for populations to recover. Oil is extremely difficult to clean up completely, and often takes many years to disperse naturally. Spills often make areas of water or land dangerous for people as well, and can wash up on shores, leaving an ugly, sticky mess.

**Activity 3: To Understand the Complications in Cleaning Up an Oil Spill & Finding the Most Effective Method:** Let us assume that the bowl of water with oil is an ocean in which an oil spill has taken place. How do you think we can 'clean up' the water? Try all your ideas and see if you can come up with an effective solution. Note down all your observations in the table below. Some examples have already been mentioned in the table. Continue to add to the list.

Observation Table

Material Used	Method	Observation
Cotton balls	Soak up the oil by placing the cotton over the contaminated areas.	Cotton ball fibres absorb the oil from the water but also take a lot of water along with it The number of cotton balls required to clean up that small amount of oil is staggering!
Detergent	Put a few drops of detergent to the oil & water	The soap breaks it up at first, then just mixes it all together
A Ladel		
Paper Tissue		
Hair		
Coconut Husk		

**Discussion:** What do you think would be the hardest to clean up in the case of an oil spill – an ocean, lake, or river? Imagine the effect of millions of gallons of oil being spilled into a water body and how much effort would be required to "absorb" it all. Discuss with friends.

**Ever thought of how YOU can contribute to reduction of oil spills?**

Oil is a major source of energy and is used in numerous ways in our day to day activities. We use oil to fuel our cars/buses and to heat/light up our homes. It is used extensively in industries to power large machinery. Oil is used to tar roads, make plastics, used in inks, paints etc. If oil consumption is reduced, the demand on the refining and transportation of oil would also decrease, leading to reduction in oil spills. Little oil saving measures such as walking or riding a cycle for short distances and reducing electricity consumption by turning off electronic equipment when not in use add up and impact the demand for oil, which can lead to lesser spillages.



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